Vegetation for Erosion Control – A Manual for Residents

Slope Stabilization and Erosion Control using Vegetation on Dry Forested Hillsides in the Virgin Islands

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This manual was prepared by Sean Richardson of the Coral Bay Community Council with assistance provided by Watershed Consulting Associates, LLC. www.watershedca.com

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Using this publication

Slope Stabilization and Erosion Control using Vegetation on Dry Forested Hillsides in the Virgin Islands seeks to provide basic information to homeowners, the general public, and the relevant government agencies on how to target sources of sediment from exposed areas by using slope planting techniques that will help in stabilizing slopes and controlling erosion.

This landscaping manual is focused on erosion control of exposed areas utilizing mostly native species. The information in this manual includes:

(1) plant information: type, photo, description, erosion control potential, drought tolerance, feral livestock and iguana resistance;
(2) planting methods;
(3) planting times;
(4) planting densities/spacing, and
(5) potential purchase locations.

Emphasis is on plants that provide erosion protection through fast growth and good root structures.

No non-native, invasive species are recommended for use.

There will likely be many situations where professional advice will be needed. This manual is not a replacement for professional engineering or site specific consultation advice from landscaping professionals.

The information provided in this manual is to help homeowners in their planting decisions and to assist in making simple installations on slopes.

Introduction to the Coral Bay Watershed and similar steep Caribbean island residential watersheds **:**

The Coral Bay Watershed, at about 3000 acres, is one of the largest watersheds in the US Virgin Islands (USVI), and the largest land surface area draining into an individual bay on St. John. The Coral Bay shoreline contains a high diversity of habitats such as salt ponds, extensive mangrove habitat, sea grass beds, and fringing reefs.

In Coral Bay:

- steep slopes are characteristic of the landscape with an average 18% slope with half exceeding 30%.
- 94% of the soils are classified as highly erodible, and 38% of the roads are unpaved (Ramos-Scharron et al 2012).

- This combination of factors leads to one of the major impacts on coastal water quality: erosion-caused sedimentation.

- Residential development in Coral Bay often leaves exposed hillsides that can become sedimentation sources. Most home sites have at least one area that is a steep, eroding hillside or cut slope steeper than 2:1.

Homeowners often wonder what plants can be used to stabilize their hillsides.
This landscape manual seeks to provide erosion control answers through landscaping to homeowners.

Proper evaluation of your homesite slope:

In evaluating your homesite slope, you need to consider what is happening on your slope. Things to observe on your site are:

1) soil type,
2) how slowly or quickly water drains into the soil, and
3) vegetation type.

Valuable information can be obtained when observing the slope under heavy rainfall events, or persistently wet conditions. When doing your slope site observations, consider:

1) The nature or steepness of the slope;
2) identifying current slope problems areas; and
3) recording factors that may be contributing to erosion and stability problems.

Soil Analysis:

According to the Soil Science Glossary from the Soil Science Society of America, soil is defined as follows: (1) "The unconsolidated mineral or organic material on the immediate surface of the Earth that serves as a natural medium for the growth of land plants. (2) The unconsolidated mineral or organic matter on the surface of the Earth that has been subjected to and shows effects of genetic and environmental factors of: climate (including water and temperature effects), and macro- and microorganisms, conditioned by relief, acting on parent material over a period of time." With soil, we must consider its composition, profile, texture, and structure.

Soil composition

Soil is composed of all different kinds of particles that are of diverse sizes. Soils are primarily composed of mineral and organic particles.

Soil profile

In soil, there are various layers that are different in color and composition. These layers are called horizons. It is this succession of horizons that is defined as the profile of the soil. A generalized and simplified soil profile can be described as follows: (a) Plough layer (approximately 8-12 inches thick) which is usually rich in organic matter and has many live roots; (b) The deep plough layer which contains much less organic matter and live roots; (c) The subsoil layer which hardly contains any organic matter and live roots. This layer is not that important for plant growth as only few roots reach this deep; (d) the parent rock layer, sometimes called "parent material" which consists of rock. What is to be noted is that these layers may vary in depth considerably and possibly have layers that are missing altogether!

Soil texture

Soil mineral particles differ widely in size. They can be classified as follows: gravel, sand, silt, and clay. The amount of these particles in the soil is defined as soil texture. Soil, in terms of its texture can be described as follows: coarse, medium, and fine. Coarse textured soil is gritty. The individual particles are loose and fall apart in the hand, even if it is moist. Medium textured soil feels very soft when dry and is easily pressed when moist, even becoming silky in feel. Fine textured soil is sticky when moist and even form a ball when pressed together. Coarse soils are sandy soils. Medium soils are silty or loamy soils. Fine soils are clay soils.

Soil structure

Soil structure refers to how soil particles (e.g. sand, silt, clay, organic matter, etc.) are grouped together into porous compounds known as aggregates. These aggregates are separated into pores or cracks. It is through these pores or cracks in which water enters. Soil structure is not a permanent feature of the soil and it can be changed by adding organic matter, such as compost.

Adding Compost from your own table scraps and food waste

Your own "backyard composting": diverting your vegetable, fruit, and other food waste (no dairy or meat) leaves and gardening waste into a valuable soil additive that helps retain moisture and provide nutrients, so you can avoid commercial fertilizers too. Check CBCC's website and the internet for more info.

Drainage

Drainage conditions on your slope should be observed and carefully evaluated. Seepage from the slope face should also be looked into. The runoff on the surface should also be investigated, particularly during periods of heavy rainfall.

Vegetation

The final key factor in evaluating your slope is the type of vegetation presently growing at your site. In addition, the presence or absence of vegetation on your slope is also important to consider. With this information recorded, you can then determine the type of environmental conditions the plants growing at your site can tolerate. This will prove useful in the variety of plants you use to control erosion and stabilize your slope.

Slope stability

Factors affecting slope stability are strength of soil and rock, type of soil and how it is stratified (i.e. how it is layered or deposited), and geometry (i.e. shape) of the slope. Causes of slope failure include erosion, rainfall, earthquakes, geological factors, construction activities such as excavation of slopes and filling of slopes, and a change in topography.

Source: Agriflora Tropicals

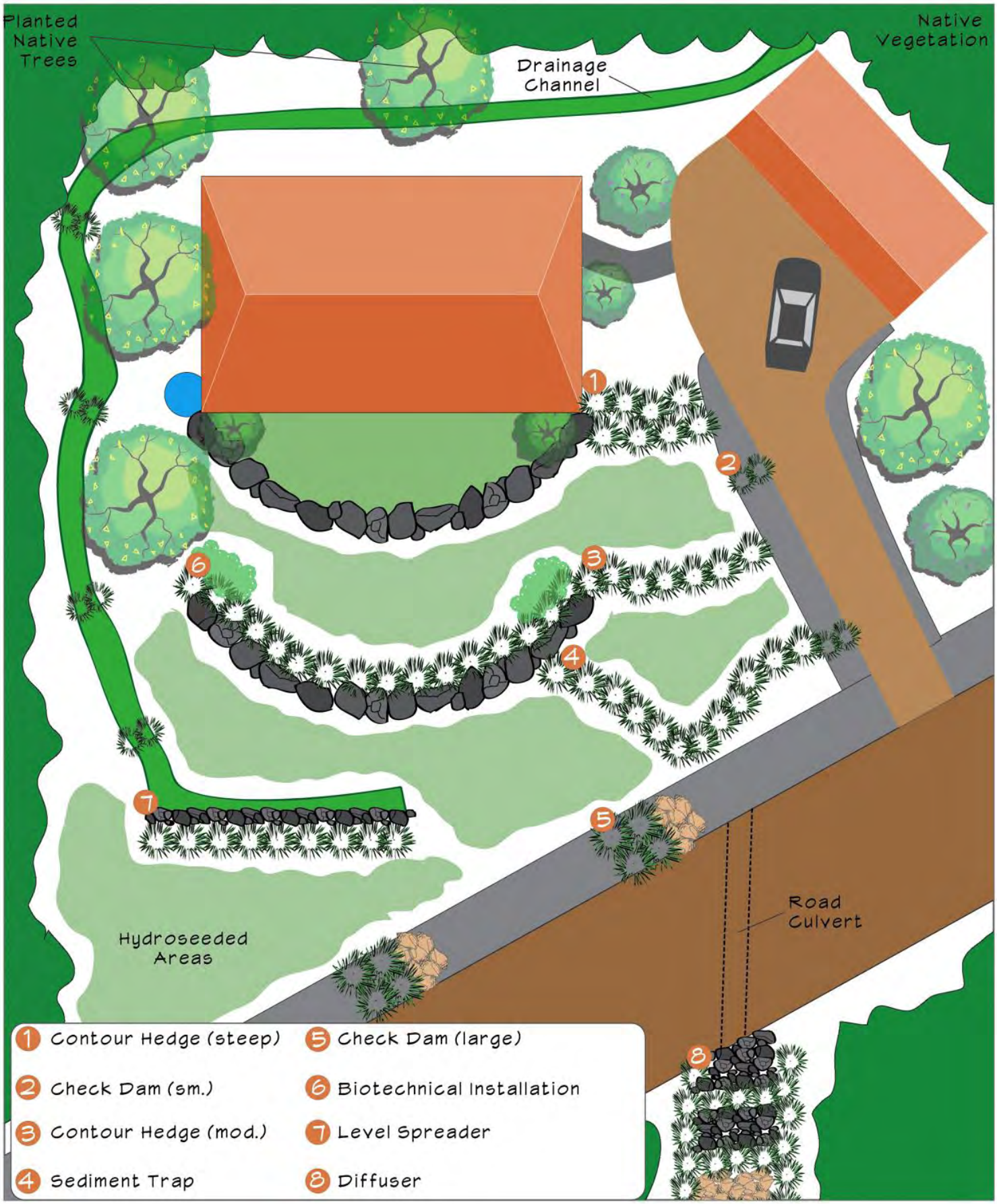
Source: Vetiver Network International

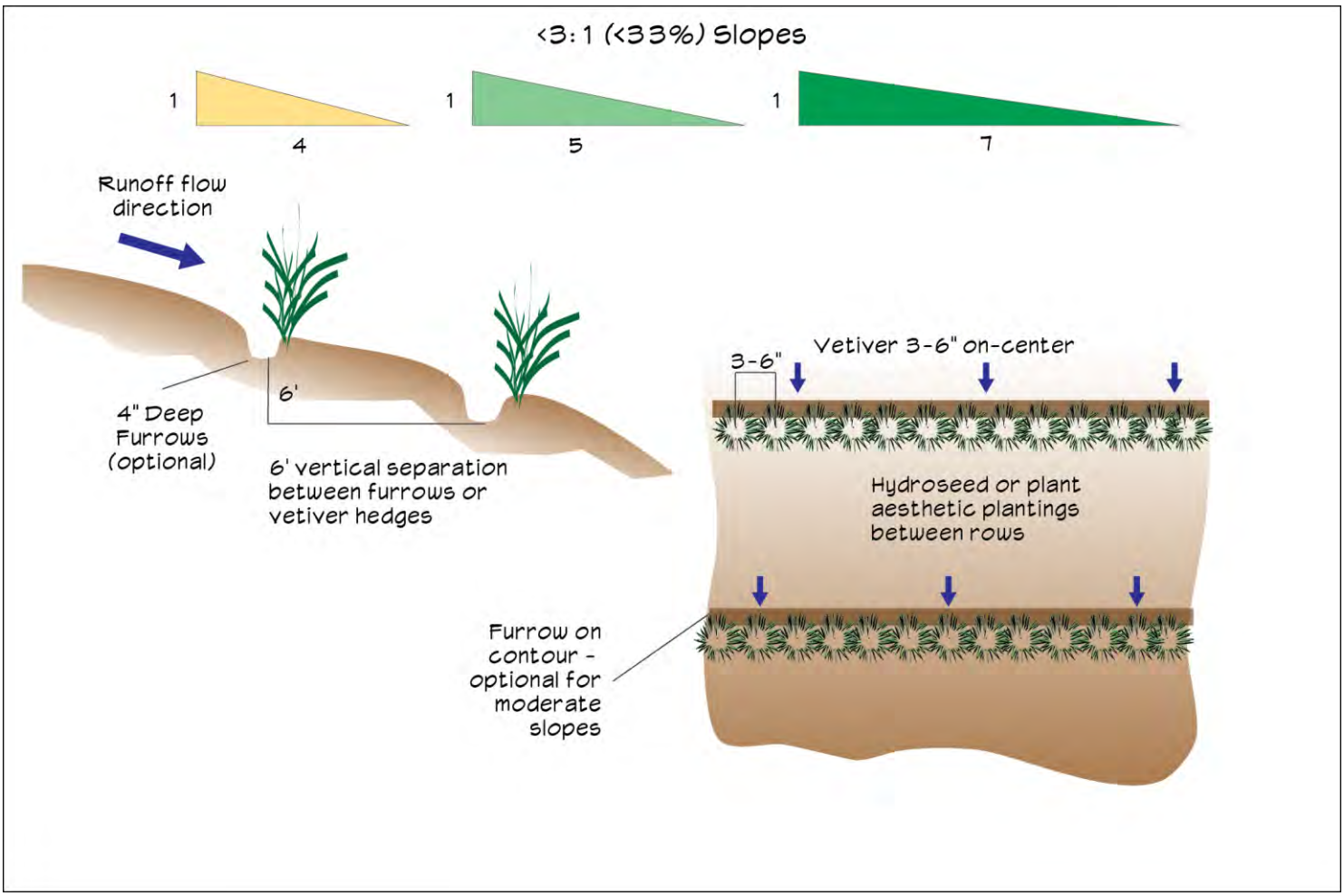
The "Vetiver Grass System" is an effective, low-cost, multifunctional bioengineering method that can prevent erosion by enhancing control over soil and water management. Vetiver is a uniquely dense, erect, deeply rooted clump grass that is infertile and non-invasive. Planting Vetiver grass, *Chrysopogon zizanioides* (aka *Vetiveria zizanioides*) in slim hedges along the contour lines of sloped land reinforces water infiltration.

This method has been deployed in numerous places around the world, including in the Caribbean. Research indicates that established vetiver, even when burnt or close-cropped by animals or landscapers, can continue to provide erosion control through its extensive, deep root system. Anecdotal evidence from vetiver plots in Puerto Rico indicate that feral animals don't seem to browse the grass as heavily as others grasses due to its woody nature.

Common Name: Vetiver grass
Scientific Name: *Chrysopogon zizanioides*
Plant family: Poaceae
Form & Habit: Upright clumping
Mature Size: 5' tall, up to 5' wide
Native Range: Indian subcontinent
Native Habitat: Tropical / sub-tropical
Water requirements: Minimum 9" rain annually, tolerates from 24"-156" rain annually.
Light requirements: Full sun, partially shade tolerant
Soil requirements: adaptable to most soil types; tolerates salinity, most pH conditions (3.3 – 12.5)
Erosion control potential: High due to dense stems at ground level, deep root structure (4-13') depending on soil conditions.
Drought tolerance: High due to deep root structure.
Feral livestock resistance: Local anecdotal evidence indicates high tolerance.
Propagation: Vetiver can be propagated by separating plants out of existing hedges – however it does not propagate extensively on its own and most research indicates that it is functionally sterile.
Planting density/recommended spacing: See specific erosion control practices using vetiver for planting specifications.
Potential purchase locations: Agriflora Tropicals, Puerto Rico (http://agrifloratropicals.com/) or see http://www.vetiver.org/g/plantsuppliers.htm for a complete list.
Notes/Comments: Use varietal 'Sunshine' (available from U.S. and Agriflora Tropicals) 'Sunshine' is non-invasive. Plant at the beginning of the wet season or ensure that irrigation during establishment is available.

Erosion Control – Sample Site Layout

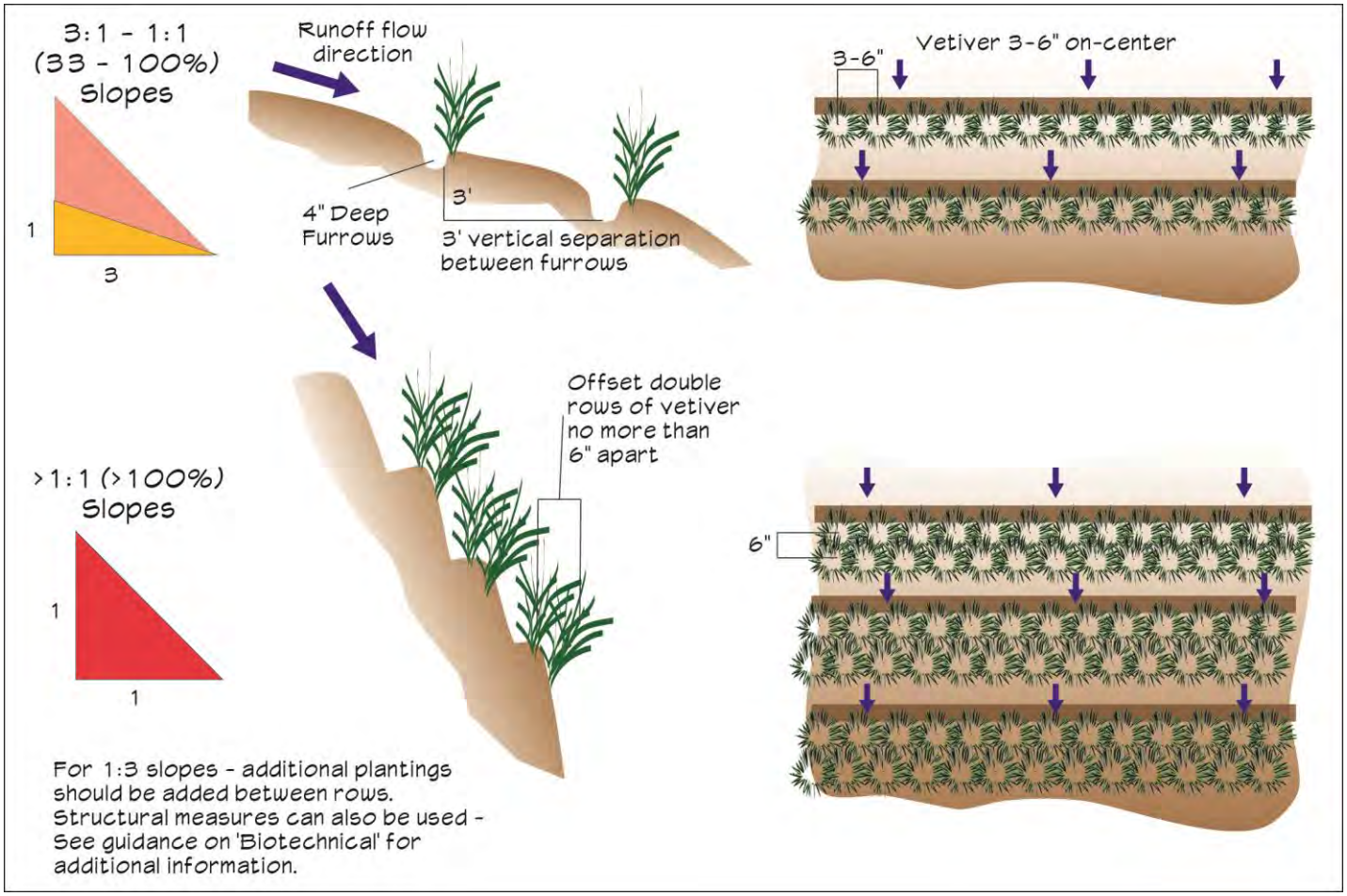




On slopes that are less severe, less than 3 to 1 (33%) or more than 3' of run for every vertical 1' of rise, it is important to initially grade the slope to eliminate rutting which may channelize water down the slope. After grading small furrows, berms can be constructed across the contour for a height from furrow to berm of 4 inches, although the creation of these furrows is less critical as compared to steeper slope installations. Vetiver hedges should be planted across the contour with a vertical interval of 6 feet as measured down the slope. Plants should be spaced 3 inches apart, but no more than 6 inches apart. Do not leave open spaces between plants.

Vetiver Establishment: It is important to plant Vetiver at the beginning of the rainy season to attempt to naturally irrigate plants as much as possible. Otherwise, ensure that irrigation water will be available (see Irrigation page).

Succession and Aesthetics: Unlike vetiver plantings on steeper slopes, aesthetic plants or grasses can be planted and encouraged immediately on moderate slopes as soils are more stable and will be more likely to hold plantings. Numerous options for aesthetic plants, shrubs, and trees are presented in this manual for consideration. Refer to the section on grasses if grasses are preferred.

