

## 4.1-g FILTER STRIP

Alternative Names: Filter Strip, Vegetated Buffer, Flow Spreading

### DESCRIPTION

Vegetated filter strips are methods for uniformly distributing stormwater runoff over vegetated pervious areas as sheet flow. The practice is intended to trap and filter sediments, nutrients, and other pollutants by maximizing stormwater runoff contact with vegetation and soil. A reduction in the quantity of surface water runoff is achieved through surface infiltration.

### APPLICABILITY

- Limited to gently sloping areas where the vegetative cover is well-established and channelized flow will not develop. Avoid siting on slopes greater than 5 percent to avoid the formation of rills and gullies that disrupt sheet flow and concentrate runoff.
- Well suited for treating runoff that sheet flows from roofs, driveways, small amount of tributary roadway, parking lots, and other impervious surfaces.
- Not appropriate for soils with Ksat rates less than 2"/hr, soils with high erosion potential, and for addressing runoff from large tributary impervious areas.
- Vegetated filter strips may also be used as buffer zones between landscape areas that require fertilization (e.g., turf grass) and sensitive receiving waters to reduce the potential for nutrient transport. In this application, soils with Ksat rates lower than 2"/hr are also applicable.

### Advantages

- Can be incorporated into a number of different landscape settings as topography allows, such as front and back yards of residential areas and road shoulder rights-of-way.
- Can help alleviate downstream flooding and other drainage problems.
- When properly designed and maintained, integrates into home and neighborhood landscapes and enhances aesthetic value.
- Can provide benefits besides water quality, such as wildlife habitat and open space.

### Disadvantages

- May require irrigation to maintain vegetation.
- May not retain (or may be difficult to demonstrate to project reviewers that the design retains) the 20-yr/1-hr storm volume generated from the tributary impervious area.

### DESIGN CONSIDERATIONS

- When using a water spreading system to uniformly distribute concentrated runoff, stabilize the outlet of the spreading area using appropriate vegetation or rock.
- Size vegetative filter strips to convey and treat the design flow. Increase the flow path length across the filter strip as much as possible to maximize filtration of

#### BMP DESIGN APPROACH

Pollutant Source Control

Hydrologic Source Control

Stormwater Treatment

#### SCALE OF APPLICATION

All SFR and MFR < 1 acre

MFR 1-5 Acre and CICU < 5 acres

MFR and CICU > 5 acres and all WQIPs

#### TYPE OF APPLICATION

Temporary

Permanent

pollutants and infiltration of runoff through increased contact with soil and vegetation.

- For concentrated stormwater runoff with high pollutant loads, use a sediment trap or an equivalent pretreatment device at the inlet of the flow spreading device to remove coarse sediment and debris.
- For concentrated stormwater runoff, design a flow spreading device to evenly distribute flows along the design length of the vegetative filter strip. Use slotted curbing, modular block porous pavement, a concrete weir, or other flow spreading techniques.
- The length of flow through a well vegetated filter strip should equal the width of the tributary area for the recommended slope (less than 5 percent).
- Preferably, place vegetated filter strips outside of snow storage areas.
- Select native vegetation and provide a dense and diverse selection of low-growing plants. For areas that will not be irrigated or sited within naturally wet areas, selected drought tolerant vegetation. If permanent irrigation will be used, a wider selection of vegetation may be selected.
- Protect vegetated filter strips and water spreading areas from pedestrian and vehicular traffic, which can damage the vegetative cover, compact soils, and impact the even distribution of runoff as sheet flow.
- Consider providing a means for runoff collection at the outlet of the system as site conditions dictate. Consider the use of a bioswale for this purpose or other BMPs in this Handbook.
- Use organic amendments to prepare soil and maintain a dense cover of vegetation. Avoid chemical fertilizers.

