# GREEN INFRASTRUCTURE: VEGETATED SWALES

Vegetated Swales are broad, shallow, trapezoidal or parabolic channels, densely planted with a variety of trees, shrubs, and/or grasses. They are designed to capture and infiltrate stormwater runoff from adjacent impervious surfaces, allowing some pollutants to settle out in the process. Check dams may be used to improve filtration and infiltration opportunities.

## DESIGN PARAMETERS*

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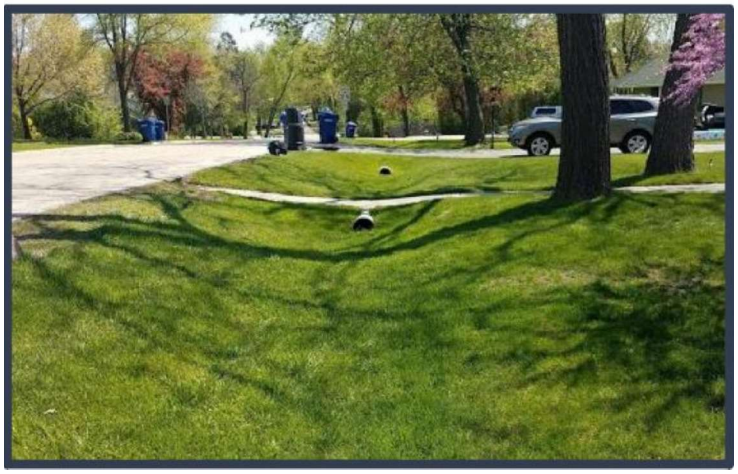
|---|---|
| **Design Storm** | Infiltrate the 1-inch storm, convey the 10-year storm |
| **Drainage Area** | 5 acres (max.) 1- to 2-acres (preferred) |
| **Site Slopes** | 6% (max.) |
| **Sizing** | 10-20% of tributary area |
| **Dimensions** | 2- to 8-feet bottom width<br>3:1 maximum side slopes<br>1% to 3% longitudinal slopes |
| **Ponding Depth** | 18 inch (max.) |
| **Drawdown Time** | 24 hour (max.) |
| **Underlying Soils** | 0.5 inch/hour infiltration rate (min.) |
| **Water Table Depth** | 2 feet below the bottom layer (min.) |
| **Pretreatment** | Forbay or level spreader |
| **Observation Wells** | N/A |
| **Additional Parameters** | Check dams should be used if slope exceeds 3% |

** Industry standards; permitting through the Village to ensure compliance with local and county requirements.*



The effectiveness of a vegetated swale is impacted by the design of the swale. A major concern when designing vegetated swales is to make certain that the velocities in the swale do not cause erosion; therefore, site specific calculations should be performed. In addition to filtration, the planting soil bed provides rooting for the vegetation in the swale. The swale should be vegetated with the proper grass species based on specific site, soils and hydric conditions present along the channel. This vegetation intercepts rainfall and slows direct runoff from sloped roofs. The type of vegetation depends on the depth of the growing media and local climate.

## CONSTRUCTION AND COSTS

The construction of vegetated swales is critical to the success of the BMP. The key construction elements are to begin vegetated swale construction only after the erosion and sediment control measures are in place, excavating equipment should operate from the side of the swale to reduce soil compaction, vegetation should be established as soon as possible to prevent erosion and scour and ensure the swale is stabilized before receiving upland stormwater flow. Vegetated swales are considered relatively low-cost control measures that provide a cost-effective alternative to traditional infrastructures with curb, gutter, and underground storm sewers.

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| ADVANTAGES | DISADVANTAGES |
|---|---|
| • Relatively low maintenance requirements,<br>• Increases groundwater recharge,<br>• Easily integrated into the site landscaping,<br>• Improves water quality,<br>• Less expensive than traditional storm sewer systems,<br>• Reduces runoff velocity, and<br>• Effective in removal of Total Suspended Solids (TSS), with removal rates of 80 percent,<br>• Generally more storage than pipes. | • Large land requirement,<br>• Higher maintenance than traditional storm sewer systems,<br>• Cannot be used in areas with steep slopes,<br>• Possible re-suspension of sediment, and<br>• Potential for stagnant water that may create nuisance odor / mosquito problems,<br>• Not feasible with small Row ditch |

## MAINTENANCE

Compared to other stormwater management measures, the required maintenance of vegetated swales is relatively low. The most common reason vegetated swales fail is due to sedimentation and clogging of the pore spaces within the underground storage media. Proper maintenance activities ensure the functionality of vegetated swales for many years.

| Maintenance Activity | Frequency |
|---|---|
| • Mow grass to maintain a height of 4 to 6 inches; remove grass clippings.<br>• Mow only when swale is dry to avoid rutting.<br>• Remove sediment from the pretreatment device, channel, and upstream of any check dams. | As needed (frequent/ seasonal) |
| • Inspect grass side slopes for erosion and formation of rills or gullies, and correct.<br>• Inspect inlet and outlet. Remove trash/debris and correct erosion.<br>• Inspect and correct erosion problems in the soil bed of dry swales.<br>• Based on inspection, plant an alternative grass species if grass cover is not successfully established.<br>• Inspect pea gravel for clogging, and correct.<br>• Inspect swale immediately after the spring melt, remove residuals and replace damaged vegetation without disturbing remaining vegetation.<br>• If roadside or parking lot runoff is directed to the swale, mulching and/or soil aeration/manipulation may be required in the spring to restore soil structure and moisture capacity and to reduce the impacts of deicing agents. | Annually (Semi-annually, year 1) |
| • Till or cultivate the surface of the soil bed if drawdown time exceeds 48 hours<br>• Remove sediment buildup within the bottom of the swale once it has accumulated to 25 percent of the original design volume.<br>• Plant alternative grass species in the event of unsuccessful establishment.<br>• Reseed bare areas; install appropriate erosion control measures when native soil is exposed or erosion channels are forming.<br>• Inspect and correct check dams when channelization, obstructions, erosion, etc. are identified.<br>• Water during dry periods, fertilize and apply pesticide only when absolutely necessary. | As needed |

## FLOOD REDUCTION

The performance of vegetated swales is determined by the timing and magnitude of inflows, available storage volume, and channel length. Considering the limited detention volume provided by vegetated swales, the peak flow and volume reduction associated with this type of green infrastructure is limited.