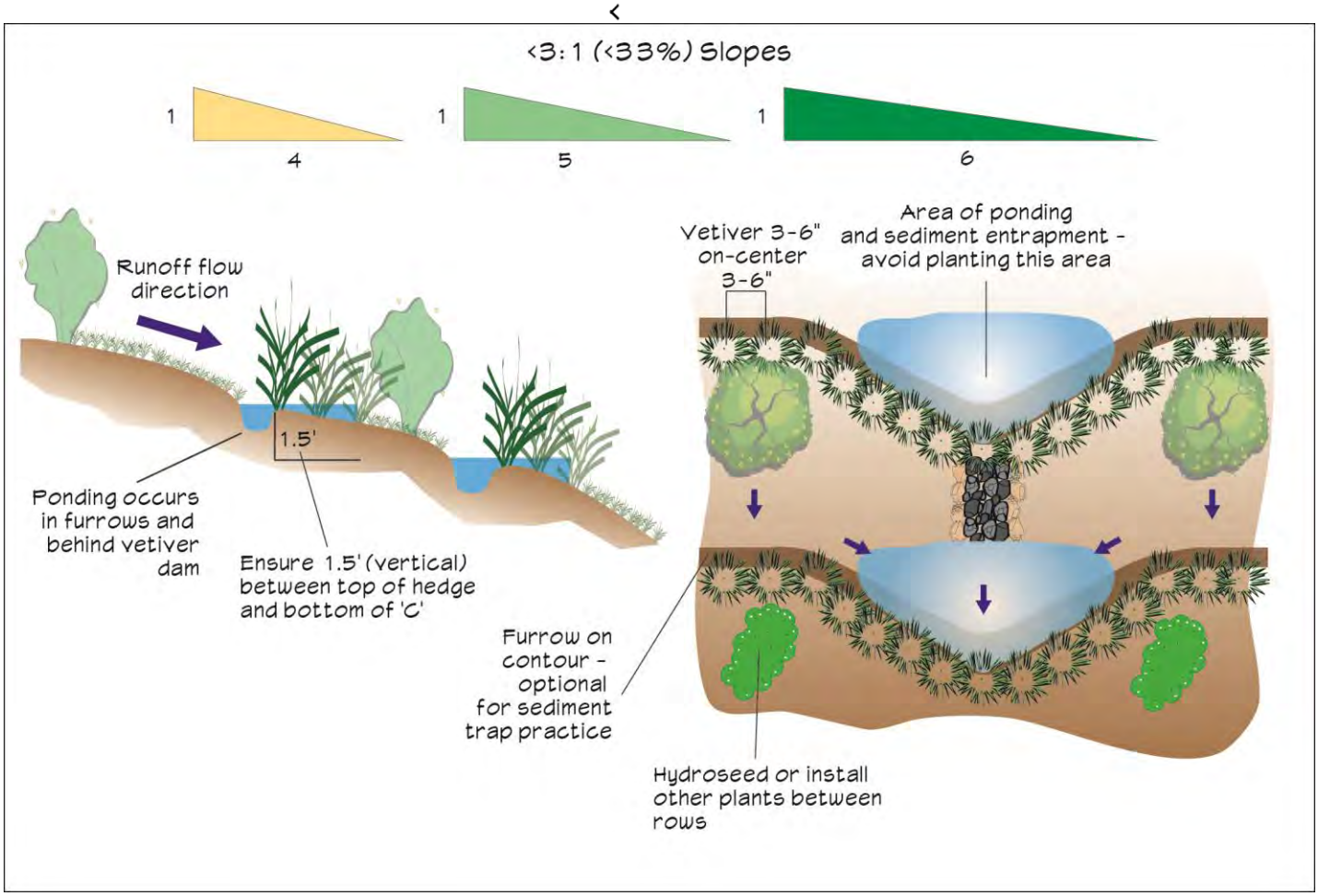


Steeper slopes over 3 (H - Horizontal) to 1 (V - Vertical) or 33% require extra attention for erosion and sediment control using vegetation. As slopes become steeper, runoff becomes more erosive and stabilizing a slope becomes more challenging.

Steeper slopes should be graded as smoothly as possible before planting so that defined channels running down the slope are eliminated to the maximum extent practicable to encourage sheet flow of water.

Initially, create small furrows and berms across the contour for a height of 4 inches from furrow to berm. These furrows should be spaced with a vertical interval of 3 feet as measured down the slope. Furrows will allow for water flow capture if runoff occurs before the vetiver has been established. Over time as plants become established the furrow will "melt" and a more natural terrace will become established.

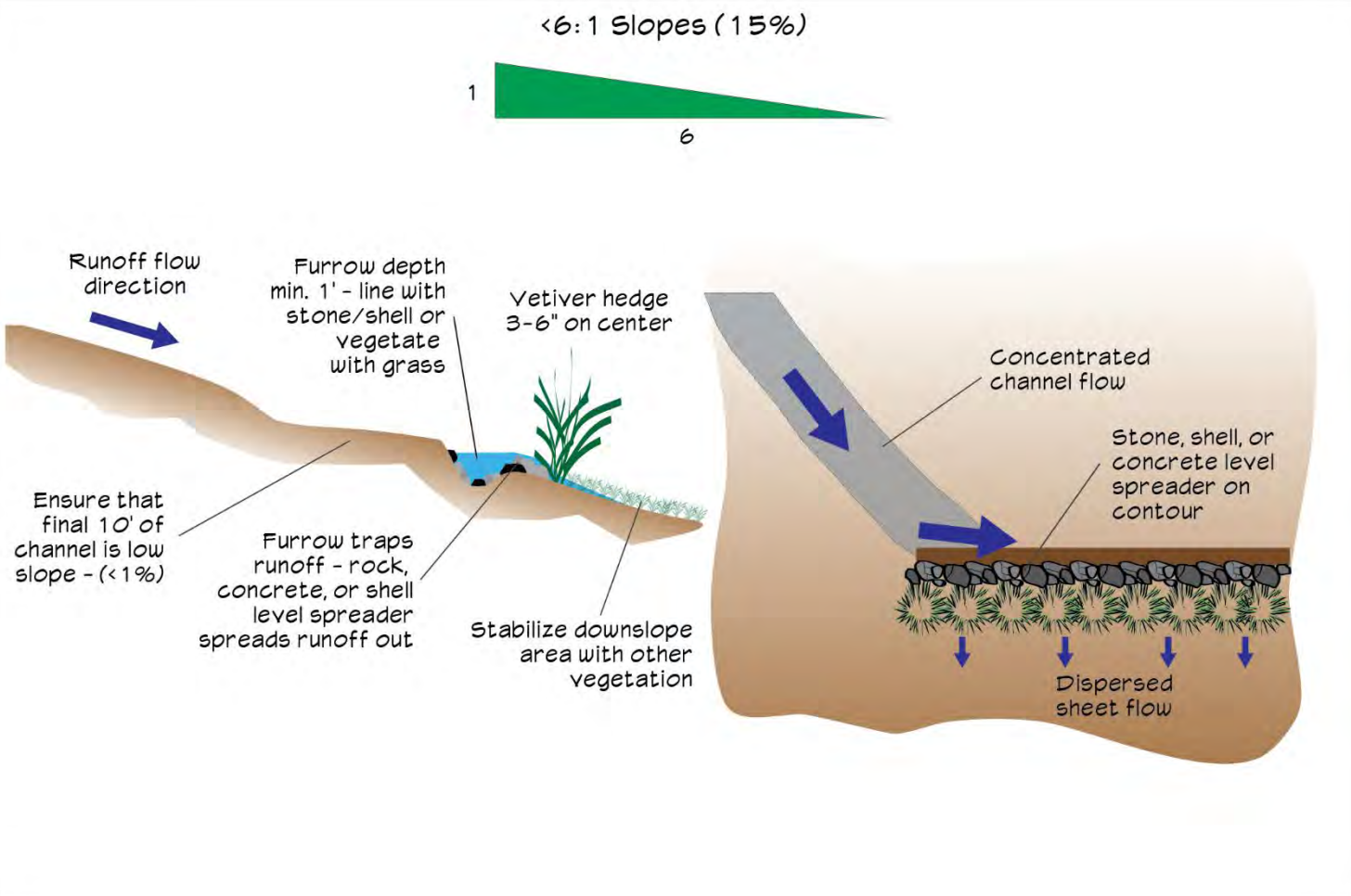
Next, install rows of vetiver along the top of the berms along the slope contour. Plants should be spaced 3 inches apart, but no more than 6 inches apart. Do not leave open spaces between plants. On slopes exceeding 1 (H) to 2 (V) two rows can be planted next to each other across the contour to further resist erosion. The second row should be planted 6 inches down the slope from the first row with the plants staggered from the first row. On slopes steeper than 1 (H) to 3 (V) it will be important to supplement the vetiver slope plantings with additional critical area plantings such as wiregrass or similar grasses and potentially also integrate structural measures for a biotechnical solution (see The Vetiver System - Biotechnical).



Vetiver can be used successfully to create small storage areas that will trap sediment. This type of system is useful when installed below land that has been actively disturbed, such as a house lot. The purpose of the sediment trap system is to encourage the temporary holding of runoff such that entrained sediment will settle out and be trapped.

The Sediment Trap system should only be installed on moderate slopes lower than 3 (H) to 1 (V). Moderate slope specifications should be followed, but instead of installing hedges directly across the contour, ends of each hedge should be elevated 1.5 feet above the middle point, creating a 'C' shape across the slope. This will result in the creation of a storage area in the middle of each 'C'. Runoff can temporarily pool in each 'C' allowing sediment to filter out of the water column. It is important to note that no plantings should be installed in the 'C'-shaped trap as this area provides a void for sediment and water storage.

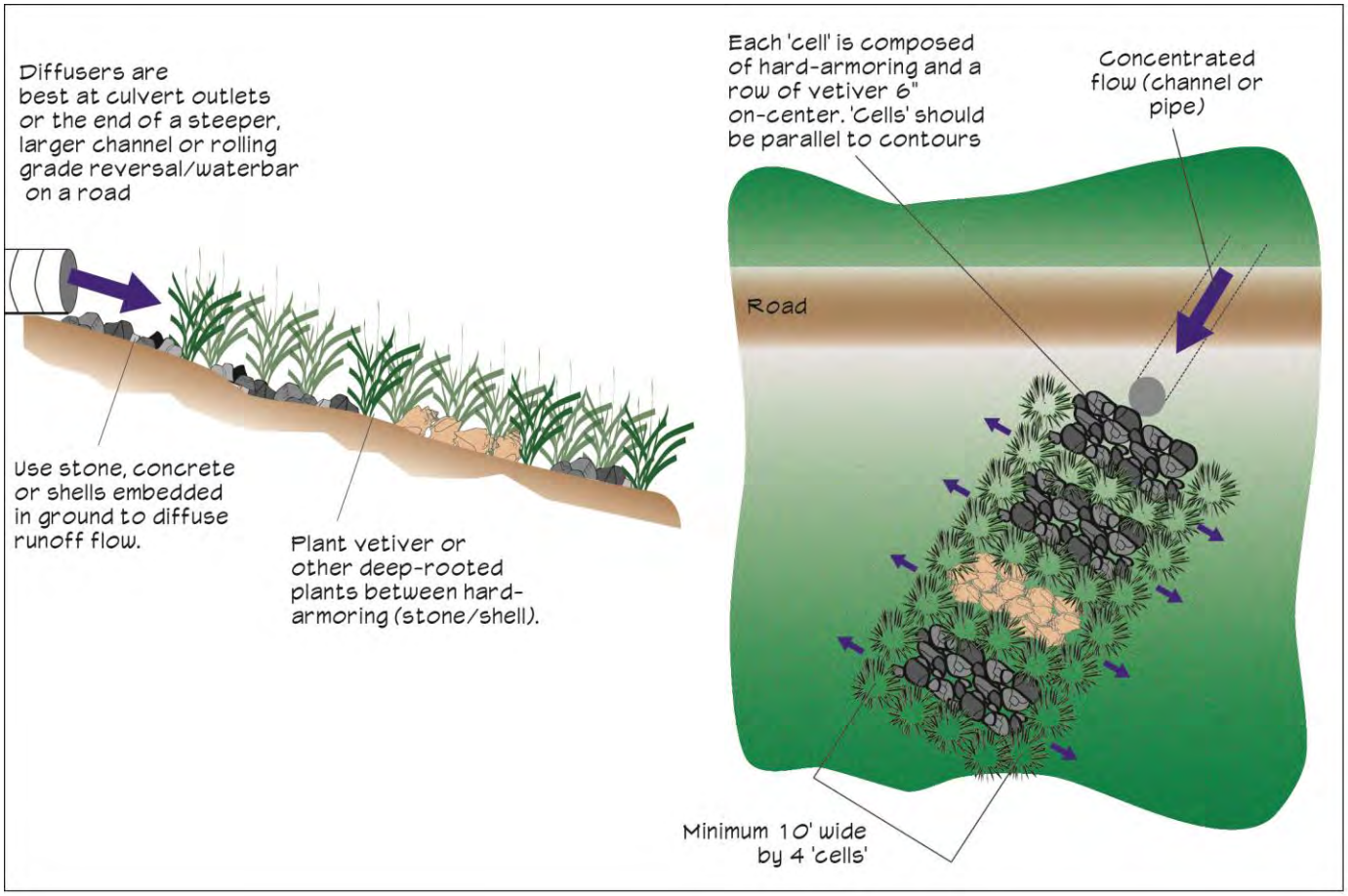
On slopes above and below the Sediment Trap, additional plantings can be used that will supplement the Sediment Trap and vetiver hedge.



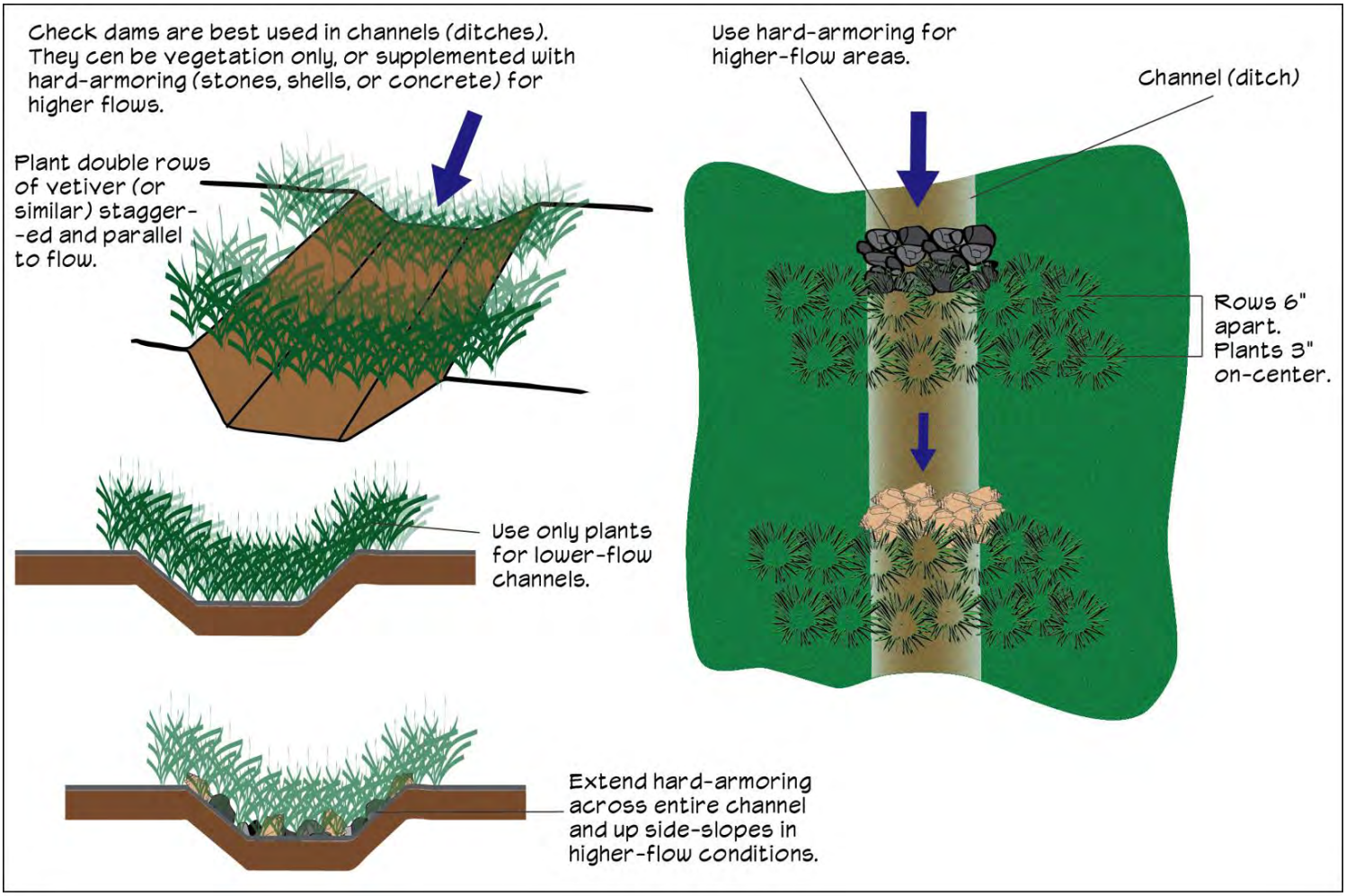
Dispersing runoff in upland areas where it has not yet concentrated into larger, more powerful, flows is an excellent strategy to avoid erosion and sedimentation. **Level spreaders** are practices that accept runoff as a concentrated inflow and return the flow to sheet flow by spreading it out through vegetation and stone and conveying the runoff over a relatively even vegetated surface below. The components of a level spreader are the inflow channel, the spreader system, and the undisturbed vegetated buffer.

Important - level spreaders should only be used with small drainage areas and on slopes that do not exceed 15%. Vetiver plantings can be integrated into a level spreading system by lining plantings behind the spreader system, which can consist of stone rip rap, concrete, or conch shells keyed into the ground.

Runoff is initially diffused by passing over the spreader's lip, and is further slowed and diffused through a vetiver hedge planted along the contour immediately downslope of the spreader. Once the runoff passes through the hedge it is dispersed into an undisturbed buffer below. In cases where very small and low slope drainage areas are being managed, the level spreader may be constructed entirely of vetiver plantings without the need for the concrete or rip rap spreader.



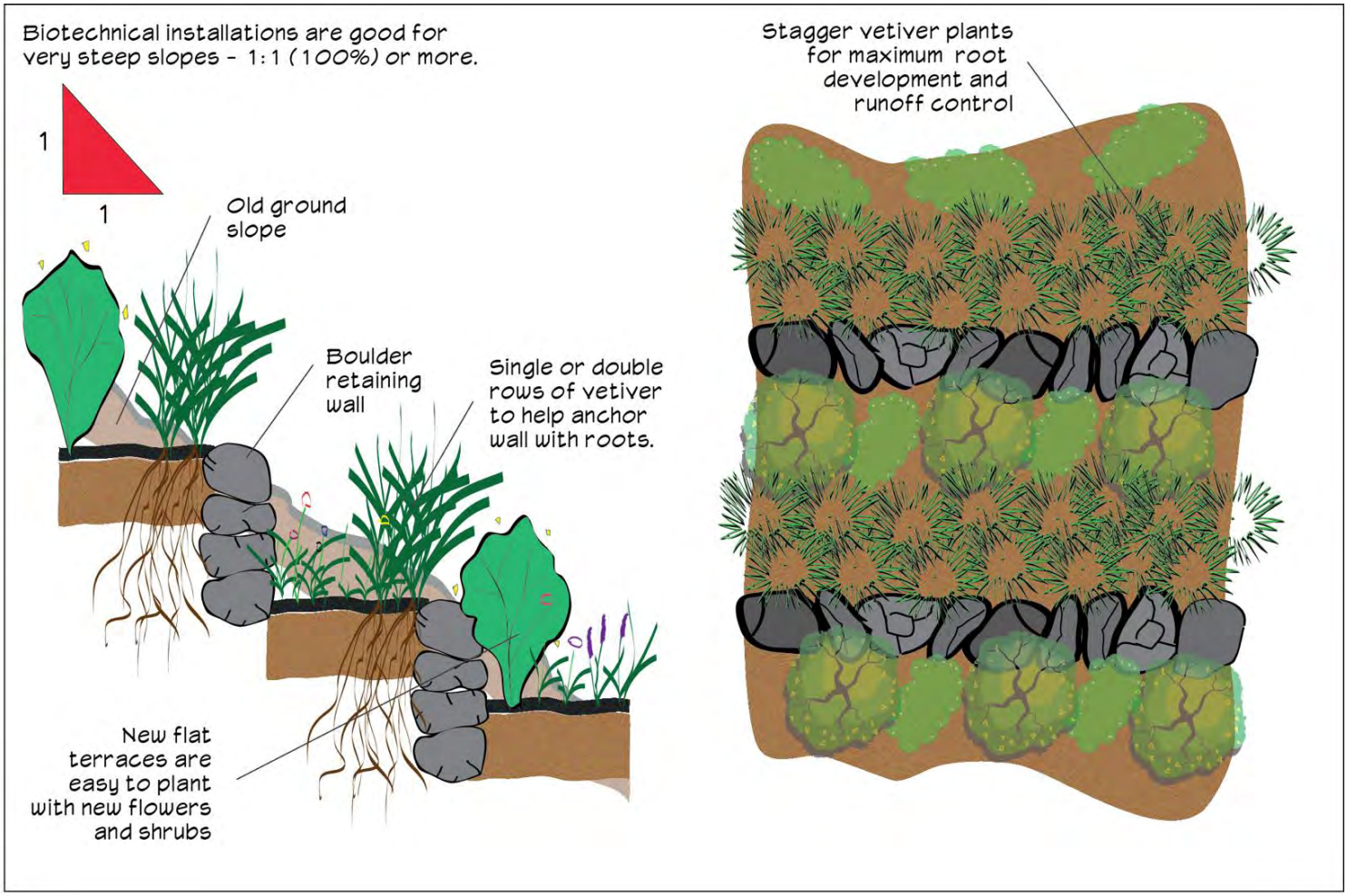
A diffuser is utilized where space is too constrained and flows are too great for a level spreader, i.e. larger drainage areas or small channelized-flow areas. **A diffuser is utilized most often at the end of a concrete or earthen rolling dip or water bar intended to manage runoff on roadway surfaces – this includes off the end of driveway switchbacks where the driveway changes direction.** Placing a diffuser off the end of a driveway switchback can be a very effective way of managing concentrated runoff. Diffusers can also be utilized at the ends of culverts. The purpose of a diffuser is to reduce the energy of concentrated runoff by interrupting the flow in a stone and vegetated pocket. Diffusers can be constructed by alternating rows of rip rap and vetiver plantings across the contour at the discharge point for a water bar, rolling dip or culvert. Rows should be a minimum of 10 feet wide, but can be narrower if space is constrained. A minimum of 4 rows of both stone and vetiver plantings is recommended as space allows.