## INSTALLATION CONSIDERATIONS

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- A flow spreading device must be installed level to uniformly spread stormwater runoff.
- Grade water spreading area to be a uniform surface that promotes sheet flow.
- After completing grading activities, till back in topsoil or other soil amendments to improve infiltration capacity, which may have been diminished by compaction from heavy equipment during grading. Tilling activities are typically at least 12 inches deep.
- The top of the vegetated filter strip shall be a few inches below the tributary impervious area or water spreading device to ensure runoff enters the water spreading area.
- Establish vegetation as soon as possible to prevent erosion and scour. Consider a construction schedule that allows for planting early in the growing season or in late fall when successful vegetation establishment is most likely.

## INSPECTION AND MAINTENANCE

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The primary maintenance tasks associated with vegetated filter strips and water spreading areas are: maintaining dense vegetation; removing accumulated sediment and debris; and maintaining infiltration capability.

## EFFECTIVENESS CONSIDERATIONS

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Adequately sized vegetated filter strips and water spreading areas are highly effective BMPs for runoff reduction from development and for pollutant source control. Overall effectiveness will depend on factors such as soil permeability, slope, flow path length, density of vegetation, and the size of the water spreading area relative to the tributary impervious area. When properly designed and installed, water spreading areas can be effective for long periods of time while requiring minimal maintenance or relatively simple maintenance (e.g., tilling soils and vegetation maintenance).

***Vegetated Filter Strip Inspection and Maintenance Table***

INSPECTION AND MAINTENANCE ACTIVITIES	SUGGESTED FREQUENCY	INSPECTION EQUIPMENT	MAINTENANCE EQUIPMENT
Inspect for trash and debris. <ul style="list-style-type: none"> <li>▪ Remove trash and debris.</li> </ul>	Annually and after major storms		Trash bag
Inspect for signs of concentrated flow and erosion, especially if a level spreader is used. Ensure that runoff is distributing over the spreading area as sheet flow. <ul style="list-style-type: none"> <li>▪ Stabilize and revegetate eroded areas.</li> <li>▪ If concentrated flow is an issue in a spreading area, repair or redesign the spreader to ensure sheet flow and proper function.</li> </ul>	During major storms		Soil Amendment, Seeds/Plants, Mulch, Erosion Control Blanket, Coir Logs, Irrigation
Inspect for successful vegetation establishment and initial die off to determine if any remedial actions are needed, such as reseeding and irrigation. <ul style="list-style-type: none"> <li>▪ Amend soils, re-grade, reseed/replant, mulch, and irrigate as necessary to achieve desired vegetation establishment.</li> </ul>	Monthly during first growing season and annually thereafter	Vegetation Inspector	Soil Amendment, Seeds/Plants, Mulch, Irrigation, Temporary BMPs
Inspect for invasive weeds <sup>10</sup> . <ul style="list-style-type: none"> <li>▪ Remove invasive weeds monthly during the first two growing seasons. Thereafter, weed annually, or as needed.</li> </ul>	Monthly during first growing season and annually thereafter	Invasive Weeds Inspector	Tools as needed to control infestation
Measure depth of sediment to determine accumulated depth in the level spreader and spreading areas. <ul style="list-style-type: none"> <li>▪ If accumulated material is greater than 2 inches deep remove accumulated material. Routine removal of accumulated sediment in spreading areas will ensure proper function.</li> <li>▪ Use a leaf rake to remove sediment from spreading areas. Dispose of sediment at a stable on-site location or outside of the Lake Tahoe Region.</li> </ul>	Semi-annually (spring and fall) and after major storms	Ruler	Shovel Leaf rake Trash bag
Inspect vegetation and measure vegetation percent cover following BMP RAM protocols. <sup>11</sup> <ul style="list-style-type: none"> <li>▪ If percent cover of plant species is not at least 80%, additional vegetation is needed.</li> <li>▪ Reseed and patch thin or bare areas as needed. Replace vegetation as needed.</li> <li>▪ If vegetation exceeds 12", mow to 6" height. Use care (such as not mowing while ground is moist) to avoid excess compaction.</li> <li>▪ For lawns, fertilize in the spring and late summer with a biodegradable, nontoxic, slow-release fertilizer (with zero or low phosphorus or based on soil testing) to maintain vegetative health if needed.</li> <li>▪ Water according to plant species needs. Do not overwater. Water vegetation to maintain minimum soil moisture for dense growth.</li> </ul>	Semi-annually (spring and fall)	Vegetation Inspector	Clippers, Loppers Trash bag, Mower, Soil Amendment, Fertilizer, Seed/Sod, Mulch, Irrigation