Where open channels exist that convey runoff, vegetative vetiver plantings placed perpendicular to the direction of flow can serve to reduce flow velocity in the channel thereby reducing erosion, promote water infiltration, and retain sediment. As the drainage area size increases, additional plantings, possibly fortified with stone rip-rap are required to withstand the hydraulic forces. In lower flow channels, vetiver should be planted spaced 3 inches apart.

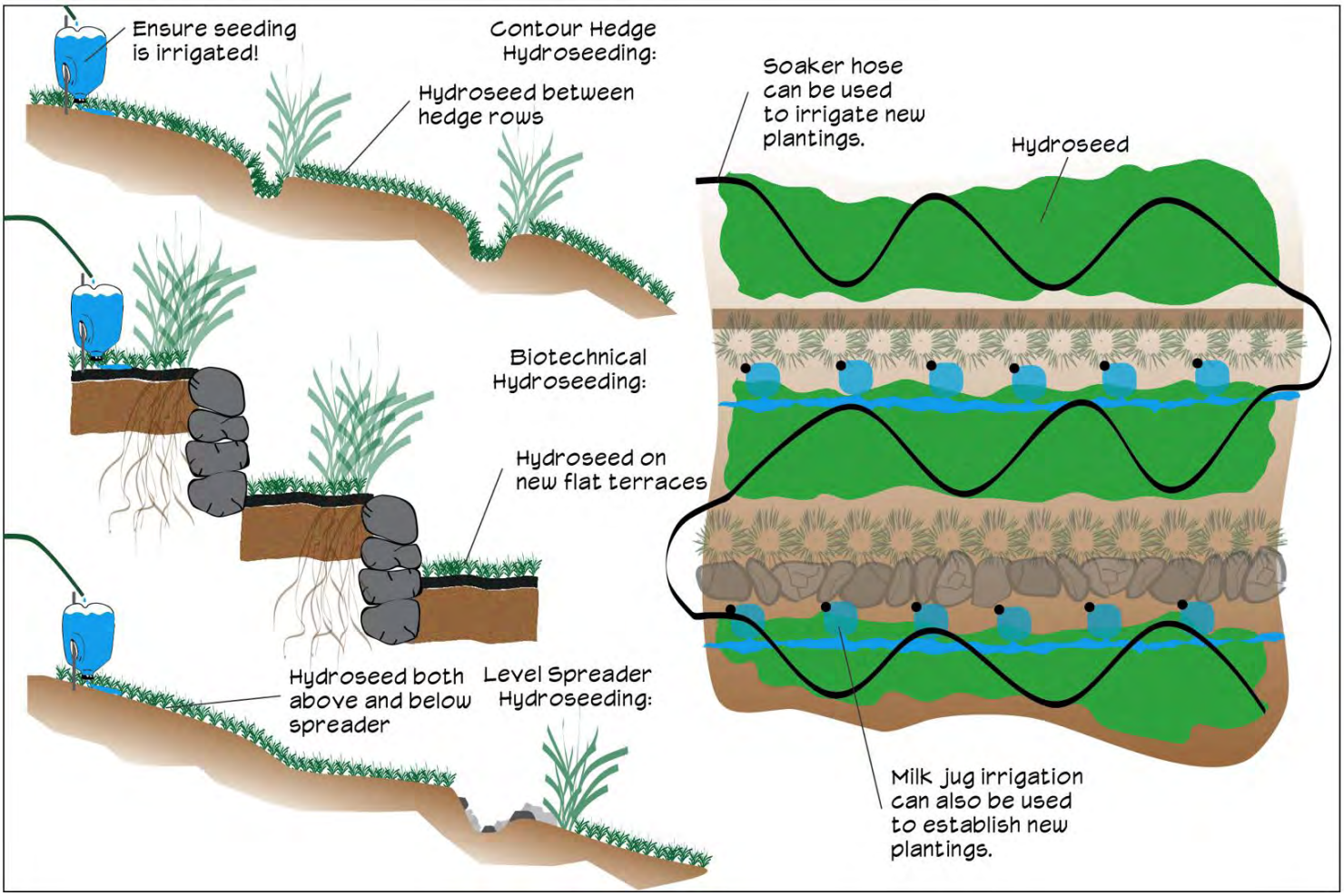
A second row should be planted 6 inches down the slope from the first row with the plants staggered from the first row. Rows should extend across the bottom of the channel and up each channel side to the top of the channel or a minimum of 1.5 feet from the bottom of the channel.

In channels that have large drainage areas, hydraulic forces in the channel could overwhelm plantings without fortification. Stone rip rap can be used to add extra resistance to the installation. Stone rip should be placed along the bottom of the channel and up the sides of the channel to a minimum of 1.5 feet above the bottom of the channel. A row of vetiver hedge can be planted on both the upstream and downstream side of the stone dam. During large flow events, the stone will serve to reduce energy of the incoming runoff and will help protect the vegetation roots from scour. The plant hedges will further reduce flow, help to trap sediment, and will soak up residual water trapped after rainfall events.



With excessively steep slopes, structural retaining will be needed to preserve the integrity of the slope and prevent erosion. The integration of structural measures such as a rock or concrete wall with vegetation is referred to as a biotechnical solution.

Generally, slopes greater than 1 (H) to 1 (V) or 100% will require structural measures, however, this figure will vary depending on site specific conditions including erodibility of the soil and length of the slope. Vegetative planting can add important aspects to a structural solution. One benefit is that enhancement with vegetation can add a landscape element and can beautify a hardscape by greening. Planting vetiver hedges along the top of retaining walls can also help manage runoff that flows down slope over the walls. Deep roots of the plants will grow behind the walls and help to stabilize the retaining system. Vetiver hedges should be planted along the contour at the top of the wall - on longer slopes a double row of vetiver can be used for maximum runoff control.

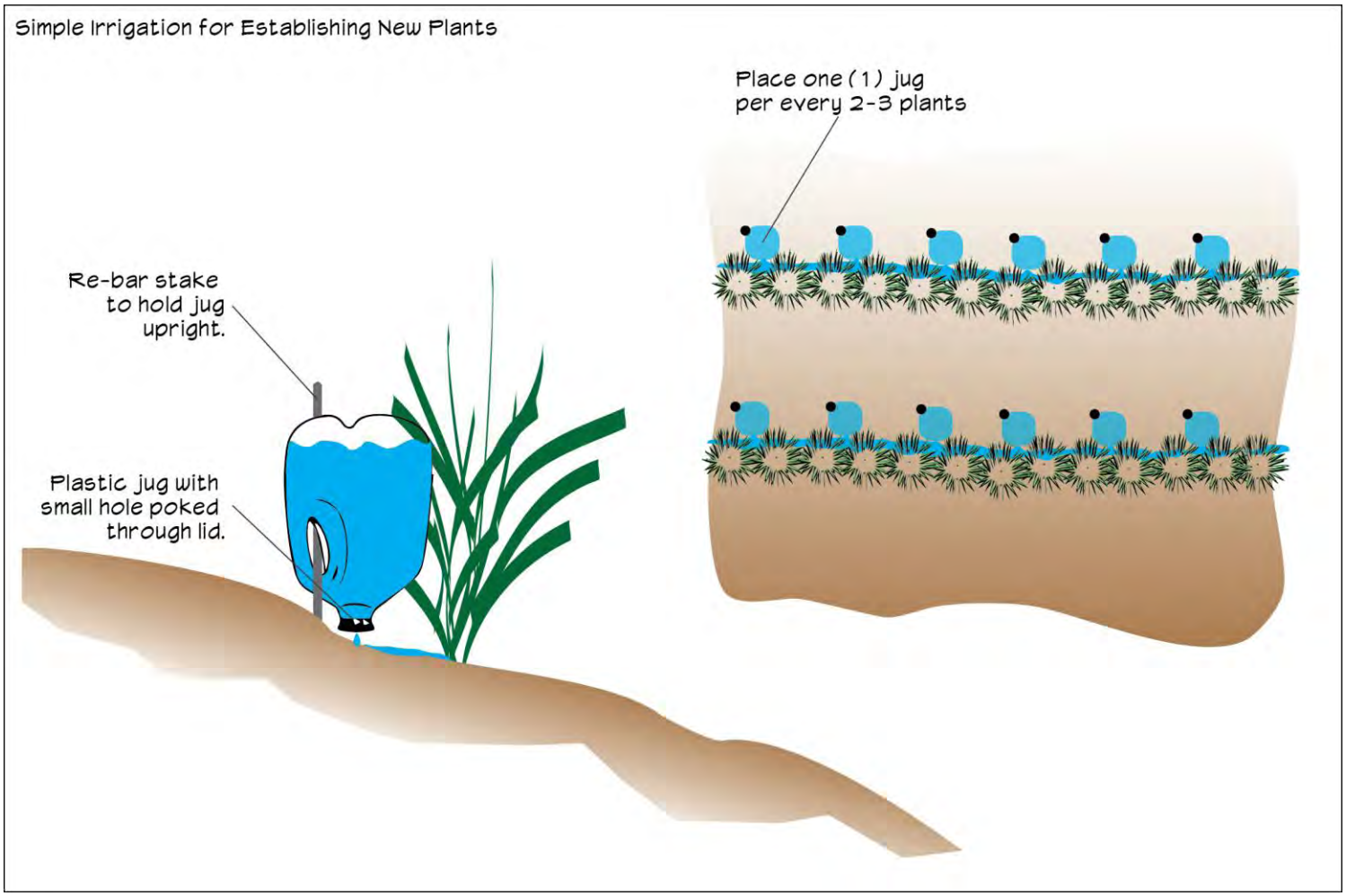


Hydroseeding on St. John can be difficult due to the arid climate – and periods with too little rain to allow establishment of the seedling. However hydroseeding can be part of a good erosion control strategy if done right. For a thorough and detailed description of hydroseeding practices, refer to the "Hydroseeding in the U.S. Virgin Islands – Guidance Manual" prepared by the UVI Cooperative Extension Service, the Virgin Islands Conservation District, and the Dept. of Planning and Natural Resources. This guide covers operating the cooperatively-owned hydroseeder, application rates, and other important information.

It's important to note that lawns can be established manually as well. Simply using the application rates, grass species, and techniques such as soaking seeds for pre-planting germination, will greatly increase the chances that a hand-seeded lawn will establish.

Other important considerations – seed MUST be covered using an erosion control blanket or stray/hay to prevent it being eaten by birds or other animals, as well as providing a means by which seed and soil can retain moisture. Always attempt to plant seed during the beginning of the wet season – this will ensure that the maximum amount of natural irrigation can be had.

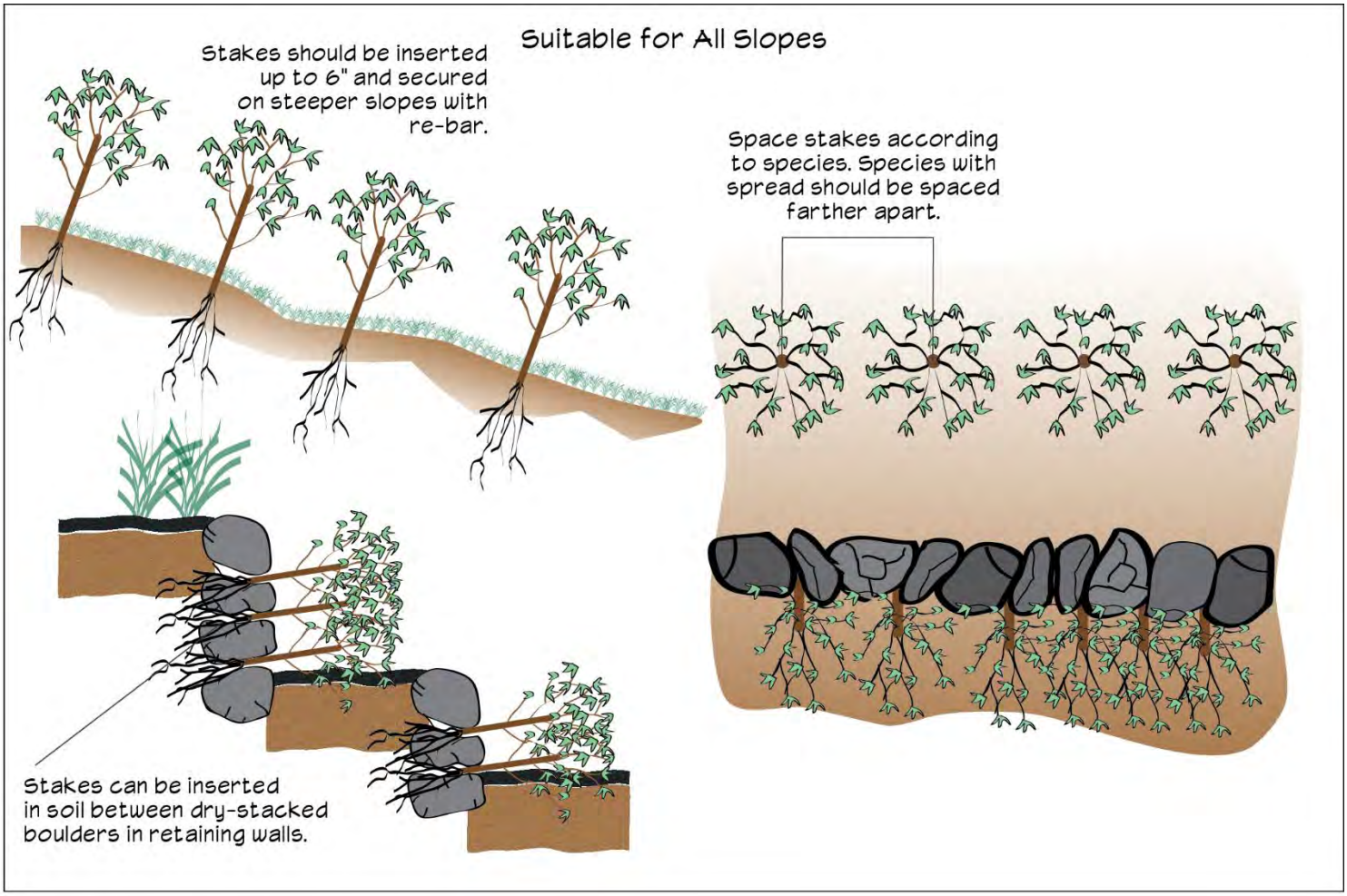
Finally, irrigation will make or break a seeding project. Use the milk jug irrigation technique for smaller areas. Larger areas may require the use of perforate 'soaker' hose. Cast sprinklers should not be used because it wastes water. Always attempt to water in the early morning or at dusk to increase water uptake by grasses.



Proper irrigation when establishing new plants is critical – but this can be one of the biggest challenges faced when landscaping in an arid climate. When considering irrigation, cast sprinklers must never be used. Water lost to evaporation and wind transportation will negate any benefits realized by irrigating.

Additionally, time of day can be critical to successful irrigation – try to water in the mornings and evenings as this will minimize evaporation and decrease plant stress. When plants are watered during the day, they tend to evapotranspirate more water than they use, resulting in a net-loss.
A good option for irrigation include the simple solution shown above: use a washed one gallon plastic water bottle and pierce a small hole in the lid. Insert a metal re-bar stake into the ground (don't use wood as termites will destroy it) and invert the jug using the handle as an anchor. Use one jug per plant. The water will slowly leak out over the course of the day and sustain the plant.

Other options for irrigation include the use of grey water cisterns, whereby the waste water from showers, baths, hand basins, and washing machines are used for the purpose of irrigating plants. In addition, installing a drip irrigation system is another good option for irrigation in a dry climate.



Live cuttings of certain species inserted into the ground on a slope will sprout roots and new branches, eventually forming mature woody plants. This method is limited to small areas with minimal bank erosion damage. It is most effective where shallow erosion has occurred, and when combined with other bioengineering methods, such as brush matting, contour wattling, or with biotechnical methods. This method does not require skilled labor to apply. It can be used in a number of different areas including the sides of gullies and across slopes. The stakes should be 0.25 to 1 inches in diameter and 2 to 3 feet long.

Installation of a live staking system consists of the following steps:

(1) The live stakes should be collected and prepared for installation. The stakes must be cut from mature stems and used within 8-10 days of being harvested. A supply of fresh cuttings should be collected using a sharp pair of shears. The side branches should be trimmed making sure not to damage the bark. The stake should be cut to the needed length (a minimum of 1 foot) and an angle cut should be made at the bottom. It is important to make sure the angle cut is done at the bottom so that the stake is not planted upside down.

(2) The stake should be driven gently into the ground forming a right angle to the slope. If the soil is tightly compacted, it may be necessary to create a pilot hole by using a piece of scrap rebar. It is important to make sure that the soil is packed around the live stake if you have used a pilot hole. The live stakes should be driven in so that approximately 70% of the stem is buried and 30% is exposed.

Image: www.landandwater.com

Live-staking is a simple, effective practice that residents can use on their sites to control erosion or enhance other erosion control practices.

Live staking involves taking a branch cutting from an existing tree that is approximately 0.25 – 1.5 inches in diameter and 2 – 4 feet long. For smaller stakes and more compact soils, holes can be pre-bored using a small piece of re-bar. The stake is inserted into the ground and soil packed around the stake to hold it in place. Water immediately.

Stakes do not need to be as densely planted as grass or other plants. Their primary purpose is to put down deeper roots on steep slopes and stabilize the soil under-structure, as well as provide rain drop interception and wind protection of slopes.

They can also be installed between boulders or shells.

Native Species for Live Staking (and Brush Matting):

Ficus citrifolia - wild fig or wild banyan tree: This species of ficus is native to the Caribbean and can grow up to 50 feet tall.

Bursera simaruba – turpentine tree: This native, deciduous dry forest tree can grow up to 50 ft. tall. It has often been used for live fences.

Plumeria alba - wild frangipani: Not to be confused with *Plumeria rubra*, which is a common cultivar. This native evergreen shrub or small tree can grow to 25 feet and features attractive white flowers.

Please see the following pages for more information on each of these species.

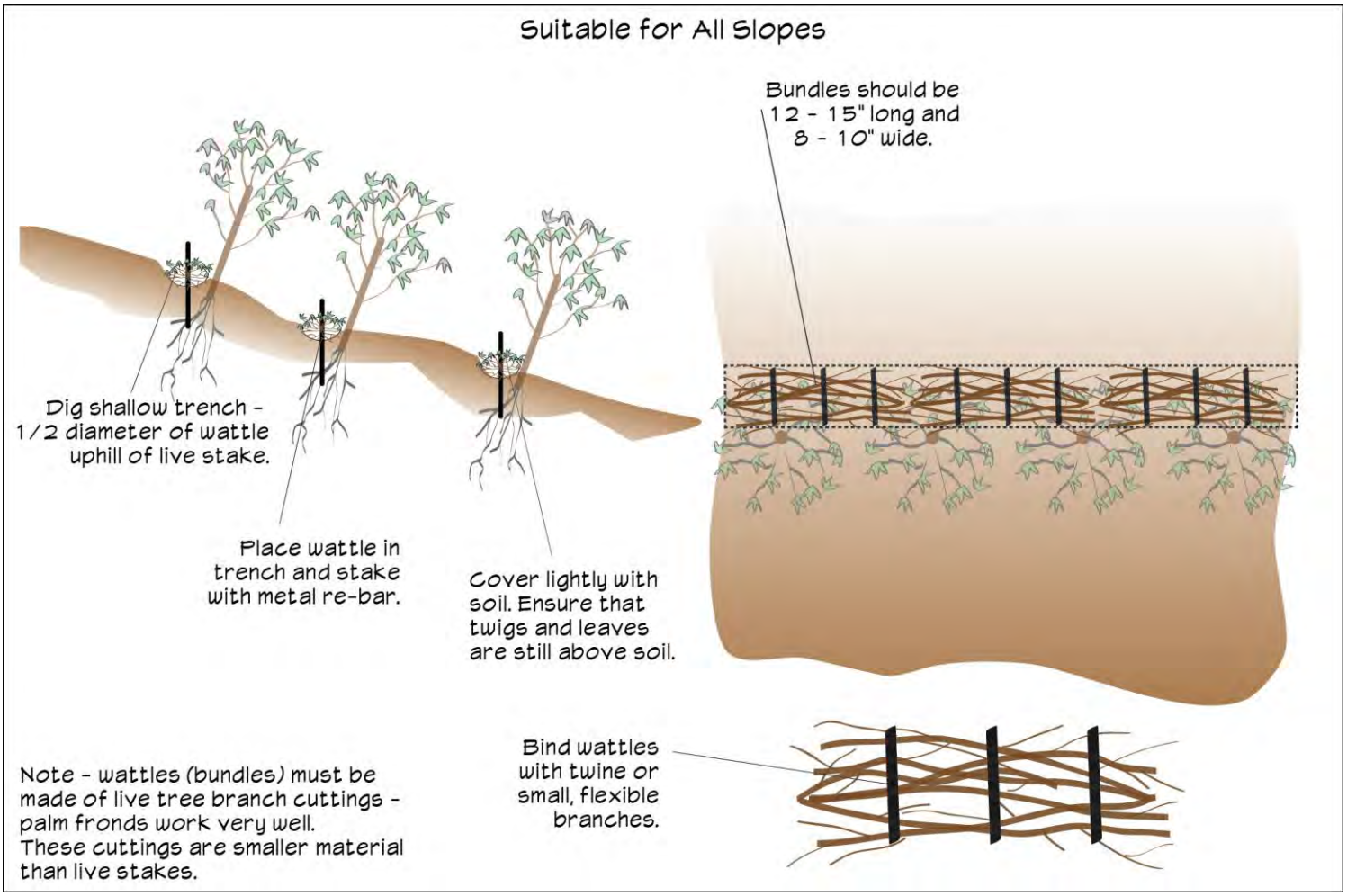
Bursera simaruba – turpentine tree: This native, deciduous dry forest tree can grow up to 50 ft. tall. It has often been used for live fences.

Plumeria alba - wild frangipani: Not to be confused with *Plumeria rubra*, which is a common cultivar. This native evergreen shrub can grow to 25 feet and features attractive white flowers.

Ficus citrifolia - wild fig or wild banyan tree: This species of ficus is native to the Caribbean and can grow up to 50 feet tall.

Tabebuia heterophylla – pink cedar: This is the official tree of the British Virgin Islands. Depending on conditions, it can grow up to 60 feet tall, and produce beautiful pink blooms, particularly after heavy rainfall.

Pisonia subcordata – mampoo or water mampoo: This native dry forest tree grows quickly and can become quite large in size with its “elephant toe” trunk and exposed root system.



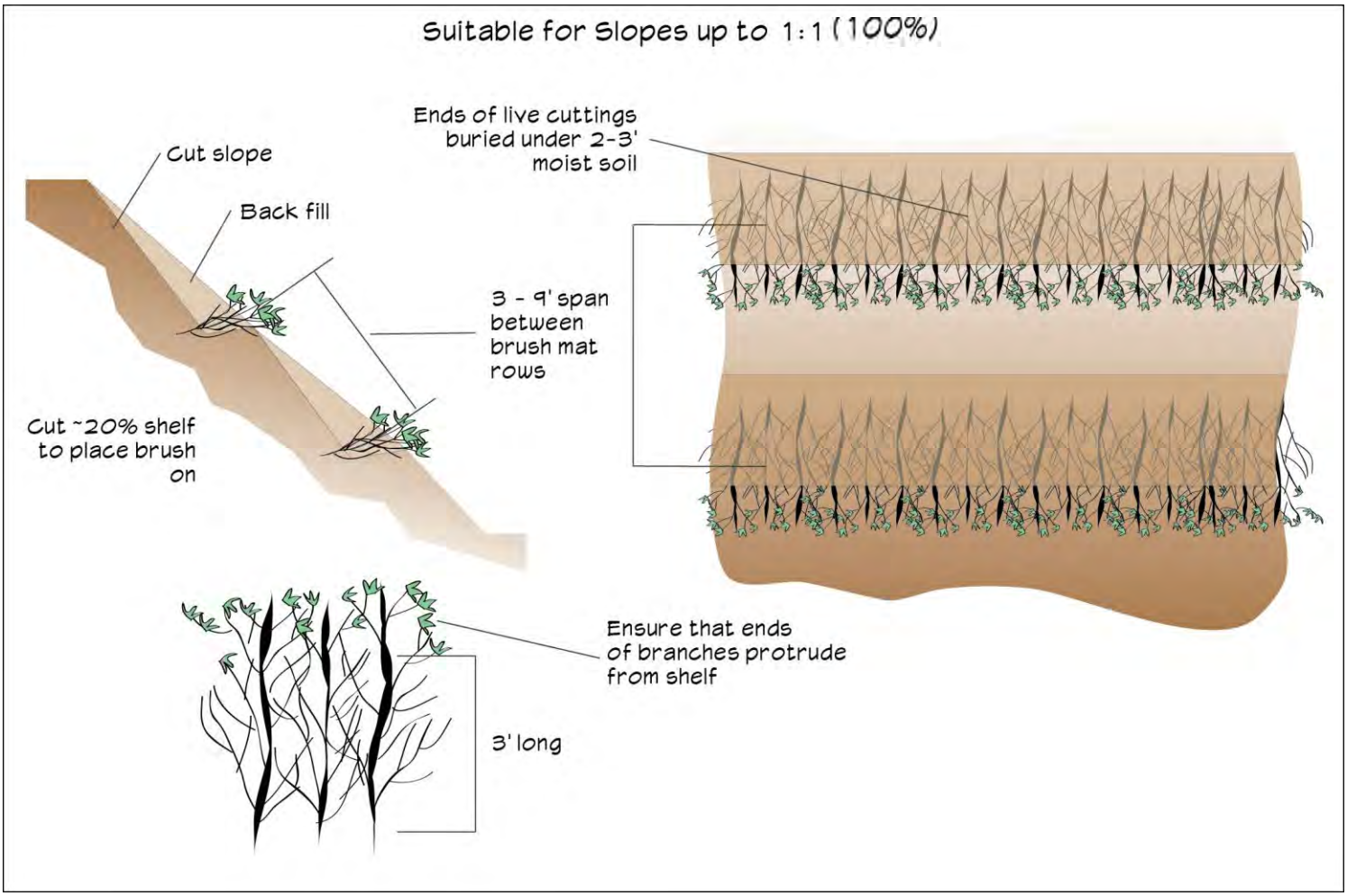
Use live branch cuttings (palm fronds are perfect for this) to form small bundles, called wattles, that can be planted in shallow trenches to supplement live staking. They can protect the toe, face, and top of a slope.

Installation:

1) Use fresh, live-cut plant materials from 0.25 to 1 inch in diameter to form wattles 8-10" in diameter bundles up to 12-15" long. Tie the wattles with hemp twine, or use a small flexible branch to secure the bundle in several spots.
2) Dig a trench half the diameter of the wattle uphill of live stakes and place the wattle uphill in the trench. Trenches should be spaced every 3 – 4 feet.
3) Stake the wattles every 2 – 3 feet using stout dead stakes approximately 2 – 3 feet long (or use metal re-bar). Pound stakes so that only 2 – 3 inches are showing.
4) Place moist topsoil over the top of the bundle but ensure that leaves/buds and twigs are still showing above the soil surface. This will allow the wattles to continue to grow and form a hedge.

On steeper slopes, use the stakes to secure erosion control matting to prevent erosion while vegetation establishes. You can also hydroseed between rows.

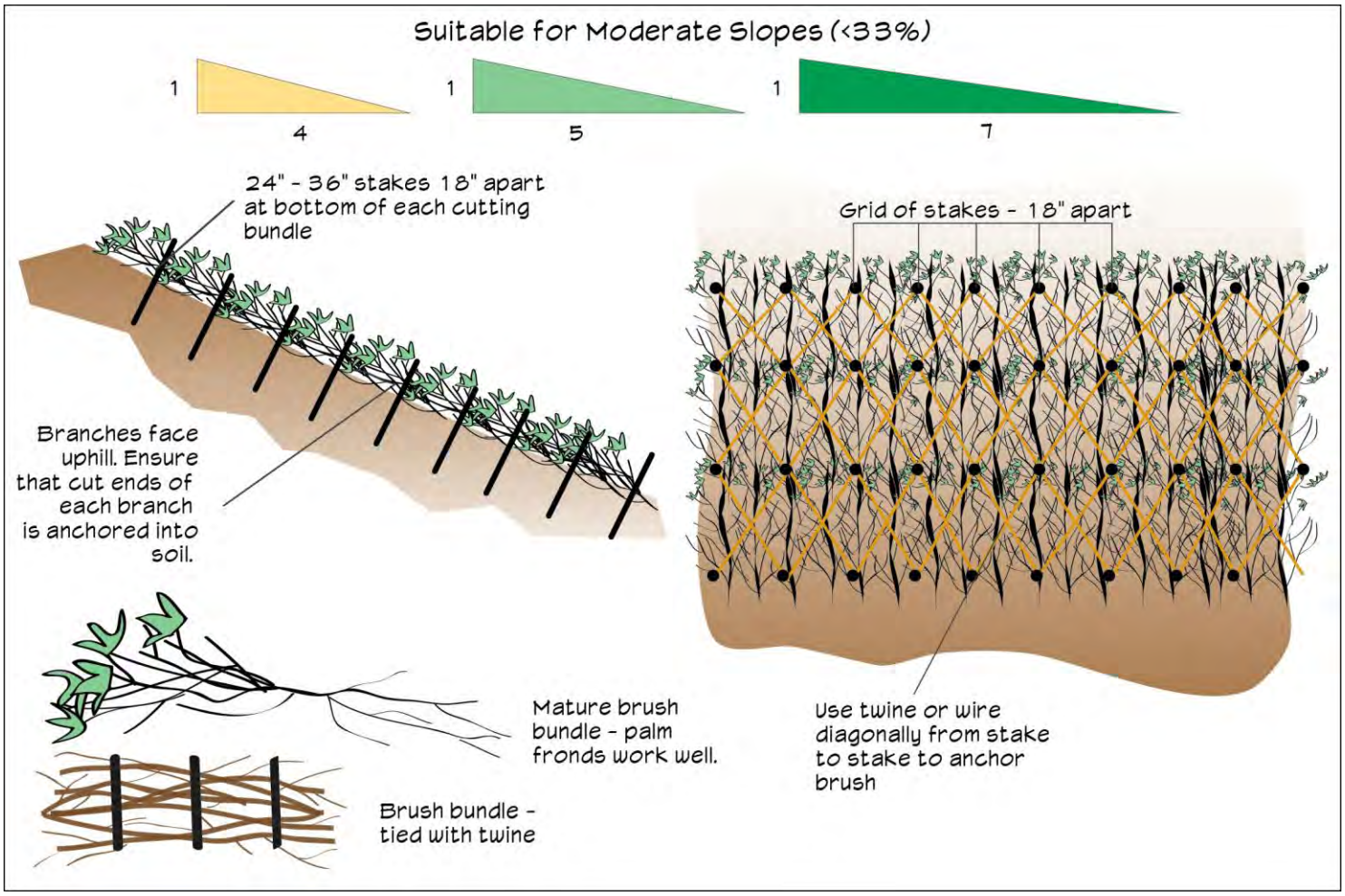
Brush berms or brush barriers consists of woody brush and branches less than 2 inches in diameter that forms a barrier to reduce the transport of coarse sediment from a site. Brush berms will: (a) help stop erosion; (b) help water to soak into the ground; (c) returns nutrients to the soil; (d) it is a best gardening practice.



Use live branches from the same species as for live-staking and create shallow shelves on a slope in order to layer brush bundles on the shelves. Back fill the slope above the shelf.

Installation:

1) Collect branches up to 6 feet from live trees. Branches can be 0.25 – 1 inch in diameter.
2) Start from the bottom of the slope and cut in shallow 10 degree (20% grade) shelves on slopes up to 1:1 (100%). Make sure that the ends of branches are angle-cut and touch the soil on the back of the shelf. Tips of the branches should protrude off the end of the shelf.
3) Fill this first brush mat layer with dry light soil and place another layer of brush on top of this one – repeat up to four times. Repeat these steps as you move up the slope, spacing shelves 3 – 9 ' apart depending on slope and soil conditions. It may be helpful to build two shelves at a time, using the soil from the shelf above to back fill the shelf below.



Brush mattresses (or mats) are made of interwoven layers from the species listed for live staking – palm fronds will also work well for this. The mats are secured in place using stakes and tied down using twine or wire. Branches should be flexible and range from 0.25 – 1.5 inches in diameter. Use this practice on moderate slopes.

Installation:

1) Prior to installing mats, slopes should be graded flat to ensure maximum brush stem / ground contact to ensure root development. Slope length should not exceed 18 – 20 feet.
2) The one end of the live branch should be anchored in soil. If digging shallow trenches on the slope, insert the end of the branch into the trench.
3) Use 24 – 36 inch stakes spaced 18 inches apart. A layer of branches should be laid out 2 – 4 inches thick and anchored in place with twine or wire laced diagonally between stakes and secured with a clove hitch. Light backfill should be placed over the mats.

A word about roadside and driveway maintenance and erosion control

It is best to learn to work with the forces of nature instead of trying to overcome them.

Our goal should **not** be to send the water downhill as fast as possible, since the faster it goes the more erosion power it has.

The more ways that water can get downhill, the better. Channeling all the drainage into fewer paths increases rushing water & erosion, even around your home. You should slow it with vegetation (which also grabs silt), with small rock barriers it can get around, but nevertheless slows the water speed.

The inchplant groundcover, for example, is excellent in all but the extended drought months -- and it does come back right away with the first rain. The ghuts, full of stones, naturally slow water. Trees and other vegetation also slows the water and works out silt. Cut brush can be thrown in drainage areas and near ghuts to hold back water flow and catch silt. Vegetation and trees should not be cut in guts (in fact, it's illegal), since they slow water flow and thereby reduce erosion.

On the subject of roadside cutting: some people use weed whackers to clear brush down to dirt by roads and driveways. The first three inches of ground-covering plants should always be left undisturbed -- so we have a green carpet -- not "neat" dirt. This should be specified to roadside crews and landscapers.

Normal rainfall in the Virgin Islands is very irregular –ranging from 2 inches in an hour to sometimes months with virtually no rain. During the dry spells, our soil dries out and shrinks, pushing rocks to the surface, and shrinking back away from solid objects -- like the edges and base of concrete roads and driveways. Then when the heavy rains come, water rushes alongside and UNDER concrete roadways undermining them. This final step of adding fill to grade level is rarely done in any concrete road or driveway construction on St. John - but it is critical to avoiding undermining and settling. Therefore, it is extremely necessary to maintain the roadsides with the earth even with the edge of the road concrete ("to grade level" in professional terms), with plantings to hold the soil and never let the gap get very big. If the groundcover and plants grow slightly over the edge of the road, the chances of a gap opening are reduced -- and the smallest rain will let the vegetation start trapping soil and silt to fill the gap naturally.

Furthermore, the weight of water trucks, cement trucks, construction equipment and, other large vehicles -- put continuing stress on our concrete roads. Small cracks and crushes should be patched and filled. This does seem to stop the next heavy truck from expanding the damage -- and it helps reduce the potential for water to get under the concrete and start the undermining "settling process". Cracks across driveways should also be filled with caulk. This is an inexpensive fix and preventative.

From the experience of the Upper Carolina Landowners Association

A word about roadside and driveway maintenance and erosion control

For all the good of concrete paved roads, the reality is they do block rain from soaking into the ground. This creates the problem of rain "with nowhere to go", and in the case of our steep hills rushing DOWN.

Wherever this new dose of water leaves the concrete - erosion starts, especially if the planting doesn't cover all the dirt.

Uphill dirt driveways still retain some ground water, but push dirt and rocks constantly onto the road. Concrete driveways on the uphill side of concrete roads that do not have substantial depressions built into them at the bottom (like they should), send a rushing river across the road in heavy rains undermining the roadway, in combination with the natural gapping process mentioned earlier.

Therefore, if possible, try to have your parking pad be made of gravel and grass so water can drain into the ground directly.

If your lot is a downhill build from the road, water flow from your driveway typically ends up around your house! Be sure water can go both ways around your house. If you already have a concrete driveway, consider where the drainage from your concrete driveway should go and plan for it.

If the water is channels, try to spread it across your slopes with brush berms, small terraces, and rocks placed to interrupt and slow the water speed – so it can infiltrate into the ground

Traditional road standards say that water shouldn't run down concrete roads - it should run beside the road. Given the infrequency and the intense nature of our heavy rains, it is probably more economical to allow heavy flow to come out onto the concrete road to reduce the erosion of a deep dirt gut, or the speed of a concrete swale -- that is going to empty into a dirt gut somewhere.

Therefore, a shallow dirt swale by the side of a concrete road well covered in short vegetation, like inch plant, wildflowers, and pruned down tan-tan and other plants (the roots are still holding earth, especially next to the concrete) lets water flow easily while stealthily removing the silt as the water meanders. In heavier rain, the water can expand its flow onto the concrete road without erosion.

From the experience of the Upper Carolina Landowners Association

Selecting plants for erosion control and soil stabilization depends on your goals, objectives, and environmental conditions. Each situation is unique. Some situations will require short-term plantings, some will require mid-term plantings, and some will require long-term plantings. There will be even some situations that will require all three of these solutions.

The plants presented here are by no means an exhaustive listing, and others could be recommended by other plant professionals. The majority of the species recommended are native. However, there were some non-natives which are recommended that are non-invasive.

In this guide, the plants are broken down into the different growth categories. We include the non-native invasive species for educational purposes, so that you, the resident/homeowner, can recognize them, and thus avoid using them, or if they are growing on your property, remove or eradicate them as much as possible.

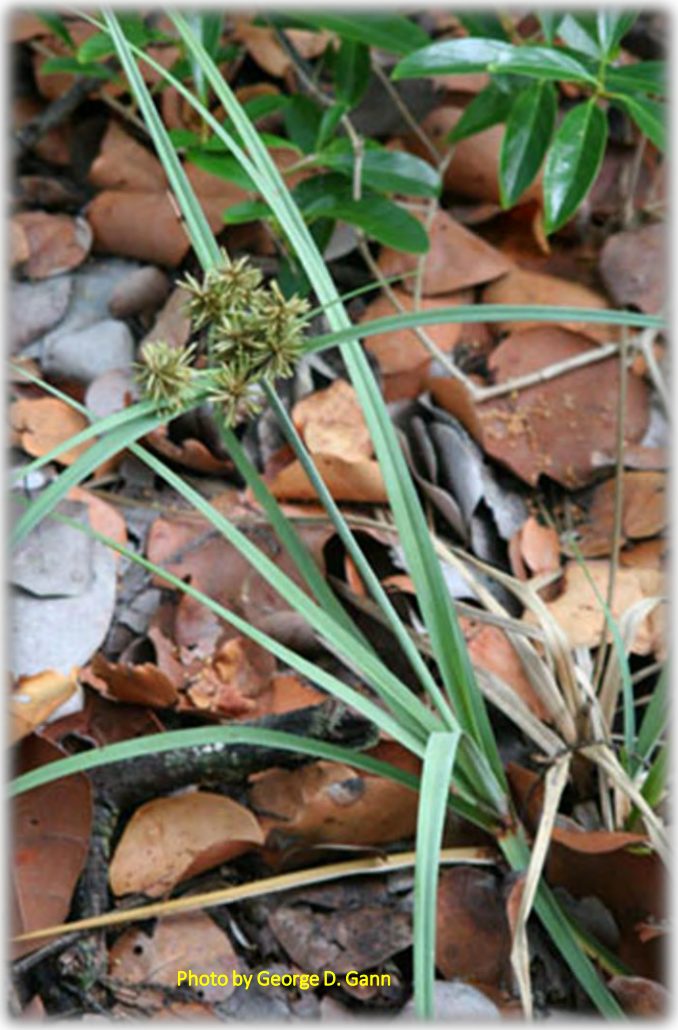
Also note, that when selecting plants from local nurseries, many species (even native ones) are imported from Florida, or other parts of the world whereby pests and diseases can be brought in. Ask what plants were grown locally at the nurseries, and consider using them rather than imported plants. Also, holding plant swaps with friends can work. All in all, the best planting stock (particularly cuttings) to use will be the native plants found in our very landscape because (a) they may not be that hard to find, (b) are already adapted to our local climatic conditions, and (c) they will not cost you a thing!

Grasses and Sedges

Grasses and sedges belong to the plant families *Poaceae* and *Cyperaceae* respectively. The family *Poaceae* is a large and nearly ubiquitous group of monocotyledonous flowering plants commonly called grasses. Grasses are usually herbaceous and less often woody in nature and appearance. These include cereal grasses, bamboos, grasses of natural grasslands, cultivated lawns, and grasses of the pasture. *Poaceae* is the fifth largest plant family in the world. Grasses are not only found in areas where they are dominant (i.e. grasslands and prairies), but also in wetlands, forests, and tundra. *Poaceae* is the most economically important plant family producing cereals, forage, building materials, and fuel.

The family *Cyperaceae* includes monocotyledonous graminoid flowering plants which are grasslike in appearance commonly called sedges. This large family of plants has a worldwide distribution, with its centers of diversity primarily in tropical Asia and South America. Sedges can be found in almost all environments, but usually in wetlands or areas with poor soils. Habitats that are dominated by sedges are called sedgelands.

Both plant families can be either annual or perennial. In terms of the root structures of these plants, they are either rhizomatous or stoloniferous and generally fibrous. This type of root structure lends themselves well to proper soil erosion control and soil stabilization.



Flat-leaf flatsedge could provide a native alternative to importing grasses from outside the USVI. However, sourcing may be problematic and may require using local wild populations to split out plants for transplanting. Additionally, this sedge typically requires more moisture, though it can tolerate periods of drought.

Common Name: Flat-leaf flatsedge
Scientific Name: *Cyperus planifolius*
Plant family: Cyperaceae
Form & Habit: Bunching sedge
Mature Size: 2 – 3 feet tall, up to 4 when flowering (0.4-1 m) tall
Native Range: Caribbean, northern South America, southern United States, Central America
Native Habitat: Coastal forests
Water requirements: Low to Moderate
Light requirements: Full Sun, Part Shade
Soil requirements: Moist to well-drained. Prefers soils with some organic content but can thrive in nutrient poor soils as well
Erosion control potential: Unknown – may behave similarly to vetiver (high stem count, deep root structure)
Drought tolerance: Moderate – will tolerate short periods of drought.
Feral livestock/iguana resistance: Unknown
Propagation: Seeds, split from existing plants
Planting density/Recommended spacing: Less than 1 foot on center
Potential purchase locations: Unknown – generally not cultivated
Notes/Comments: This native sedge has the potential to provide a local alternative to imported vetiver, or other species of grass useful for erosion control. However, it may be less drought tolerant than other species. Cultivation of this sedge does not seem to be widespread by nurseries or other sources. It may be available from nurseries outside the USVI.