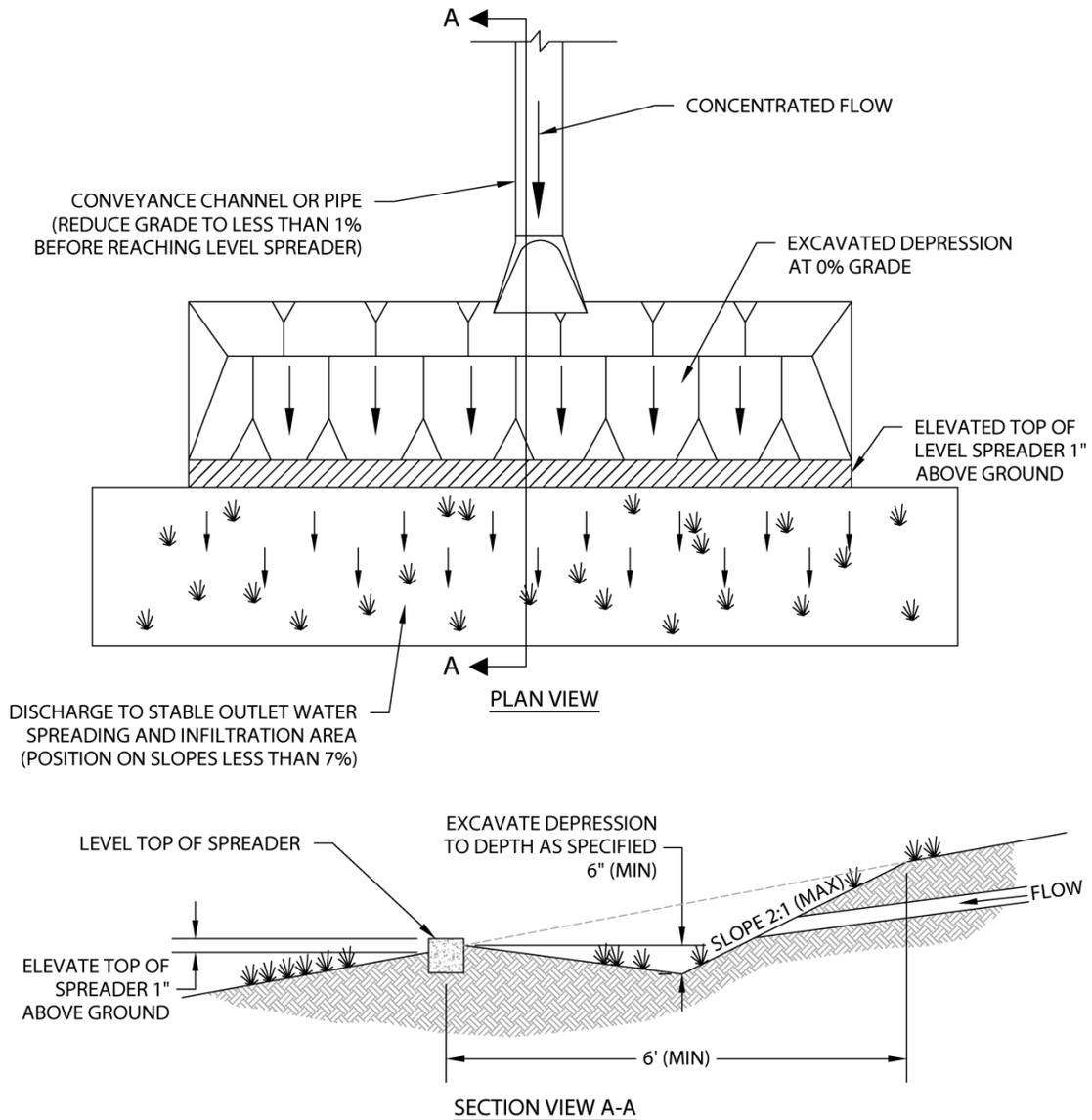
<sup>10</sup> Lake Tahoe Basin Weed Coordinating Group. <http://www.tahoeinvasiveweeds.org/>.