West Indian bristlegrass is a native grass that is known to grow on even "poor soils." This represents another potential alternative to imported grasses. With its fibrous root structure, it can potentially hold soil in place well like other non-native grasses.

Common Name: West Indian bristlegrass
Scientific Name: *Setaria setosa*
Plant family: Poaceae
Form & Habit: Grass, perennial herb
Mature Size: 1.6-3.3 ft. (50-100 cm) tall
Native Range: West Indies to northern South America
Native Habitat: Open dry to moist areas
Water requirements: Moderate
Light requirements: Full sun to partial shade
Soil requirements: Sandy loam, gritty loam, or sandy clay soil
Erosion control potential: Unknown – has fibrous root system like other grasses
Drought tolerance: Moderate; can tolerate periods of drought
Feral livestock/iguana resistance: It is not toxic to livestock or iguanas

Propagation: Seeds; can also be reproduced by vegetative fragmentation
Planting density/Recommended spacing: Unknown
Potential purchase locations: Unknown
Notes/Comments: Relatively little is known about this plant and more research and trials need to be conducted for its use.


Photo by Dr. Gary Ray


Photo by Dr.Jose Marl Mutt

This native grass and its associated "glade" community is becoming increasingly rare in the Virgin Islands. However, it has great potential for erosion control due to its rhizomatous rooting nature. Trial runs using this grass for erosion control and water quality-wildlife habitat enhancement have been conducted in Puerto Rico. For more information, see this link: http://www.nrcs.usda.gov/wps/PA_NRCSConsumption/download?cid=nrcseprd330008&ext=pdf

Common Name: Wiregrass
Scientific Name: *Uniola virgata*
Plant family: Poaceae
Form & Habit: Grass, perennial herb
Mature Size: 2-6.5 ft. (0.6-2 m) tall
Native Range: West Indies
Native Habitat: Open exposed areas along the coast
Water requirements: Low to moderate
Light requirements: Full sun
Soil requirements: sandy and rocky soils, close to the coastline
Erosion control potential: High due to its rhizomatous root nature and tendency to grow on rocky areas
Drought tolerance: High
Feral livestock/iguana resistance: Very Low, easily eaten by goats, other livestock, and probably iguanas
Propagation: Seeds
Planting density/Recommended spacing: Unknown
Potential purchase locations: Unknown
Notes/Comments: Not much is known of the ecology of this grass. It is also a fairly uncommon grass. More research is needed on this species. It is recommended in this manual because of its rhizomatous root structure and its tendency to grow on rocky soil habitats.

Herbs

Herbs or herbaceous plants are plants that have no persistent woody stem above the ground. These types of plants can be either annuals, biennials, or perennials. In herbs, new growth develops from living tissues that remain on or underground. This includes roots, a caudex, or different types of underground stems such as bulbs, corms, stolons, rhizomes, and tubers. Some herbaceous plants are what are called pioneers or early successional species. Other herbs are the main type of vegetation in a particular habitat such as the ground layer or floor of a forest. There are some herbaceous plants which can be quite large such as the Musa genus in which the banana plant belongs to. However, herbaceous plants are usually very short or small in stature.

Our native spider lily is a beautiful addition to anyone's home or property, with its bright white spider-like blooms. Although drought tolerant, it actually prefers to be kept moist. The plant's root structure is bulbous in nature, and thus can be propagated apart from seed. It has a deep root structure that can stabilize slopes. It may have potential to be used like Vetiver. This plant is mildly toxic, particularly if eaten, and thus is livestock-proof.

Common Name: spider lily, ladybug, white lily,
Scientific Name: *Hymenocallis caribaea*
Plant family: Amaryllidaceae
Form & Habit: Herb with bulbous base
Mature Size: 1-1.5 ft. (0.3 -0.5 m) tall
Native Range: Jamaica, Hispaniola, Puerto Rico and Lesser Antilles
Native Habitat: Disturbed areas and roadsides
Water requirements: Regular or high; needs to stay moist
Light requirements: Full sun to partial shade
Soil requirements: mildly acidic to mildly alkaline; prefers fertile, moist, and well-drained soil though it can tolerate other types of soil
Erosion control potential: Good; best planted in clusters
Drought tolerance: Good
Feral livestock/iguana resistance: All parts of this plants are poisonous if eaten
Propagation: By seed; also by division of rhizomes, tubers, corms, or bulbs. Seeds are easily collected from blooms.
Planting density/Recommended spacing: 1 per 2 sq. ft.
Potential purchase locations: Bryan's plants on St. Thomas
Notes/Comments: Plant is toxic if ingested.

Vines and ground covers

Vines are plants that tend to trail or climb in their growth habit. Ground covers are plants that grow over an area of ground. Vines may be ground covers but not all ground covers are vines. A ground cover is typically used for the purpose of protecting topsoil from erosion and drought.

Some plants grow as vines all the time, while some grow as vines sometimes depending on how they are pruned and if there is a support for them to grow on. Vines may be found growing on rock exposures, other plants, or other means of support. The growth habit of vines may cause them to spread over a large area relatively quickly. Thus, this is the reason why many vines are also invasive exotics which will be noted in the nonnative invasive section of this landscape manual.

Although there are vines that are groundcovers, there are other types of plants which are used as groundcovers such as herbaceous plants, low growing and spreading shrubs, mosses, and ornamental grasses. Vines/groundcovers are useful in soil erosion control and soil stabilization because they tend to grow quickly, need a minimum amount of care, and can cover a large area in a relatively short time.

Native vines/ground covers for erosion control and soil stabilization

This apparently native mat-forming herb makes an excellent ground cover for roadsides and moderate slopes. It even grows over concrete and is great at catching sediment. Despite its invasive potential, it tends not to be invasive in the Virgin Islands.

Common Name: creeping inchplant, Bolivian Jew, turtle vine, chain plant
Scientific Name: *Callisia repens*
Plant family: Commelinaceae
Form & Habit: Prostrate, mat-forming herb
Mature Size: 4-10 inches (10-25 cm) long
Native Range: Tropical and subtropical America
Native Habitat: Disturbed areas, riparian areas, secondary forests, and Shrublands
Water requirements: Moderate
Light requirements: Full sun to partial shade
Soil requirements: acidic, light to medium texture
Erosion control potential: Excellent for roadsides and moderate slopes; grows over concrete and catches sediment
Drought tolerance: Good
Feral livestock/iguana resistance: Unknown

Propagation: Cast live plants & roots across hillside, press roots in place, if you can reach them.
Planting density/Recommended spacing: 24-36 inches (60-90 cm) apart
Potential purchase locations: Unknown; commonly found along roadsides
Notes/Comments: Although this plant is known to invade forests, smothering native vegetation, it does not do so in the Virgin Islands. It makes an excellent ground cover for sunny areas, even growing over concrete and catching sediment. It grows fairly easily and spreads very quickly (hence its tendency to be invasive). Highly recommended as a ground cover for erosion control.

The Limber caper is a common native plant which is really a vinelike shrub in its growth habit. Although it is typically found growing on or around shrubs and trees, it can be a good ground cover if it has enough room to sprawl. It produces beautiful flowers which only bloom at night.

Common Name: limber caper, dog caper, bottle wiss
Scientific Name: *Capparis flexuosa*
Plant family: Capparaceae
Form & Habit: very woody vine, almost a shrub
Mature Size: Up to 33 ft. (10 m) long
Native Range: Florida to Argentina
Native Habitat: Dry and coastal forests
Water requirements: High but drought tolerant once established
Light requirements: From full sun to full shade
Soil requirements: mildly acidic to mildly alkaline
Erosion control potential: Good because of its tendency to grow as a ground cover
Drought tolerance: Exceptional
Feral livestock/iguana resistance: Unknown
Propagation: By the fresh seeds just as the pods are splitting open
Planting density/Recommended spacing: 6 to 8 feet (1.8-2.4 m) apart
Potential purchase locations: Unknown
Notes/Comments: This plant is a common component of the dry forest vegetation in the Virgin Islands. It is really a vine-like shrub in its growth habit. If it has enough room to sprawl, it can become a good ground cover or informal hedge. Its beautiful flowers however only bloom at night, to be pollinated by moths and bats.

Native vines/ground covers for erosion control and soil stabilization


Photo from http://www.asergeev.com/pictures/k/r-549-06.htm


Photo from http://wikiflower.blogspot.com/2014/08/the-legend-of-beach-morning-glory.html

Use this flowering vine as a ground cover near driveways or roads to control sandy, erodible soils. It will spread rapidly, so some annual pruning or uprooting may be necessary.

Common Name: Beach Morning Glory
Scientific Name: *Ipomoea pes-caprae*
Plant family: Convulvolaceae
Form & Habit: Flowering Vine
Mature Size: 4 – 6 inches tall, spreads up to 75 feet
Native Range: Throughout the tropics
Native Habitat: Primarily Sandy beaches; Can also be found in scrub and upland areas
Water requirements: Low
Light requirements: Full Sun
Soil requirements: Sandy, tolerates salty, acidic soils well
Erosion control potential: Moderate to High
Drought tolerance: High
Feral livestock/iguana resistance: Plant produces abundant milky sap which protects it from grazing herbivores such as donkeys and other livestock. However, iguanas are reportedly known to eat this plant.
Propagation: Seed and rootings from stem cuttings
Planting density/Recommended spacing: 24 – 36 inches apart
Potential purchase locations: Unknown
Notes/Comments: This flowering vine is a great ground cover for highly sandy, dry sites in full sun but beware – it will creep and can take over a site if not put in check. Does well near driveways and roadsides.

This native, generally low growing shrub not only makes an excellent ground cover but it is also a reputable medicinal plant (for those who are interested). It also produces a tiny but bright yellow flower which will add to the beauty of a landscape.

Common Name: Old woman's broom, damiana
Scientific Name: *Turnera diffusa*
Plant family: Turneraceae
Form & Habit: Ground hugging shrub
Mature Size: up to 2 ft. (0.6 m) tall
Native Range: Continental tropical America, West Indies from the Bahamas to Virgin Islands
Native Habitat: Scrub and open dry areas
Water requirements: Low to moderate
Light requirements: Full sun
Soil requirements: Prefers dry, well-drained soil. Can grow on sandy, loamy, or clay soils
Erosion control potential: Ideal for rock gardens; makes good ground cover for exposed situations
Drought tolerance: Exceptional
Feral livestock/iguana resistance: Goats usually browse on younger shoots but do not kill plants entirely; iguana resistance is unknown
Propagation: By the tiny seeds or 3 inch cuttings of older stems in light potting soil or perlite
Planting density/Recommended spacing: 24 to 36 inches (60 to 90 cm)
Potential purchase locations: Unknown
Notes/Comments: This plant not only is ideal for rock garden situations and makes a good ground cover for exposed situations, but it is reportedly to have a lot of excellent medicinal properties. It has been used to treat menopausal symptoms, nervous complaints, afflictions of the kidneys and bladder, and indigestion.

Shrubs

Shrubs, which are also called bushes, are small to medium-sized plants that are generally shorter than trees. They can be distinguished from trees by their multiple stems and generally shorter height. Species that grow as shrubs can either be deciduous or evergreen. Shrubs are usually plants that respond very well to pruning, whether the pruning is renewal pruning or selective pruning. Shrubs come in a variety of shapes, sizes, and character, and can prove to be an important part of erosion control and soil stabilization.

This slow-growing plant has potential to be a landscape specimen if it were not for its growth rate. The fact that it naturally grows in rocky areas and rock crevices, is not eaten by goats, and has an extensive root system makes it a prime candidate for soil erosion and soil stabilization, particularly in coastal forest situations. It should be noted that this species tends to form multiple stems arising from the base of its trunk. Best used for long-term erosion control situations.

Common Name: Nothing nut, nut muscat, spoon tree, ton ton
Scientific Name: *Cassine xylocarpa*
Plant family: Celastraceae
Form & Habit: Shrub or rarely a small tree
Mature Size: 6.5-13 ft. (2-4 m) tall
Native Range: West Indies, Tropical American mainland from Mexico to Venezuela
Native Habitat: Dry forests along the coasts
Water requirements: Low to moderate
Light requirements: Full sun
Soil requirements: Well-drained sites
Erosion control potential: Good; Supported by a shallow and deep lateral root system with an occasionally discernable taproot
Drought tolerance: Excellent
Feral livestock/iguana resistance: This plant and others in the family Celastraceae are reportedly not eaten by goats; iguana resistance is unknown
Propagation: The fruits germinate fairly easy
Planting density/Recommended spacing: 1 per 16 square feet
Potential purchase locations: Unknown
Notes/Comments: This unassuming but attractive native shrub is a good candidate for soil erosion control and soil stabilization for very long term situations because of its slow growth rate. It is not eaten by goats and has a very extensive root system. it tends to grow in rocky areas and crevices. It has been reported that it is an excellent accumulator of the element nickel, removing this toxic mineral from contaminated sites.

This modestly attractive shrub can be used for borders or hedges. The name "poison cherry" is a misnomer, since the fruit is actually edible (though not tasty) and is not poisonous in any way. It has been reported that goats eat the branches and leaves of this shrub.

Common Name: Maidenberry, poison cherry
Scientific Name: *Crossopetalum rhacoma*
Plant family: Celastraceae
Form & Habit: Shrub or rarely a small tree
Mature Size: 6.5-13 ft. (2-4 m) tall
Native Range: From Mexico to northern South America, including the West Indies
Native Habitat: Dry forests
Water requirements: Low to moderate
Light requirements: Full sun to partial shade
Soil requirements: Tolerant of marginal soils; grows in well-drained soils
Erosion control potential: Unknown
Drought tolerance: Good
Feral livestock/iguana resistance: Goats reportedly eat the branches and leaves of this shrub; iguana resistance is unknown

Propagation: By seed
Planting density/Recommended spacing: 1 per linear feet
Potential purchase locations: Unknown
Notes/Comments: This plant can be placed into cut bank walls, full sun roadsides; also road shoulders to control bank wasting

Croton flavens as a species occurs throughout the West Indies and in Colombia and Venezuela. However, the variety 'rigidus' occurs only in Puerto Rico and the Virgin Islands. This may not be the most attractive plant to have on your property, but since it is poisonous to goats and other livestock, it may be well worth keeping as a soil stabilizer on overgrazed slopes.

Common Name: Yellow maran, soldier whip
Scientific Name: *Croton flavens var. rigidus*
Plant family: Euphorbiaceae
Form & Habit: Shrub
Mature Size: up to 10 ft. (3 m) tall
Native Range: Species throughout West Indies and northern South America; variety rigidus found only in Puerto Rico and the Virgin Islands
Native Habitat: Dry coastal scrub and disturbed areas
Water requirements: Low
Light requirements: Full sun
Soil requirements: Unknown; likely tolerant of poor soils
Erosion control potential: Can be quite useful as a soil stabilizer on over-grazed slopes
Drought tolerance: Exceptional
Feral livestock/iguana resistance: Very toxic to livestock and iguanas
Propagation: By seed or cuttings
Planting density/Recommended spacing: Unknown
Potential purchase locations: Unknown
Notes/Comments: This common, poisonous plant can quickly proliferate on overgrazed slopes. It is probably more common on some of the overgrazed slopes of the East End of St. John. Though not attractive, it would prove useful for soil stabilization if not removed.

Photo from https://en.wikipedia.org/wiki/Lantana_involucrata

Photo by Shirley Denton (Curry Hammock State Park)

Lantana involucrata is the cousin of the well-known worldwide-invasive plant *L. camara.* Despite this, neither plant is invasive in the Virgin Islands. This plant will be relatively easy to grow, and can prove to be a valuable short to mid-term solution for erosion control and soil stabilization since it is also poisonous to livestock. Examples of this plant can be found growing at the outer fence of the Myrah Keating health Center.

Common Name: Sage, pink sage
Scientific Name: *Lantana involucrata*
Plant family: Verbenaceae
Form & Habit: Shrub
Mature Size: up to even 9 feet (3 m) tall
Native Range: Florida, West Indies, Mexico to Venezuela
Native Habitat: Dry and disturbed habitats
Water requirements: Average
Light requirements: Full sun
Soil requirements: Tolerates sandy soil very well
Erosion control potential: High
Drought tolerance: Excellent
Feral livestock/iguana resistance: Poisonous to most livestock and iguanas; It has been reported that goats ingest the leaves and the seeds but specimens at the Myrah Keating Health Center have remained untouched by goats
Propagation: Cuttings or seeds
Planting density/Recommended spacing: 15 to 18 inches apart
Potential purchase locations: Unknown for *Lantana involucrata*; However *Lantana camara* is sold at the Coral Bay Garden Center
Notes/Comments: This is the cousin of the worldwide known invasive *Lantana camara*, which is also found in the VI. However, in local conditions, *L. camara* has proven not to be invasive in the VI. Neither is this species *L. involucrata*. This plant may be a valuable species for erosion control and soil stabilization because it is not only a good soil stabilizer but it is also livestock proof.

Melochia tomentosa is an attractive flowering shrub that is becomingly increasingly common, particularly in the East End of St. John since goats do not eat it. As its common name implies, it can become weedy since it propagates from seed or cuttings relatively easy. It also should be noted that it blooms repeatedly throughout the year.

Common Name: Black broom, broom weed, broom wood
Scientific Name: *Melochia tomentosa*
Plant family: Sterculiaceae
Form & Habit: Shrub
Mature Size: 3.5 ft. (1 m) tall
Native Range: Texas, Florida, Mexico, West Indies, Central America to Brazil
Native Habitat: Open disturbed areas such as roadsides
Water requirements: Moderate; avoid excessive irrigation as plant can develop root rot in excessively wet soils
Light requirements: Full sun
Soil requirements: Rocky or sandy soils; well-drained
Erosion control potential: Good soil stabilizer for steep arid areas
Drought tolerance: Excellent
Feral livestock/iguanas resistance: Apparently unpalatable to goats; iguana resistance is unknown
Propagation: By seeds or cuttings
Planting density/Recommended spacing: 18-36 inches apart
Potential purchase locations: Unknown
Notes/Comments: Can be an attractive flowering shrub for low hedges and borders. Because of its apparent unpalatability to goats, it can become a good soil stabilizer in goat infested areas.

This spiny and mostly sprawling shrub bears very beautiful blue, violet, or lavender flowers but only briefly. Despite its spiny appearance, goats still consume the younger shoots leaving plants as stubby little mounds. It can be used as a barrier to humans and as a soil stabilizer. However, there is no guarantee it will keep goats out. This plant can often be confused with the very rare Woodbury's Machaonia which is found only on St. John and Virgin Gorda.

Common Name: Chuk bush
Scientific Name: *Oplonia microphylla*
Plant family: Acanthaceae
Form & Habit: Shrub with sprawling spiny branches
Mature Size: 6 ft. (2 m) long, often forming tangled masses
Native Range: Jamaica to the Grenadines
Native Habitat: Coastal thickets
Water requirements: Unknown
Light requirements: Unknown
Soil requirements: Unknown
Erosion control potential: Useful as a soil stabilizer
Drought tolerance: Excellent
Feral livestock/iguana resistance: Goats consume the younger shoots; iguana resistance is unknown
Propagation: By seeds or cuttings
Planting density/Recommended spacing: Unknown
Potential purchase locations: Unknown
Notes/Comments: Care should be taken in placement of this plant because of its spines. It is useful as a soil stabilizer but not as a goat barrier.

Wild rondeletia is found only in Puerto Rico (where it is reportedly quite rare) and the Virgin Islands. It produces a small pink flower which is scentless during the daylight but very fragrant at night. Even though it is adapted to very dry areas, it actually prefers to grow on a north exposure, away from full sun. Because it naturally grows on rocky substrates and vertical walls (as seen in the photo), it is highly recommended for erosion control and soil stabilization.

Common Name: Downy rondeletia, wild rondeletia
Scientific Name: *Rondeletia pilosa*
Plant family: Rubiaceae
Form & Habit: Shrub
Mature Size: 6.5-13 ft. (2-4 m) tall
Native Range: Puerto Rico and the Virgin Islands
Native Habitat: Scrub and dry forests
Water requirements: Low to moderate
Light requirements: Prefers north exposure or protection from full sun
Soil requirements: Well to excessively well-drained soils
Erosion control potential: Good; clings to vertical walls
Drought tolerance: Very good
Feral livestock/iguana resistance: Unknown
Propagation: By seeds barely covered with fine potting medium; or by cuttings or air layers
Planting density/Recommended spacing: 1 per 4 lineal feet
Potential purchase locations: Unknown
Notes/Comments: This native endemic (meaning it is only found in the PR/VI region) is well-adapted to growing in dry areas on vertical walls and rock faces, preferably on north exposures. Its inconspicuous but pretty flower is very fragrant at night.

The yellow boxwood is a common shrub found in various habitats in the Virgin Islands. It is very drought tolerant, its leaves turn yellow-green but remaining intact for many months. It is a good dense shrub for soil stabilization purposes. However, it has been reported that goats consume the leaves of this shrub.

Common Name: Yellow boxwood
Scientific Name: *Schaefferia frutescens*
Plant family: Celastraceae
Form & Habit: Shrub
Mature Size: 6.5-13 ft. (2-4 m) tall
Native Range: Florida to Grenada and Mexico to Venezuela
Native Habitat: Dry forests and dry evergreen woodlands
Water requirements: Low to moderate
Light requirements: Full sun to partial shade
Soil requirements: alkaline, sandy soil; tolerates a wide range of well-drained soils
Erosion control potential: Good dense shrub for soil stabilization
Drought tolerance: Excellent
Feral livestock/iguana resistance: It is reported that goats consume the leaves of this shrub; iguana resistance is unknown
Propagation: By seed
Planting density/Recommended spacing: 1 per 9 square feet
Potential purchase locations: Unknown
Notes/Comments: This hardy, drought tolerant plant thrives in various habitats in the VI but is most commonly found in dry areas. It makes a good hedge, screen, and soil stabilizer. *S. frutescens* looks best when grown in partial shade. It has been reported that its leaves are eaten by goats.

Trees

From a botanical standpoint, a tree is defined as a plant that is perennial in its lifespan, has an elongated stem (i.e. trunk), with supporting branches and leaves. A tree can also be defined as a woody plant with secondary growth, that is useful for lumber, or grows above a specified height. A typical tree grows to a height above 20 feet (6 m), and have many secondary branches supported by the trunk that is clear of branches from 1/3 to ½ of the trunk above the ground. Most trees have a layer of woody tissue called the bark which serves as a protective barrier. Below the ground, trees have a root system whereby the roots branch out and spread widely. This not only anchors the tree in place, but it also serves as the means for the tree to extract moisture and nutrients from the soil. Trees play a very important role in erosion control and soil stabilization, as well as moderating climate by capturing carbon dioxide from the atmosphere. In controlling soil erosion and stabilizing soil, trees should play a vital part of your long-term plan.

Pigeonberry, as it names implies, has its abundant fruit consumed by our native pigeons and other birds. It is one of our most common trees in the Virgin Islands, and makes for an attractive landscape tree. However, care must be taken in where it is planted because of its tendency to have drooping branches and dropping fruit. It is reported that the leaves of this tree are consumed by goats.

Common Name: Pigeonberry, chink, chinkwood, juniper, pigeon wood, spoon tree
Scientific Name: *Bourreria succulenta*
Plant family: Boraginaceae
Form & Habit: Shrub or tree
Mature Size: up to 25 ft. (8 m) tall
Native Range: Florida, West Indies, and Venezuela
Native Habitat: Dry to moist areas
Water requirements: Low once established
Light requirements: Full sun to light shade
Soil requirements: Moist, well-drained soil; can tolerate nutrient poor soils
Erosion control potential: Good
Drought tolerance: Excellent
Feral livestock/iguana resistance: Goats reportedly eat the leaves; Iguana resistance is unknown
Propagation: By seeds
Planting density/Recommended spacing: 1 per 81 sq. ft.
Potential purchase locations: Unknown but may be in some local nurseries
Notes/Comments: This abundant native tree produces flowers and fruit practically all year round. It makes a good landscape tree for open areas. Because of its profuse flowers and fruit, it is a definite wildlife attractant. However, it is not recommended to plant it near houses, gravel, or driveway areas, as the branches tend to droop (thus it may need regular pruning) and the copious amount of fruit can make a sticky mess.

One of our largest native trees, black-olive is actually not a true olive tree. It develops an extensive root system which holds soil in place and thus prevents erosion. It will make for an excellent signature specimen tree. However, care must be taken in not planting it near driveways and structures, because of its root system and with its tendency to drop leaves, blooms and seed capsules.

Common Name: black-olive, oxhorn bucida, gregorywood, ucar, gregre, bois gli-gli
Scientific Name: *Bucida buceras*
Plant family: Combretaceae
Form & Habit: Tree
Mature Size: Generally 65 feet (20 m) but can be up to 100 (30 m) feet tall
Native Range: Florida, Central America, and throughout the West Indies
Native Habitat: Moist and coastal forests
Water requirements: Regular; soil should be kept moist ideally
Light requirements: Full sun
Soil requirements: Does best in rich, moist, well-drained soils, but tolerant of most soil types.
Erosion control potential: *B. buceras* develops an extensive fibrous root system which holds the soil and prevents erosion
Drought tolerance: High
Feral livestock/iguana resistance: Unknown
Propagation: Seeds or air layering
Planting density/Recommended spacing: 1 per 225 sq. ft.
Potential purchase locations: Unknown
Notes/Comments: Attractive to birds for nesting and cover, shade and specimen tree -- give plenty of room to grow. Does well in sea-side locations, heavy branches very wind tolerant. Messy -- drops leaves, spent blooms and seed capsules which stain sidewalks, cars or anything else they drop on -- roots uplift sidewalks and pavements.

Use turpentine trees as large specimen plantings for shade and long-term soil retention via the large root structure that will form over time. They can drop smaller branches, and the large amount of fruit can drop also, so be wary of planting them too near to houses. To note, goats eat the bark and leaves of this tree.

Common Name: Turpentine tree, cachibou, gommier, gumbo limbo, red bellytree, takantin, tourist tree
Scientific Name: *Bursera simaruba*
Plant family: Burseraceae
Form & Habit: Deciduous tree or shrub
Mature Size: Up to 50 feet tall
Native Range: Florida, Mexico, Caribbean to South America
Native Habitat: Dry Forests
Water requirements: Low
Light requirements: Full Sun
Soil requirements: Well-drained, wide variety of soil types tolerated, will tolerate alkaline soils
Erosion control potential: Low – best as a rain interceptor. Roots will spread and hold soil.
Drought tolerance: Exceptional
Feral livestock/iguana resistance: Goats reportedly eat the bark and the leaves; iguanas do not eat this tree
Propagation: Seed, will also propagate from cuttings (can be used in live-staking applications)
Planting density/Recommended spacing: Minimum 50' on center
Potential purchase locations: Unknown
Notes/Comments: A native tree to the Caribbean, turpentine tree is well adapted to dry forest conditions and will tolerate a wide variety of soil types. It is a great shade tree, but does have weak branches that can drop into yards and driveways, though overall it is wind tolerant. It will even tolerate salt spray if planted near the ocean. It also produces a vast amount of tiny fruit which can attracts birds but make a mess if planted near driveways and structures. Goats reportedly eat this bark and leaves of this tree.

Good for hedges or as specimen plantings, Jamaican caper is a well-adapted native small tree or shrub in the USVI. Use as a supplemental landcover with other erosion control practices.

Common Name: Black willie, black witty, Jamaican caper, linguam tree
Scientific Name: *Capparis cynophallophora*
Plant family: Capparaceae
Form & Habit: Small tree or shrub
Mature Size: up to 25 feet tall (8 m)
Native Range: southern Florida, West Indies to Central America
Native Habitat: Moist or dry coastal forests
Water requirements: Low
Light requirements: Full Sun
Soil requirements: Grows in various types of soils
Erosion control potential: Low to Moderate – will form hedges if pruned, so can act as wind barrier but low stem count and moderate root system don't make this a standout for erosion control
Drought tolerance: Exceptional
Feral livestock resistance: Unknown
Propagation: Will propagate from seed – may propagate from cuttings
Planting density/Recommended spacing: Plant either as specimen planting 10-15 feet on center or plant densely in hedges and prune accordingly
Potential purchase locations: Local nurseries may have this plant. Local native stock may be other source.
Notes/Comments: Tough and well-adapted to the climate in St. John, Jamaican caper is a good hedge or specimen planting. Low maintenance and attractive blossoms in spring and summer make this a good choice for privacy hedges or wind barriers for other plantings. Will tolerate some shade.

Fiddlewood is a common native tree in the Virgin Islands. It can be used as a landscape tree in different areas. It tends to be defoliated by a moth caterpillar. As its common name suggests, its wood was use to make musical instruments such as fiddles.

Common Name: fiddlewood, old woman bitter, susannaleche
Scientific Name: *Citharexylum fruticosum*
Plant family: Verbenaceae
Form & Habit: Small tree or shrub
Mature Size: up to 33 ft. tall (10 m)
Native Range: West Indies and northern South America
Native Habitat: Dry to moist forests
Water requirements: Moderate
Light requirements: Partial sun to partial shade
Soil requirements: acidic to alkaline; can grow in sandy, clay, and loam soils
Erosion control potential: Unknown
Drought tolerance: Very good
Feral livestock/iguana resistance: Deer reportedly do not eat this tree; iguana resistance is unknown

Propagation: By seeds, cuttings of semi-hard wood, or airlayers
Planting density/Recommended spacing: 1 per 25 square feet
Potential purchase locations: Unknown; However some nurseries may have a variety brought in from South Florida
Notes/Comments: Fiddlewood is a fairly common tree in the Virgin Islands. It is deciduous in nature with attractive white flowers and a handsome bark. Can be used as a landscape tree. Occasionally, this tree is attacked by a moth caterpillar which defoliates the tree (temporarily).

The autograph tree is known as the tree that people can write their names on the leaves, and it wouldn't fade away. It is versatile, adaptive, and very drought tolerant. It has a long spreading root system which can even be found growing over rocks. Thus, it is excellent for erosion control and soil stabilization. It produces a beautiful pink and white flower, which is very attractive to pollinators. For these reasons, it is recommended to also be planted more for its ornamental value.

Common Name: autograph tree, chigger, false mammee, pitch apple
Scientific Name: *Clusia rosea*
Plant family: Clusiaceae
Form & Habit: Free standing or strangling tree
Mature Size: up to 40 ft. (12 m) tall
Native Range: Bahamas, Greater Antilles, Virgin Islands, Anguilla, St. Martin
Native Habitat: Moist forests and dry coastal vegetation
Water requirements: Must be kept well-watered until fully established
Light requirements: Full sun to shade
Soil requirements: Tolerates many soil types but prefers moist, well-drained soils
Erosion control potential: Excellent; Its long and spreading roots hold soil in place well
Drought tolerance: Excellent
Feral livestock/iguana resistance: It is reported that goats eat the leaves; iguana resistance is unknown
Propagation: By seeds or cuttings
Planting density/Recommended spacing: From 8 to 15 feet (2.4-4.7 m) apart
Potential purchase locations: ABC Plant Nursery in St. Thomas
Notes/Comments: This hardy native tree is very versatile and adaptive in terms of its growth pattern as well as where it is found growing. It could be found in moist forests growing as a free standing tree. It can also be found growing on other trees as a strangler, eventually killing its host. It has a long, spreading root system, which can be even found growing on rocky slopes. Because of this it is highly recommended for erosion control and soil stabilization.

This typically small tree or shrub is a close relative of the more well-known Seagrape tree. It typically becomes multi-stemmed and the bark becomes rough and plate-like as it ages. Like its cousin, it has the same soil stabilizing capabilities, and will prove very valuable in long-term erosion control and soil stabilization. The pictures here are of specimens in the Botany Bay area of St. Thomas, which had individuals of considerable size, potentially over 100 years of age.

Common Name: Pockhout
Scientific Name: *Coccoloba microstachya*
Plant family: Polygonaceae
Form & Habit: Small tree or shrub
Mature Size: 5-23 ft. (1.5-7 m) tall
Native Range: Hispaniola, Puerto Rico, and the Virgin Islands
Native Habitat: Coastal scrub and dry forests
Water requirements: Wet
Light requirements: Full sun
Soil requirements: A variety of well to excessively well-drained soils;
Erosion control potential: Although it has a weak taproot, it is supported by many extensive tough and flexible lateral roots. Thus, it is a valuable protector of soil
Drought tolerance: High
Feral livestock/iguana resistance: Goats reportedly eat the leaves of this tree; iguana resistance is unknown
Propagation: By seed
Planting density/Recommended spacing: 1 per 81 sq. ft.
Potential purchase locations: Unknown
Notes/Comments: This tree, related to Seagrape, also has soil stabilizing capabilities which would be valuable in a long term erosion control and soil stabilization plan.

The Seagrape tree is one of the signature coastal trees throughout the Caribbean. It is absolutely vital to stabilizing shorelines, as is evidenced when they are removed from a sandy shore. Even though it is typically found along coastal fronts and beaches, it is very adaptable. It can grow as a hedge along a windy shoreline or as an almost 50 ft. tree inland in dry forest areas. It is highly recommended for erosion control and soil stabilization from the coast to inland areas.

Common Name: Seagrape, grape tree
Scientific Name: *Coccoloba uvifera*
Plant family: Polygonaceae
Form & Habit: tree or shrub
Mature Size: Ranging from 6.5 ft.-50 ft. (2 -15 m), depending on environmental conditions
Native Range: Bermuda, Florida, and all Caribbean shorelines
Native Habitat: Coastal fronts and sandy beaches, also inland in dry forests
Water requirements: Regular for establishment and fast growth
Light requirements: Partial shade to full sun
Soil requirements: Wide; from sand to rocky headlands to inland forest soils
Erosion control potential: Well-known and established for stabilizing sandy shores; also will work well on somewhat steep slopes
Drought tolerance: Excellent
Feral livestock resistance: Deer reportedly may eat this tree; iguanas ignore this tree
Propagation: By cuttings, seeds, or air layers
Planting density/Recommended spacing: 1 per 81 sq. ft.
Potential purchase locations: Grown at Coral Bay Garden Center and Bryan's Plants on St. Thomas
Notes/Comments: This very adaptable tree will work excellently for long term soil stabilization, particularly on sandy shores, beach fronts, and even moderately steep slopes. Care must be taken with female plants bearing fruits, as it can become quite messy. Also, leaves are very slow to decompose, so raking must be taken into consideration.

Our native and endemic broom palm is a fairly common specimen in our forests in the Virgin Islands, with its tall, spindly form waving in the wind, particularly in higher elevations. Like most palms, it does not regenerate when cut down. It is found growing in rocky areas, and as some of its common names implies, it has been historically used for making brooms and in basket weaving. To note, a skeletonizing insect has been attacking these trees recently, partially defoliating the trees.

Common Name: Broom palm, broom teyer, fan palm, silver palm, teyer palm
Scientific Name: *Coccothrinax alta*
Plant family: Areceaeae
Form & Habit: Erect solitary palm
Mature Size: 6.5-20 ft. (2-6 m) tall
Native Range: Puerto Rico and the Virgin Islands
Native Habitat: Moist to Dry forests
Water requirements: Moderate
Light requirements: Partial shade or sun to full sun
Soil requirements: Acidic to alkaline soils; Sandy, clay, loamy soils; Soil should be well-drained
Erosion control potential: High; naturally grows on rocky substrates
Drought tolerance: High
Feral livestock/iguana resistance: Unknown
Propagation: By seeds
Planting density/Recommended spacing: 1 per 9 sq. ft.
Potential purchase locations: Bryan's Plants in St. Thomas
Notes/Comments: This endemic palm was historically used to make brooms and woven baskets (hence one of its common names). It naturally grows on rocky substrates, so it will be ideal for rocky, sloped sites. However, it grows fairly slowly and does not regenerate if cut down. Can be used for long-term soil stabilization.

This common small tree or shrub is in the same family of trees such as Surinam cherry (Eugenia uniflora) and guavaberry *(Myrciaria floribunda).* The fruit is reportedly edible. It can make a very useful ornamental tree with its evergreen foliage and beautiful white flowers as seen in the above photo.

Common Name: Rodwood
Scientific Name: *Eugenia biflora*
Plant family: Myrtaceae
Form & Habit: Small tree or shrub
Mature Size: 10-20 ft. (3-6 m) tall
Native Range: Mexico and West Indies to northern South America
Native Habitat: Moist to dry evergreen forests
Water requirements: Unknown
Light requirements: Full sun
Soil requirements: Moist soil, preferably sandy loam
Erosion control potential: Unknown
Drought tolerance: Good
Feral livestock/iguana resistance: Unknown
Propagation: By seed
Planting density/Recommended spacing: 1 per 36 sq. ft.

Potential purchase locations: Unknown
Notes/Comments: This common small tree or shrub can be confused with other species of the Myrtaceae family, but will be the one more commonly found in dry areas. Fruits are edible but have only been consumed on a smaller scale compared to other trees of the Myrtaceae family such as Surinam cherry and guava berry. This tree can be shaped as a hedge or screen. It should also be quite useful as a soil stabilizer.

The white fig is a relatively large native tree with an expansive root system. It will establish readily from cuttings (so much so that it was once used to create live fences). It will often establish as a parasite, with roots hanging from the branches and trunk of another tree. It will eventually strangle its host tree. The erosion control potential of the wild fig is high if used in live staking and brush layering / matting applications as it will readily establish from cuttings. It does require some organic matter to initially establish, so soil amendment may be necessary for establishment. Ensuring irrigation in the early phase of growth is essential – otherwise the potential for failure is high.

Common Name: White Fig
Scientific Name: *Ficus citrifolia*
Plant family: Moraceae
Form & Habit: Tree
Mature Size: To 33 feet (10 m) tall
Native Range: Florida and West Indies
Native Habitat: Moist forests to coastal scrubs
Water requirements: Low
Light requirements: Full sun
Soil requirements: Tolerates moist or well-drained soils. Needs some organic content to thrive. Will grow in nutrient-poor soils.
Erosion control potential: High – roots will spread over a large area.
Drought tolerance: High
Feral livestock/iguana resistance: Goats reportedly eat leaves and seeds; iguana resistance is unknown

Propagation: Local horticulturalists indicate that it will propagate from cuttings. Roots establish easily. Will also propagate from seed.
Planting density/Recommended spacing: If pruning or using in brush mats, live staking, layering, etc – plant cuttings densely. If using for specimen plantings – an average of 40' on-center should provide adequate space for larger trees to take root and flourish.
Potential purchase locations: Source locally from cuttings.
Notes/Comments: White fig does have an expansive root system – care must be taken that roots don't intrude into areas that are unwanted. Do not plant this tree too near to your house as it is known to crack cisterns/foundations.

Much can be said about this beautiful tree. It is the densest wood known to man, so dense that it would sink in water. For this reason, it was heavily used and cut down out of our forests for various uses such as ship building and posts for dwellings. It is now very rare in the wild and is protected by local law. It is extremely slow-growing and long-lived, reportedly to live up to 1000 years. It makes an excellent landscape tree as seen in our various parks and gardens in the VI. It is best used for very long term erosion control and soil stabilization.

Common Name: Lignum vitae, liki wiki, pockenholt
Scientific Name: *Guaiacum officinale*
Plant family: Zygophyllaceae
Form & Habit: Tree
Mature Size: up to 33 ft. (10 m) tall
Native Range: Throughout the West Indies, Colombia, and Venezuela
Native Habitat: dry coastal forests
Water requirements: Requires regular watering when being established or during extended period of drought
Light requirements: Full sun
Soil requirements: Wide range; will prosper in well-drained deep soils
Erosion control potential: Good
Drought tolerance: Exceptional
Feral livestock resistance: Not eaten by feral livestock and iguanas
Propagation: By seed
Planting density/Recommended spacing: 1 per 144 sp. Ft.
Potential purchase locations: May be available in local nurseries since it is also planted in parks and gardens
Notes/Comments: The species that come from nurseries may be ones from Florida, and therefore should be avoided. This tree is rare in the wild, and protected by VI law.

Black mampoo is one of the most common trees in the Virgin Islands. It is easily recognized by the insect galls that are usually on its leaves. It makes for a prominent signature specimen tree in open areas for landscaping. Because of its expansive root system and fairly quick growth, it makes for an excellent soil erosion control and soil stabilizer tree on a medium to long term basis. Care must be taken to not plant this tree near structures and driveways due to its root system and fruit drop which can make quite a mess.

Common Name: Black mampoo, wild mampoo
Scientific Name: *Guapira fragrans*
Plant family: Nyctaginaceae
Form & Habit: Tree or shrub
Mature Size: 10-26 (-55) ft. ((3-8 (-17) m)) tall
Native Range: West Indies and northern South America
Native Habitat: Dry to moist forests
Water requirements: Low to moderate
Light requirements: Full sun
Soil requirements: Can grow on a variety of soil types
Erosion control potential: High due to its sturdy and expansive root system
Drought tolerance: Excellent
Feral livestock/iguana resistance: Unknown
Propagation: Seed
Planting density/Recommended spacing: 1 per 144 square feet
Potential purchase locations: Grown at Coral Bay Garden Center
Notes/Comments: This fairly common tree makes for a good soil erosion control and soil stabilization candidate due to its extensive root system. However, it produces a massive amount of sticky purplish fruit which can make a mess of structures and driveways.

A very common and characteristic tree of the dry forests in the Virgin Islands, water mampoo is easily recognized by its "elephant toe" trunk and exposed root system. It grows very quickly, and can become quite large on very dry rocky sites. For these reasons, along with its excellent drought tolerance, water mampoo makes for an ideal specimen for soil erosion control and soil stabilization overall. It should be noted that female trees can become untidy due to fruit drop, so selecting cuttings from grown male trees will be better if planting are near structures.

Common Name: loblolly, mampoo, water mampoo
Scientific Name: *Pisonia subcordata*
Plant family: Nyctaginaceae
Form & Habit: Small tree or shrub
Mature Size: up to 26 ft. (8 m) tall
Native Range: Jamaica to Martinique
Native Habitat: Dry forests and thickets
Water requirements: Moist
Light requirements: Full sun
Soil requirements: Sandy, clay, loamy, pH acidic to slightly alkaline
Erosion control potential: Excellent; Has massive exposed and extensive root system
Drought tolerance: Excellent
Feral livestock/iguana resistance: Unknown
Propagation: By the sticky seeds, or by semi-hard wood cuttings
Planting density/Recommended spacing: 1 per 144 square feet
Potential purchase locations: Unknown
Notes/Comments: With its quick growth, excellent drought tolerance, and massive and exposed root system, water mampoo is an ideal candidate for soil erosion control and soil stabilization. However, trees that are female (will bear green fruit which turn purple in maturity) will become quite messy due to fruit drop. Cuttings from male trees (will bear flowers that do not turn into fruit but instead drop off) will probably be the preferred choice for planting, especially near home structures.