<sup>11</sup> The Lake Tahoe Stormwater Community and Environmental Improvement Program, September 2009, *BMP RAM Users Manual V.1.Vegetation Cover*. pg 63-64

INSPECTION AND MAINTENANCE ACTIVITIES	SUGGESTED FREQUENCY	INSPECTION EQUIPMENT	MAINTENANCE EQUIPMENT
<p>Perform Constant Head Permeameter (CHP) infiltration tests according to BMP RAM protocols to determine current infiltration rates<sup>12</sup>. Only perform when spreading area is dry.</p> <ul style="list-style-type: none"> <li>▪ Compare Ksat test results to initial Ksat rates of the spreading area. If the rate has decreased by 20%, rehabilitation of the spreading area is needed.</li> <li>▪ Rehabilitate spreading area to restore infiltration capability and establish healthy vegetation. To prevent compaction, perform only when area is dry. Rehab options include: <ul style="list-style-type: none"> <li>○ Remove vegetation and top few inches of soil with a sod cutter or equivalent.</li> <li>○ Dispose of sediment in a stable on-site location or out of the Lake Tahoe Region.</li> <li>○ Spread amendment, compost, or topsoil and re-grade as necessary to ensure even sheet flow over entire spreading area.</li> <li>○ Reseed/replant spreading area.</li> <li>○ Mulch (if needed) and irrigate to establish healthy vegetation.</li> <li>○ Once vegetation is established perform CHP tests to determine baseline infiltration rates.</li> </ul> </li> <li>▪ Aerate the spreading area in spring when the soil is dry to restore infiltration rate and promote healthy vegetation.</li> </ul>	Annually in summer	CHP kit and instructions	Sod cutter or equivalent Pickup or Dump Truck Amended Topsoil Landscape Rake Seed/Sod Mulch Irrigation Aerator
<p>Inspect for animal burrows, holes, and mounds.</p> <ul style="list-style-type: none"> <li>▪ If burrows are causing erosion or compromising function, backfill firmly.</li> </ul>	Annually in fall		Tools as needed to repair

<sup>12</sup> The Lake Tahoe Stormwater Community and Environmental Improvement Program, Final – September 2009, *BMP RAM Users Manual V.1. Step 4. Field Observation Protocol Constant Head Permeameter (CHP). pg 49-52*