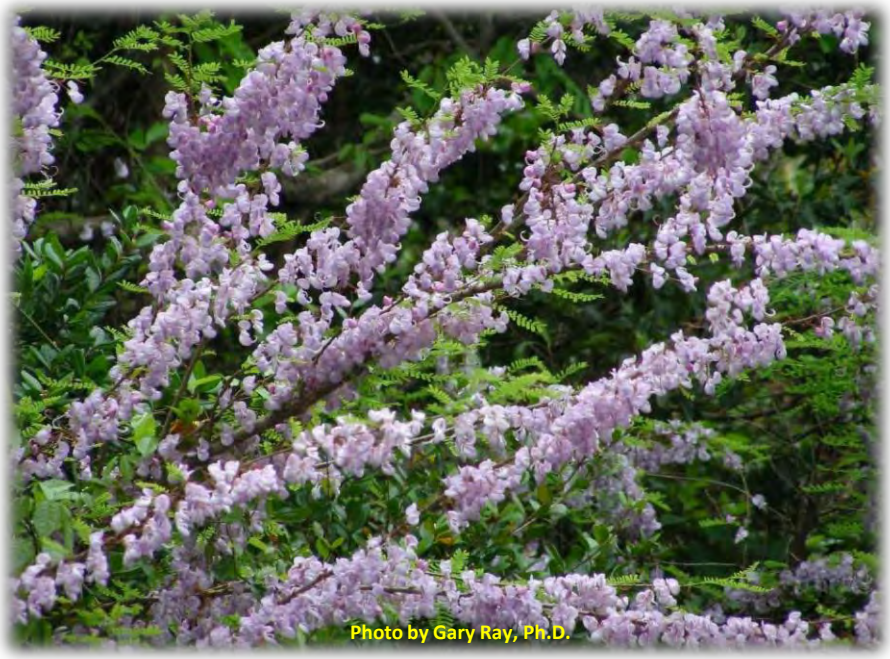
Plumeria alba is native to the Caribbean. Don't confuse this species with *P. rubra* or *P. obtusa*, which are both introduced varieties. *P. alba* has elongated, pointier leaves than either of these other species.

Wild frangipani will propagate easily from cuttings, making it ideal to use in live-staking and brush matting or layering applications.

Though it tolerates a wide variety of soil conditions, make sure that soil is well-drained. As always, irrigation during establishment is critical, though once established, it should fare relatively well.

Its erosion control potential is only moderate as it loses its leaves for a period each year due to a caterpillar, meaning its rain-interception potential is lowered. However the root system will still provide soil holding capabilities.

Common Name: Wild frangipani, milk tree
Scientific Name: *Plumeria alba*
Plant family: Apocynaceae
Form & Habit: Small tree
Mature Size: 10-23 ft. (3-7 m) tall
Native Range: Puerto to Grenada in Lesser Antilles
Native Habitat: Tropical dry forest
Water requirements: Low to Moderate
Light requirements: partial shade to full sun
Soil requirements: Clay, loam, sand, acidic to alkaline, well-drained
Erosion control potential: Moderate – loses leaves due to caterpillar (less rain interception).
Drought tolerance: Exceptional
Feral livestock/iguana resistance: Unknown for livestock though deer reportedly eat this plant; iguanas do not eat this plant
Propagation: Seeds and cuttings. The seedlings tend to produce stronger root systems than cuttings. Seeds are best collected when pods are just splitting open. Cuttings should be woody, an inch in diameter and 10-12 inches long.
Planting density/Recommended spacing: If pruning or using in brush mats, live staking, layering, etc – plant cuttings densely. If using for specimen plantings – an average of 5-10' on-center should provide adequate space for larger trees to take root and flourish.
Potential purchase locations: Source locally from cuttings.
Notes/Comments: This beautiful native tree tends to lose its leaves due to a caterpillar. Nevertheless, it is still recommended for erosion control and soil stabilization. This tree produces a poisonous, milky white sap if injured, so be careful.



This endemic, leguminous shrub or small tree can produce some of the most beautiful blooms you will ever see, particularly after spring wet periods. Although it may have good drought tolerance, it will usually be found in more moister areas. Like most legumes, it will fix nitrogen into the soil, improving soil nitrogen content which is essential for plant foliage growth.

Common Name: solider whip, wattapama
Scientific Name: *Poitea florida*
Plant family: Fabaceae-Faboideae
Form & Habit: Shrub or small tree
Mature Size: 20 ft. (6 m) tall
Native Range: Puerto Rico and the Virgin Islands
Native Habitat: Moist to dry forest
Water requirements: Moderate; needs regular watering
Light requirements: Partial shade to full sun
Soil requirements: Grows on various types of soils
Erosion control potential: Unknown
Drought tolerance: Good
Feral livestock/iguana resistance: Unknown
Propagation: By seed
Planting density/Recommended spacing: 1 per 16 sq. ft.

Potential purchase locations: Unknown
Notes/Comments: This small tree is known for its profuse blooming displays after spring-time rains. The blooms however, only last for a few days. Being part of the legume family, this tree will fix nitrogen into the soil, thereby improving the nitrogen nutrient content.

The well-known white cedar tree is actually the official tree of the British Virgin islands. It is one of our most prettiest blooming natives, particularly after heavy rainfall. It is a very adaptable tree, found in a variety of habitats and soils from mountain peaks to coastal forests. For this reason, it is good for revegetation, soil stabilization, and long-term erosion control. Raking of the flowers may be needed after its profuse blooming period, since the flowers tend to fall off rapidly after a few days.

Common Name: White cedar, pink cedar, black cedar, pink manjack tooshee
Scientific Name: *Tabebuia heterophylla*
Plant family: Bignoniaceae
Form & Habit: Tree
Mature Size: up to 60 feet depending on conditions
Native Range: Hispaniola through Lesser Antilles
Native Habitat: Coastal scrub to moist forests
Water requirements: Once established, will tolerate periods of short drought
Light requirements: Full sun
Soil requirements: Will grow in many types of soils, wet or dry, as long as it is well-drained
Erosion control potential: Good for revegetation projects
Drought tolerance: Very good
Feral livestock/iguana resistance: It is reported that goats eat the leaves and seeds; iguanas will reside in the tree but do not consume leaves or flowers (author's observation)
Propagation: By seed or semi-hard wood cuttings
Planting density/Recommended spacing: 1 per 100 square feet
Potential purchase locations: Bryan's Plants on St. Thomas
Notes/Comments: This native tree is one of the prettiest blooming trees in our landscape. It is very adaptable with a huge environmental tolerance, growing on even the most poorest and degraded soils and sites. For this reason, it is good for soil stabilization, revegetation, and long-term erosion control.

Succulents

Succulents are defined as plants that have leaves and stems that are abnormally thickened or fleshy in order to conserve water in dry climatic conditions and soils. Typically, succulents live in areas of high temperatures and low rainfall. Therefore, they are able to thrive in areas where water is scarce. This makes these plants extremely drought-tolerant, making them very valuable species in the climatic conditions of Coral Bay and the Virgin Islands overall. For this, as well as other reasons, succulents are widely utilized as ornamental plants. In addition, many succulents plants are thorny or spiny, deterring livestock from eating them. Moreover, these plants are excellent in soil erosion control and stabilization because they naturally grow in areas where erosion and soil stabilization may be a problem such as rocky sites and steep, arid slopes. Thus, it is highly recommended that if you live on a site that is arid, steep, and prone to soil erosion, to use succulents as a very important part of your soil stabilization and erosion control plans. Cacti are one kind of succulent.

The century plant is one of our endemic and what is called in ecology a "keystone species." That is, a species which is so important that if it were removed, it would drastically alter the ecosystem in which it is found. It is usually found on steep, rocky slopes and thus makes an excellent soil stabilizer/retainer in these areas. Contrary to its name, it actually blooms in about 25 to 35 years time instead of a century, and then dies. In the early 2000s, an agave weevil decimated the population of these plants but the population is beginning to recover.

Common Name: Century plant, karata
Scientific Name: *Agave missionum*
Plant family: Agavaceae
Form & Habit: Large succulent shrub
Mature Size: 2.5 to 8 ft. long
Native Range: Puerto Rico and the northern Virgin Islands
Native Habitat: coastal thickets among rocky outcrops
Water requirements: Moderate to heavy; low once established
Light requirements: Full sun
Soil requirements: Well-drained to excessively well-drained soils; most soil types over both sedimentary and igneous rock formations
Erosion control potential: Excellent soil retainer on steep slopes
Drought tolerance: Exceptional
Feral livestock/iguana resistance: Eaten by cattle when small but generally avoided after the thorns harden; deer eat the center of this plant; iguana do not eat this plant
Propagation: Seeds or adventitious plantlets that may be produced on the flower stems a month or two after flowering
Planting density/Recommended spacing: 1 plant per 25 sq. ft.
Potential purchase locations: Unknown
Notes/Comments: This keystone species is only found in Puerto Rico and the northern Virgin Islands. It produces a beautiful flower stalk which sustains numerous native birds, bats, and insects. It makes for an excellent soil retainer on steep, rocky slopes. The population of these plants have began to recover from the agave weevil attack in the early 2000s.

This barrel shaped native cactus is typically found in very dry areas and coastal rock cliffs. It is becoming an increasingly popular ornamental plant. Although it has spines, goats still manage to break through the juicy interior of the plant, eventually killing it. Nevertheless, it makes for an effective soil stabilizer because it has an extensive and deep root system.

Common Name: Turk's cap, Pope's head, barrel cactus
Scientific Name: *Melocactus intortus*
Plant family: Cactaceae
Form & Habit: Succulent
Mature Size: 2 ft. (60 cm) tall
Native Range: West Indies
Native Habitat: Dry coastal areas
Water requirements: Low
Light requirements: Full sun
Soil requirements: Prefers alkaline soils
Erosion control potential: Has a surprisingly extensive root system and may be effective soil stabilizers on steep dry slopes
Drought tolerance: Exceptional
Feral livestock/iguana resistance: Feral goats may break into the juicy interior, usually killing the plant; iguana resistance is unknown

Propagation: By seed from collecting the dried fruit
Planting density/Recommended spacing: 24 to 36 inches apart
Potential purchase locations: May be at certain nursery locations
Notes/Comments: This cactus is an effective soil stabilizer on steep slopes due to its extensive and deep root system. However, it is susceptible to being eaten by goats.

Prickly pear is not as common as it used to be due to predation from the caterpillar of the introduced Cactoblastis moth. The fruits and leaf pads are both edible. This plant is ideal for rock gardens and is highly recommended for stabilization of cut banks.

Common Name: Prickly Pear, Miss Blyden, Bull sucker
Scientific Name: *Opuntia dillenii*
Plant family: Cactaceae
Form & Habit: Shrub
Mature Size: to 10 ft. (3 m) tall
Native Range: Southeast U.S., Mexico and West Indies
Native Habitat: dry coastal scrub vegetation
Water requirements: Moderate
Light requirements: Full sun to partial shade
Soil requirements: mildly acidic to mildly alkaline
Erosion control potential: High; recommended for stabilization of cut-banks
Drought tolerance: Exceptional
Feral livestock/iguana resistance: Probably resistant to livestock and iguanas due to its thick, long spines
Propagation: Cutting of the pads, taken at the joint; or by seed (slow)
Planting density/Recommended spacing: 2 to 4 feet apart
Potential purchase locations: Unknown
Notes/Comments: This cactus with its thick long spines and extensive root system is ideal for rock gardens and stabilization of cut banks.

Pipe-organ cactus is our tallest local cactus in the Virgin islands, becoming quite large in size. Its fruit is reported to be juicy and sweet but difficult to harvest due to it numerous spines. This cactus naturally grows on steep cliff-sides, and thus makes an excellent stabilizer on banks and cliffs. Hummingbirds are very attracted to the flowers of this cactus, and can be seen feeding on them.

Common Name: Diddledoo, dildo, pipe-organ cactus
Scientific Name: *Pilosocereus royenii*
Plant family: Cactaceae
Form & Habit: Shrub or small tree
Mature Size: up to 23 ft. tall (7 m)
Native Range: Puerto Rico to Antigua
Native Habitat: dry coastal scrub areas
Water requirements: Average; water regularly
Light requirements: Bright shade to full sun
Soil requirements: Well-drained soil
Erosion control potential: High; useful as a stabilizer on banks and cliffs
Drought tolerance: Unparalleled
Feral livestock/iguana resistance: Resistant to livestock and iguanas due to spines; however goats reportedly consume the fruit and the seeds
Propagation: By cuttings of smaller branches or by seeds (Note: allow cuttings to callus at cut end for a week or two)
Planting density/Recommended spacing: 3-8 feet apart
Potential purchase locations: Unknown
Notes/Comments: This tall, bluish green columnar cactus makes an excellent stabilizer of banks and cliffs, on which it naturally grows. As with all cacti, care must be taken in handling it due to its spines. Pipe-organ cactus is very attractive to hummingbirds when in bloom.

According to the National Invasive Species Information Center, an invasive plant species is one that thrives and spreads aggressively outside of its native range. It should also be noted that a naturally aggressive plant may become invasive when it is introduced to a new habitat. Invasive plant species are one of the most serious threats to plant biodiversity and can also be traced to plant extinctions. Most invasive plant species usually have some or all of these characteristics: (a) produce a copious amount of seed; (b) have a fast growth rate; (c) have rapid vegetative growth or reproduction (d) thrive on disturbed soils; (e) are distributed via wind, birds, or knowingly or unknowingly by people; (f) have aggressive root systems which either spread long distances from the parent plant or smother the root systems of other plant species; and (g) may produce chemicals in their leaves or root systems which inhibit the growth of other plant species (allelopathy).

The effects of invasive species are detrimental not only to the environment, but even to human health and the economy. These impacts include reduction of plant diversity by outcompeting natives for moisture, sunlight, nutrients, and space. This can lead to degradation of wildlife habitat. Overall, invasive species create an imbalance in the ecology and environment of the area that they are invading. In Coral Bay and in the Virgin Islands overall, we have been impacted by invasive plant species. The species that are listed here are ones that are common in Coral Bay and in the US Virgin Islands.

Coral vine has large sprays of attractive pink flowers and is commonly used for landscaping in many warm areas of the world.. Despite its aesthetically pleasing form, it will smother surrounding vegetation and spreads readily via numerous seed-dispersal strategies.

Common Name: Coral vine
Scientific Name: *Antigonon leptopus*
Plant family: Polygonaceae
Form & Habit: Vine
Mature Size: Up to 40' feet tall
Native Range: Mexico
Native Habitat: Tropical forests, grasslands, riverbanks, scrub/Shrublands
Notes/Comments: Though coral vine is widely cultivated in areas like Florida, it is also considered an invasive. It will readily climb existing structures such fence posts, utility poles, buildings, and will also climb trees using its coiled tendrils to attach to these things. Once attached, it will quickly smother other vegetation.

Coral vine spreads via its fruit (eaten by birds), water dispersal (seeds will float on waterways), or by its tuberous roots which will spread underground and send up new shoots. These tubers also make it well adapted to St. John's dry climate as they can store water.

Coral vine is difficult to remove. For small, residential areas, mechanical removal is the best option but will likely require numerous cutting and re-cutting of new sprouts.

There is currently no way to remove it from large areas in the USVI.

The rubber vine, shown here with a flower, above, is an invasive plant in the USVI. It is still sold by online retailers and occasionally landscapers will plant it on St. John, not knowing of its invasiveness.

Common Name: Rubber vine
Scientific Name: *Cryptostegia grandiflora*
Plant family: Asclepiadaceae
Form & Habit: Vinelike shrub
Mature Size: Up to 25' feet long
Native Range: Madagascar
Native Habitat: Riverbanks and gallery forests
Notes/Comments: Rubber vine is considered one of the world's worst invasive species. In Australia alone it costs millions of dollars to eradicate as it damages crops and decreased agricultural productivity.

The vinelike shrub will grow over other vegetation and smother plants, quickly taking over. Its seeds are distributed by the wind, meaning that any rubber vine planted in a discrete location by a house will quickly disperse into the surrounding forest and spread. Seeds have been known to float for weeks in salt water and still remain viable.

This plant can be eradicated four ways – biological control (introducing a rust disease), herbicide, fire, and mechanical controls. The USDA in the USVI recommends chopping the vine out of the ground and burning it (or leaving it in the hot sun to dry out and die over the course of a few days). Do not discard it directly into the forest – it will re-root quickly. To note, this plant exudes a toxic milky-white sap if its leaves, vines, and seed pods are broken.

Most importantly, do not plant this for any type of erosion control. Its invasiveness outweighs any potential benefit.

Tan Tan is very common on St. John because it thrives where few, if any, other plants will. It will quickly colonize in disturbed pastures and can take over road cuts as well. Luckily it is relatively easy to eradicate in small areas. Planting native trees will eliminate it from most areas as tan tan is not shade tolerant.

Common Name: Tan Tan, wild tamarind
Scientific Name: *Leucaena leucocephala*
Plant family: Fabacaeae
Form & Habit: Shrub to small tree
Mature Size: 15-20 feet tall
Native Range: Central America
Native Habitat: Disturbed areas
Notes/Comments: Tan Tan is one of the most common plants in the USVI, having been introduced as pasture forage for animals. It is commonly associated with disturbed sites like pastures or road cuts where direct sunlight, lack of shelter from wind, and compacted soils are very unattractive for most plants. Tan Tan will even tolerate light fire and prolonged drought.

Tan Tan will drop its dried seed pods onto the ground where they can persist for years before sprouting. They may be spread by hurricane winds, but no concrete proof exists for this.

Ridding an area of Tan Tan requires either pulling out single plants with a root-puller tool, or cutting down large stands of them and treating each stump with a few drops of herbicide. It can also be eradicated by planting fast-growing native trees which will shade the Tan Tan, rendering it less viable through shading.

The snake plant or mother-in-law's tongue is a commonly cultivated herbaceous plant not only in the VI but practically worldwide. Its invasiveness is due to the fact that it can reproduce not only by seeds, but also vegetatively by leaf segments and underground rhizomes, where it can form dense, almost impenetrable thickets. For this reason, it is very difficult to control and thus eradicate. Nevertheless, it is incredibly good at erosion control and grows on very steep slopes, but should be avoided.

Common Name: guana tail, lizard tail, mother-in-law tongue, rhamni, snake plant
Scientific Name: *Sansevieria trifasciata*
Plant family: Dracaenaceae
Form & Habit: Herb
Mature Size: 12-39 inches (30-100 cm) long; 1-3 inches (3-7 cm) wide
Native Range: Africa
Native Habitat: Coastal areas, Scrub/Shrublands, Grasslands, Dry and Moist forests floor
Notes/Comments: The snake plant is a widely cultivated and widely distributed aggressive, invasive plant. It has also been cultivated and naturalized in the Virgin Islands. It is cultivated as an ornamental plant and as a plant for fiber in many parts of the world. As a result, has spread from place to place.

It is able to reproduce via seeds, but also by leaf segments and rhizomes. These vegetative parts (i.e. rhizomes and leaf segments) can easily resprout and grow rapidly, forming dense and almost impenetrable thickets.

The risk and impact factors of snake plant are as follows: competition by monopolizing resources, as well as by strangling and smothering, ecosystem change/habitat alteration, reduced native biodiversity, and the threat to/loss of native species.

Snake plant is very difficult to control because of its ability to form extensive rhizome networks and thickets. It should be removed by digging or hand-pulling, and completely removed from the site because of its ability to resprout vegetatively.

Guinea grass is great animal fodder, but will quickly dominate an open area and out-compete other native species. Though its morphology makes it good for erosion control, its invasiveness eclipses that small benefit. Guinea grass should not be used for erosion control.

Common Name: Guinea grass
Scientific Name: *Urochloa maxima*
Plant family: Poaceae
Form & Habit: Bunch grass
Mature Size: Up to 6 feet tall
Native Range: Africa
Native Habitat: Open grasslands, woodland bush thickets
Notes/Comments: Guinea grass is very pervasive in the USVI having been introduced intentionally for animal fodder. It is extremely hardy due to its deep root structure and tolerance of drought and full sun conditions. It will often be seen growing as the understory of a tan tan grove in old pastures.

Guinea grass produces seeds which are readily carried by the wind, meaning it will disperse easily into any open areas.
Though guinea grass has many traits that are in some ways desirable for erosion control (deep roots, dense, bunchy stems), its ability to quickly take over an area out-compete other grasses make it undesirable for use in erosion control applications. It should definitely be avoided.

To eradicate guinea grass, frequent mowing before the grass goes to seed is the best way to eliminate it from a small site. Shade will slow its growth, so planting native trees above it will help slow its spread.

Neem is widespread globally, likely due to its much-touted health claims, its natural herbicidal tendencies, and some claims that it has an effect as an insecticide. However, it will rapidly out-compete native forests on St. John, so it should not be planted.

Common Name: Neem tree
Scientific Name: *Azadirachta indica*
Plant family: Meliaceae
Form & Habit: Tree
Mature Size: Up to 60 feet tall
Native Range: Northeast India
Native Habitat: Arid forests
Notes/Comments: Though once thought to be a highly beneficial tree because of its supposed healing properties, as well as the organic herbicide that can be produced using neem oil, the neem tree is highly invasive in the USVI.

Neem produces 40,000 – 200,000 seeds per tree annually, which are primarily spread by bats and birds. In the drier north-east end of St. John, guts are frequently invaded by neem.

Neem is particularly difficult to remove. Mechanical removal seems to be the best option. Trees can be cut and seedling pulls. Neem will grow from its roots very readily, so be prepared to continue pulling these saplings over the long-term.

The Chinaberry tree is closely related to the neem tree and is part of the mahogany family. Thus, it would be valued for its wood. Despite this, its wood is under-utilized. However, like the neem tree it is also invasive in the Virgin islands, particularly on St. Thomas. Care must be taken to not mistake this tree for neem because of its toxicity. It should also be avoided due to its invasiveness. However, we encourage woodworkers to utilize its wood since it is similar to mahogany in quality.