**Level Spreader Figure**

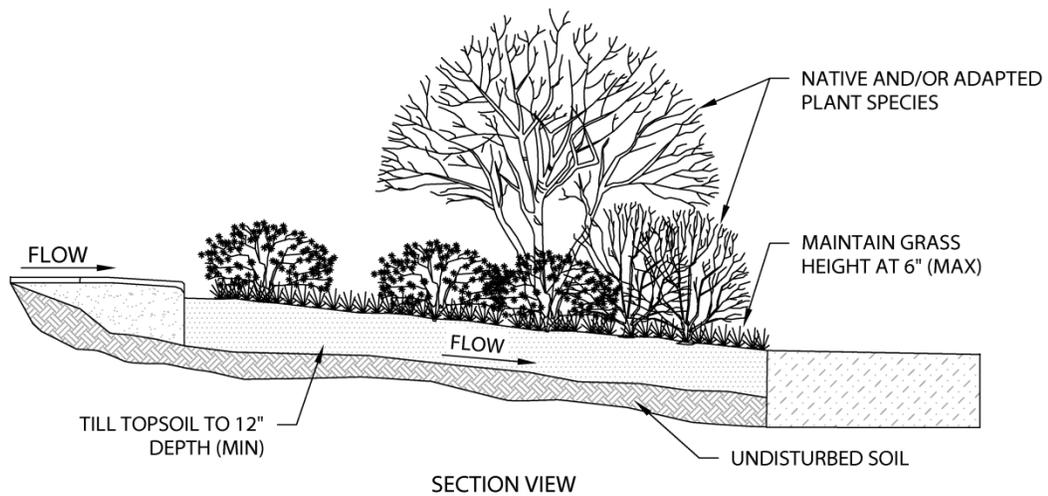
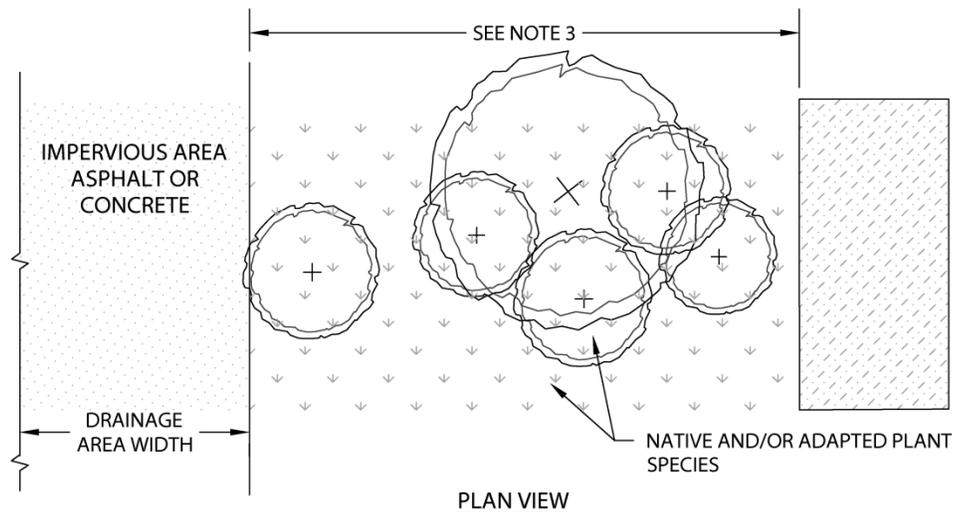


**NOTES:**

1. VEGETATION SHALL BE ESTABLISHED AND THE SITE SHOULD BE VOID OF BARE SOIL.
2. WATER SPREADING AREA SHALL BE LEVEL WITH SLOPE NO GREATER THAN 7% FROM EXCAVATED DEPRESSION.
3. LEVEL SPREADER SHALL BE 4"X4" CONCRETE CURB OR EQUIVALENT STABLE MATERIAL.
4. CONVEYANCE CHANNEL SHALL REDUCE GRADE TO LESS THAN 1% BEFORE DISCHARGING LEVEL SPREADER.

THE TAHOE REGIONAL PLANNING AGENCY (TRPA) SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF ELECTRONIC COPIES OF THIS DETAIL.

## Vegetated Filter Strip Figure



### NOTES:

1. THIS DETAIL DISPLAYS KEY CONCEPTS FOR A VEGETATED FILTER STRIP AND MAY NOT PROVIDE ALL NECESSARY DESIGN INFORMATION FOR INDIVIDUAL SITES.
2. AVOID SITING FILTER STRIPS ON SLOPES GREATER THAN 5%.
3. WIDTH OF FILTER STRIPS SHALL EQUAL WIDTH OF IMPERVIOUS AREA (MINIMUM).
4. FOR NON-PERMITTED PROJECTS, MULCH AND REVEGETATE FILTER STRIP IN ACCORDANCE WITH THE TRPA BMP HANDBOOK. FOR PERMITTED PROJECTS, MULCH AND REVEGETATE FILTER STRIP TO SPECIFICATIONS OF REVEGETATION PLAN.

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