Common Name: Chinaberry, hagbush, lilac
Scientific Name: *Melia azedarach*
Plant family: Meliaceae (Mahogany Family)
Form & Habit: Tree
Mature Size: can grow up to 50 feet tall
Native Range: Asia
Native Habitat: Lowland and highland rainforest, mixed deciduous tropical forests
Notes/Comments: This tree of the Mahogany family is actually closely related to the aforementioned Neem tree. But just like its closely related cousin, it is also very invasive.

Chinaberry invasiveness is due to the fact it is a prolific seed producer, reproduces vegetatively, and thus displaces native vegetation. It reproduces vegetatively by resprouting after it has been cut. The fruits, leaves, and seeds are poisonous to humans and mammals, but not to birds. Thus, birds quickly spread the seeds. It is also believed that it is has allelopathic properties, prohibiting other vegetation in its proximity from colonizing and growing.

Chinaberry is typically found growing along roadsides and forest edges, colonizing areas where disturbance has taken place.

Genip is very widespread in the USVI as it produces a tasty fruit enjoyed by wildlife and humans alike. It tolerates a wide variety of conditions, making it a fierce competitor for ecological niches. Though it is naturalized, it is not native and it will out-compete native plants, leading to a homogenous forest composition. It will spread very quickly along road cuts as well.

Common Name: genip, kenep, Spanish lime
Scientific Name: *Meliococcus bijugatus*
Plant family: Sapindaceae
Form & Habit: Tree
Mature Size: Up to 65 feet (20 m) tall
Native Range: northern South America
Native Habitat: Both dry and moist forests
Notes/Comments: Genip is very naturalized throughout the USVI, likely owing to its introduction in pre-Columbian times by natives who valued it for its fruit. Because it can tolerate a wide variety of conditions (dry or moist soil, shade, sun, salt spray, etc.), it has spread widely throughout the island.

Genip will grow up to 65 feet tall in the right conditions and will shade out most competitors.

They spread primarily through the seeds in their fruit. Both wildlife and humans will spread genip seeds. Humans will often eat the fruit and throw the pit out the window of a car, leading to a profusion of genip along roadsides.

They can be removed mechanically and treated with concentrated herbicide, but seeds can remain viable for long periods of time and will require long-term follow-up.

Nevertheless, this tree has become a part of the local culture and the economy, whereby people enjoy its fruit for consumption and individuals, young and old, sell its fruit in the summer-autumn time of the year.

Though once valued as a resilient hedge planting, sweet lime now colonizes the banks of guts and out-competes native vegetation. It is very hard to eradicate and should not be planted for any reason.

Common Name: Sweet lime
Scientific Name: *Triphasia trifolia*
Plant family: Rutaceae
Form & Habit: Shrub
Mature Size: Up to 10 feet (3 m) tall
Native Range: Malaysia, Southeast Asia
Native Habitat: Moister forest areas, guts
Notes/Comments: Sweet lime was originally planted to form dense hedges. Unfortunately its seeds are very attractive to birds, which eat them and disperse them widely. Sweet lime prefers moister conditions, so it is most often seen near the banks of guts where it can form dense thickets in the understory and shades out all other vegetation. Sweet lime will also outcompete other plants for water via its extensive root system.

Eradicating sweet lime is difficult and is only possible through mechanical and herbicidal means. The wood is somewhat flexible, so even chopping it can be challenging. Shrubs should be chopped and then herbicide applied to the fresh cut. Larger areas of sweet lime can be removed using heavy machinery to uproot all existing plants, though it can still sprout from roots and stumps. Sites will usually have to be re-visited to ensure removal.

Although there are many non-native plants that are invasive, there are some that are not invasive. These are plants that are found growing in our local nurseries, and are widely cultivated in the Virgin Islands. Unlike the non-native invasive plants, these plants typically do not have the characteristics which would make them invasive. The plants that are selected here are good for erosion control and soil stabilization, and for the most part aesthetically pleasing. Once these plants are established, they will need little care, watering, or maintenance. So, for those residents and property owners who will have a hard time obtaining native specimens, these plants will be ideal for use in erosion control, soil stabilization, and overall cultivation.

Periwinkle is a pretty flowering plant from the island of Madagascar off the east coast of Africa. It is drought tolerant, easy to propagate, and grows fairly rapidly. It is popular around tropical areas of the world as a garden plant. With its low-growing spreading habit, it will make an excellent ground cover to hold soil in place even on steep slopes. This plant is also well known for its medicinal properties, including being used to treat cancer.

Common Name: Church flower, periwinkle
Scientific Name: *Catharanthus roseus*
Plant family: Apocynaceae (Dogbane family)
Form & Habit: Herb
Mature Size: Up to 20 inches (50 cm) tall
Native Range: Madagascar
Native Habitat: Woodlands, forests, grassland, and disturbed areas
Water requirements: Moderate; do not overwater
Light requirements: Full sun to partial shade
Soil requirements: Tolerates a variety of soils even poor soils; however, soils must be well-drained
Erosion control potential: Good; makes an excellent ground cover on sloped land
Drought tolerance: Excellent
Feral livestock/iguana resistance: Unknown
Propagation: By seeds or cuttings
Planting density/Recommended spacing: 6-9 inches (15-30 cm) apart
Potential purchase locations: Home Depot and probably other nurseries
Notes/Comments: This beautiful flowering plant is fairly popular as a garden plant. It comes in a variety of flowering colors and very easy to grow from seed or cuttings. It grows fairly rapidly and is considered invasive in some areas of the world, but not in the Virgin islands. Periwinkle makes an excellent ground cover that will hold soil in place, even on steep slopes. For these reasons, it is recommended for erosion control and soil stabilization.

Cuban oregano is an aromatic, thick-leaved herb that typically can be found growing on rocky slopes in the Virgin Islands. It is well-known for its use as a culinary herb as well as for medicinal purposes. It is even cultivated in some home gardens. It can reproduce by seed as well as by leaf and stem cuttings, thus making it very easy to grow. Since, it can reproduce fairly easily and grow quite rapidly into dense thickets, it has the tendency to become invasive.

Common Name: Cuban oregano, French thyme
Scientific Name: *Plecanthrus amboinicus*
Plant family: Lamiaceae (Mint Family)
Form & Habit: Succulent herb
Mature Size: 12-18 inches (30-45 com)
Native Range: Southern and eastern Africa
Native Habitat: Woodland, coastal bush, rocky slopes, sand flats
Water requirements: Low to moderate
Light requirements: Sun to partial shade
Soil requirements: mildly alkaline to mildly acidic; well-drained
Erosion control potential: Good; forms dense thickets which tend to hold soil in place
Drought tolerance: Excellent
Feral livestock/iguana resistance: Unknown
Propagation: leaf and stem cuttings
Planting density/Recommended spacing: 12-18 inches 30-45 cm) apart
Potential purchase locations: Unknown
Notes/Comments: This aromatic, succulent herb is more known for its culinary and medicinal use. However, because of its tendency to form dense thickets, it is recommended as a good soil stabilization and erosion control plant. It should be noted that this plant has the tendency to become invasive, so it may need to be cut back at times.

Non-native plants for erosion control and slope stabilization - herbs

Sedums are a large and wide-ranging family of plants, numbering over 600 members, ranging from cold tolerant to very warm tolerant species, from 2 inches to 2 feet in height, growing from the far reaches of northern Canada to the southern hemisphere in the country of Peru. These very drought tolerant plants are very easy to grow, and require little to no maintenance once established. They are becoming increasingly common along our exposed roadsides. Note: Some species can actually accelerate instead of mitigate soil erosion because their roots can tend to pull down soil.

Common Name: Stonecrops
Scientific Name: *Sedum spp.*
Plant family: Crassulaceae
Form & Habit: creeping herbs to shrubs
Mature Size: from 2 inches to 2 feet, depending on variety
Native Range: throughout the Northern hemisphere with a few in the southern hemisphere of Peru
Native Habitat: varies, depending on species
Water requirements: Low
Light requirements: full sun to light shade
Soil requirements: very well-drained
Erosion control potential: Good but some species actually accelerate soil erosion
Drought tolerance: Depending on variety, excellent to exceptional
Feral livestock/iguana resistance: It appears to not be eaten by livestock or iguanas

Propagation: By seed, by division, or cuttings
Planting density/Recommended spacing: 6 inches to 2 feet apart
Potential purchase locations: Coral Bay Garden Center; has started to grow along exposed roadsides in the VI
Notes/Comments: This large number of species is becoming increasingly popular in gardening for their hardiness and drought tolerance. They are also becoming increasingly common in the Virgin Islands, growing along our dirt sloped roadsides, particularly those that are very sun exposed. Although they make excellent candidates for rock gardens and soil erosion control, there are some species that have the tendency to pull soil downward due to their weight and growth pattern. Consult with plant experts to see which would be ideal for your erosion control situation.

This native of the Arabian peninsula and northeastern Africa is indeed aptly named, naturally surviving in those desert climate areas. It has a very sturdy root system, making it a prime candidate for erosion control and soil stabilization. Care must be taken not to overwater this plant, as too much water causes its roots to rot, thus killing it. Also, this would be a plant for generally long-term erosion control, as it grows very slowly.

Common Name: Desert Rose
Scientific Name: *Adenium spp.*
Plant family: Apocynaceae
Form & Habit: shrubs or small trees
Mature Size: variable, depending on variety. Some varieties can grow to 15 feet tall.
Native Range: Africa and the Arabian Peninsula
Native Habitat: dry climates
Water requirements: minimal once established
Light requirements: Full sun
Soil requirements: prefers lightweight, sandy and coarse soil; slightly acidic
Erosion control potential: Good; very study root system.
Drought tolerance: Exceptional
Feral livestock/iguana resistance: It is livestock resistant; iguana resistance is unknown
Propagation: Seed or cuttings
Planting density/Recommended spacing: 8-10 ft. apart
Potential purchase locations: Coral Bay Garden Center; may be available in other local nurseries
Notes/Comments: This drought tolerant succulent plant makes for a beautiful, low maintenance specimen in anyone's garden or property. Since it belongs to the Apocynaceae family, it will contains some toxins, thereby making it unpalatable to livestock. What should be noted about this plant are: (1) It does not require too much water. Overwatering will cause root rot which will cause the plant to die. (2) It is very slow growing, achieving a height of 6 feet in 15 or more years.

Bougainvillea is a locally popular ornamental plant with many endearing characteristics. This native of Brazil is either a shrub or vine. It has exceptional drought tolerance, blooming more the drier the conditions become. It is not known to be eaten by feral livestock, possibly due to its thorns. Bougainvillea has long been used for erosion control for banks and slopes. This plant makes for both a good landscape specimen and erosion control and soil stabilization plant. It would be ideal for mid to even long-term erosion control and soil stabilization plans.

Common Name: Bougainvillea
Scientific Name: *Bougainvillea glabra* or *Bougainvillea spectabilis*
Plant family: Nyctaginaceae
Form & Habit: Shrub or vine
Mature Size: up to 10 feet tall or 25 feet long, depending on variety
Native Range: Tropical South America
Native Habitat: coastal tropical forests of Brazil
Water requirements: Low once established
Light requirements: Full sun
Soil requirements: Very well-drained, acidic to alkaline, clay, loam, or sandy soil
Erosion control potential: Provides erosion control for banks and slopes
Drought tolerance: Exceptional
Feral livestock/iguana resistance: It is not known to be eaten by livestock; iguanas eat the leaves and flowers of certain varieties
Propagation: By semi-hard wood or hard-wood cuttings
Planting density/Recommended spacing: 3-9 ft. (1-3 m) apart
Potential purchase locations: Available at practically all local nurseries
Notes/Comments: This popular ornamental is ideal for the conditions in Coral Bay and the Virgin Islands overall. It actually blooms more when subjected to dry conditions, once established. In fact, bougainvillea does not do well when it is overwatered. It is not known to be eaten by livestock, but some varieties are eaten by iguanas. It provides good erosion control for banks and slopes.

Dwarf Natal Plum is a drought tolerant, generally ground hugging shrub will make a good erosion control and soil stabilization specimen. Its fruit is edible and used in a number of ways. It is reportedly resistant to be eaten by deer. Be careful of handling this plant because of its thorns and milky sap, which may irritate some individuals.

Common Name: Dwarf Natal plum
Scientific Name: *Carissa macrocarpa*
Plant family: Apocynaceae
Form & Habit: Shrub
Mature Size: up to 2 feet
Native Range: South Africa
Native Habitat: coastal areas in southern Africa
Water requirements: Low, once established
Light requirements: variable; preferably full sun but can tolerate light shade
Soil requirements: Clay, sandy, loam soils that are well-drained; soil pH ranges from acidic to alkaline
Erosion control potential: Makes for an excellent ground cover and foundation plant because of its ground hugging nature
Drought tolerance: Excellent
Feral livestock/iguana resistance: It is reported that this plant is deer-resistant; iguana resistance is unknown
Propagation: Preferably vegetatively; can also be done by seed (germinates in about a month's time)
Planting density/Recommended spacing: 36-60 inches apart
Potential purchase locations: Coral Bay Garden Center; may be found in other nurseries
Notes/Comments: Dwarf Natal Plum is a native of South Africa. It is generally a ground hugging shrub, making it an excellent ground cover. It can tolerate a wide variety of soils, though they must be well-drained. It is very drought tolerant, and reportedly deer resistant. The fruit is edible and has been known to be used for jellies and preserves. Persons must be careful in handling this plant because of its thorns and its milky sap.

This large variety of plants are an attractive addition to any garden or property. They are fairly drought tolerant, easy to grow, and easy to maintain.

Common Name: Dracaena
Scientific Name: *Dracaena spp.*
Plant family: Asparagaceae
Form & Habit: Shrub or tree
Mature Size: variable depending on the species
Native Range: Africa, southern Asia, and Central America
Native Habitat: variable, depending on species. Treelike species grow in desert and semi-arid areas. Shrubby species grow in the understory of rainforests.
Water requirements: Low to moderate, depending on the variety
Light requirements: prefers full sun but can tolerate light shade
Soil requirements: Basically any well-drained soil
Erosion control potential: Good
Drought tolerance: Generally Excellent; some varieties are more drought tolerant than others
Feral livestock/iguana resistance: Livestock and iguanas do not eat
Propagation: Generally by cuttings, can also be done by seed
Planting density/Recommended spacing: Variable, depending on the variety
Potential purchase locations: At Coral Bay Garden Center; can also be found in other local nurseries
Notes/Comments: These plants are generally easy to grow, easy to maintain, drought tolerant species. There are a large variety of these plants, so consult with a plant expert about what variety you would like to have on your property.

Bermuda grass needs to be specially mentioned for various reasons. It is a nonnative invasive species, known to be invasive worldwide. Yet it is not considered invasive here in the Virgin Islands. It is utilized worldwide in various applications such as for animal fodder, for turf, for lawns, and for erosion control. It is for this last application that it is included here. Bermuda grass is used to prevent soil erosion, to stabilize ditch banks, and roadsides. It grows and spreads fairly quickly, and can cover a large area in a relatively short time. Therefore, Bermuda grass can be used for short-term, mid-term, and long term erosion control and soil stabilization plan. It can be grown on practically any soil, and has excellent drought tolerance. However, it is highly palatable to livestock, especially cattle, who trim it and spread the seeds. Despite this, Bermuda grass is highly recommended for erosion control and soil stabilization.

Common Name: Bermuda grass
Scientific Name: *Cynodon dactylon*
Plant family: Poaceae
Form & Habit: Grass
Mature Size: up to 1.3 feet
Native Range: Africa and the Middle East
Native Habitat: Savannas (rolling grasslands)
Water requirements: grows in areas that receives 16 inches of rainfall or greater.
Light requirements: Full sun
Soil requirements: adaptable to most soil types; grows best on fertile, sandy to silty soils or alluvium
Erosion control potential: Excellent; has been widely used for initial erosion control
Drought tolerance: Excellent; may become brown or dried in severe droughts
Feral livestock/iguana resistance: It is highly palatable to livestock. It is highly preferred by cattle, and acceptable to sheep. It is also eaten by iguanas.
Propagation: By seeds, sprigs, or plugs
Planting density/recommended spacing: Varies depending on use. For pasture or hay, 3 lbs. of seed per acre at 0.5 inch depth or less. For turf (or lawn), 10 lbs. of seed per acre
Potential purchase locations: Home Depot and other hardware stores sells the seeds; may be available from other local nurseries
Notes/Comments: This native of the grasslands of Africa and the Middle East is a worldwide invasive but also a very useful plant. It is easy to grow and maintain. It has excellent drought tolerance and grows on a wide variety of soils. It grows and spreads via stolons and rhizomes, and thus roots fairly deeply. For this reason, it is highly recommended for erosion control and soil stabilization.

Glossary

Adventitious – Appearing in an abnormal or unusual position or place, as a root.

Annual – living only one growing season, as beans or corn

Bank – The rising ground bordering the sea

Biennial – completing its normal term of life in two years, flowering and fruiting the second year

Bulbs – (a) usually subterranean and often globular bud having fleshy leaves emergent at the top and a stem reduced to a flat disk, rooting from the underside, as in the onion and lily. (b) a plant growing from such a bud

Bioengineering – In soil applications, refers to the use of live plants and plant parts to reinforce soil, serve as water drains, act as erosion prevention barriers, and promote dewatering of water laden soils.

Biotechnical – In slope stability engineering, refers to the use of both live plant material and inert structures to stabilize and reinforce slopes.

Caudex – (1) the main stem of a tree, especially a palm or tree fern. (2) the woody or thickened persistent base of an herbaceous perennial.

Contour – (1) the outline of a figure or body; the edge or line that defines or bounds a shape or object. (2) to build (a road,) in conformity with the contour of the land.

Corm – enlarged, fleshy, bulblike base of a stem.

Deciduous – Losing leaves during the dry season

Endemic – belonging exclusively or confined to a particular place.

Erosion – The wearing away of rock or soil and the movement of the resulting particles by wind, water, or gravity, but usually excluding landslides or mudslides.

Face of slope – The sloping portion of a slope

Feral – existing in a natural state, as animals or plants; not domesticated or cultivated; wild

Fibrous – containing, consisting of, or resembling fibers.

Graminoid – a herbaceous plant with a grass-like morphology (i.e. structure).

Herbaceous - (1) of , relating to, or characteristic of an herb; herblike. (2) a. not woody. b. having the texture, color, etc., of an ordinary leaf.

Igneous – produced under conditions involving intense heat, as rocks of volcanic origin or rocks crystallized from molten magma.

Invasive Species – A species that is non-native (or alien) to the ecosystem under consideration and (2) whose introduction causes or is likely to cause economic or environmental harm or harm to human health.

Leguminous – Of, or belonging to the Fabaceae (formerly Leguminosae), family of flowering plants having pods (or legumes) as fruits and root nodules enabling storage of nitrogen-rich material: including peas, beans, clover, gorse, acacia, and carob

Livestock – Horses, cattle, sheep, goats, and other animals typically raised on a farm or ranch.

Monocotyledon(-ous) – commonly referred to as monocots, are flowering plants (angiosperms) whose seeds typically contain only one embryonic leaf, or cotyledon.

Glossary – continued:

Morphology – (a) a branch of biology that deals with the form and structure of animals and plants. (b) the form and structure of an organism or any of its parts.

Native – an organism indigenous to a particular region.

Niche – the position or function of an organism in a community of plants and animals.

Organic – (1) characteristic of, pertaining to, or derived from living organisms. (2) a substance, as a fertilizer or pesticide, of animal or vegetable origin.

Perennial – (of plants) having a life cycle lasting more than two years.

Relief – The differences in elevation and slope between the higher and lower parts of the land surface of a given area.

Rhizomatous – A type of plant that has a rootlike underground stem, commonly horizontal in position, that usually produces roots below and sends up shoots progressively from the upper surface.

Scour – (1) To clear or dig out (a channel, drain, etc.) as by the force of water, by removing debris, etc. (2) the erosive force of moving water, as in a river or sea.

Sedimentary – (1) of, relating to, or of the nature of sediment. (2) *Geology*. Formed by the deposition of sediment, as certain rocks.

Sedimentation – The natural process whereby eroded soil particles suspended in stormwater runoff are deposited onto flood plains, roadways or downhill properties, or into ghuts, ponds, and coastal waters.

Slope – The rise or fall of the land surface.

Soil – The unconsolidated mineral or organic material on the immediate surface of the Earth that serves as a natural medium for the growth of land plants. (ii) The unconsolidated mineral or organic matter on the surface of the Earth that has been subjected to and shows effects of genetic and environmental factors of: climate (including water and temperature effects), and macro- and microorganisms, conditioned by relief, acting on parent material over a period of time.

Stolon – A horizontal stem, at or just below the surface of the ground, that produces new plants from buds at its tips or nodes.

Toe of slope - The lowest part or base of a slope

Top of slope – The highest or top portion of a slope

Tuber – A fleshy, usually oblong or rounded thickening or outgrowth, as the potato, of an underground stem or shoot, bearing minute scalelike leaves with buds or eyes in their axils from which new plants may arise.

Ubiquitous - Existing or being everywhere, especially at the same time; omnipresent.

Vegetative - (1) Of, relating to, or denoting the nonreproductive parts of a plant, i.e. the stems, leaves, and roots, or growth that does not involve the reproductive parts. (2) (of reproduction) characterized by asexual processes.

Watershed - an area of land that drains all the water courses and rainfall to a common outlet such a bay. The word watershed is sometimes used interchangeably with drainage basin or catchment.

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