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Stormwater Management for Homeowners Fact Sheet 4:

Grass Swales

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This fact sheet is part of a series. Please refer to definitions in the glossary at the end of this fact sheet. Glossary terms are italicized on first mention in the text.

Introduction

When rain falls on *pervious surfaces*, like soil, mulch, and vegetative groundcovers, it soaks in through a process called *infiltration*. The water can be used by plants or it can recharge underground water storage areas called *aquifers*.

When rain falls on *impervious surfaces*, like roads, driveways, and rooftops, it does not infiltrate. Instead, water quickly collects and flows off these surfaces to the nearest stream, river, pond, lake, reservoir, bay, sound, or ocean. Water that moves in this way is called *runoff* or *stormwater*. It carries *pollutants* with it, including fertilizer, pesticides, fluids from cars, *sediment* from bare soil areas, bacteria from animal waste, plant debris like leaves and grass clippings, and trash like plastic bottles and cigarette butts. The more area covered in impervious surfaces, the greater the amount of pollution and volume of runoff, which increases the likelihood of flooding, stream *erosion*, harm to wildlife and the environment, and degradation of water quality.

Stormwater best management practices, or *BMPs* for short, are tools for managing runoff. They reduce the speed and volume of runoff and clean up the pollutants in it. Homeowners can use different practices, like *rooftop redirection, rain barrels, permeable pavement, grass swales, rain gardens*, and *buffers*, in their landscapes to manage runoff at the source. This prevents large volumes of polluted runoff from going into storm drains which flow directly into nearby water bodies. Some additional benefits of BMPs include improved drainage; a healthier and more attractive landscape; increased property value; wildlife food and habitat; improved water quality; and a cleaner environment.

What Is a grass swale?

A grass swale is a shallow, wide, gently sloping, open channel with grass sides that is used to slow down, spread out, and filter stormwater that runs off of roads, driveways, roofs, and sometimes lawns (see figure 1). Grass swales are similar to ditches in that they move runoff from one point to another, but the water moves in a much slower and wider path. Swales in the landscape can also be planted with perennials, shrubs, and trees, but grass is the most commonly used plant.

Figure 1. Examples of grass swales. Photos by L. Fox.

Where Can Grass Swales Be Used?

Grass swales can be installed in landscape beds and turf areas, and they are often used to direct runoff around and away from building foundations. They are also frequently used to manage runoff along property lines and adjacent to roads. In some developments, swales are used instead of curbs and gutters. Because swales move runoff from one point to another, they are connectors in addition to being management practices. Swales can direct runoff into a storm drain or into another BMP like a rain garden, a buffer, or a *stormwater pond* for further treatment.

The property layout and land features will determine how the swale is designed. The starting point for the swale is where stormwater is running off impervious surfaces. Location considerations include:

- If the proposed location is along a road or property line, local ordinances should be checked to make sure there are no setback, right of way, or easement restrictions or utilities located in the area. Go to www.va811.com (also known as Virginia Utility Protection Service (VUPS) or Miss Utility of Virginia) to request that all utilities be marked before any digging occurs. Swales can sometimes be installed over top of utilities if the utilities are protected and deep enough. Check first to avoid costly mistakes.
- General recommendations are to locate a swale at least 10 feet from building foundations, 50 feet from septic system fields, and 100 feet from wells.
- Swales are not recommended for areas with steep slopes (greater than 4 percent) because the water moves too fast and causes erosion.
- The bottom of the swale should be at least 2 feet above the seasonal high *water table* level to promote infiltration and prevent groundwater contamination.
- Avoid using swales in areas with compacted soils or soils that have a high clay content. The runoff will not infiltrate quickly and could lead to problems with mosquitos if water stands longer than seven days. A *perc test* (short for percolation) may be needed to determine if the infiltration rate is acceptable.

How Do They Work?

Grass swales are designed to move runoff from one point to another. Because swales slow the runoff and spread it out, the water can be used by the grass, infiltrate into the soil, and evaporate into the air as it moves slowly along the swale. This means that less runoff reaches the endpoint (a body of water or another BMP). When runoff volume and speed are reduced, erosion and flooding are also reduced.

The most effective swales have a healthy, solid cover of grass and underlying soils that allow water to infiltrate quickly. If a perc test shows an acceptable infiltration rate, the swale path can be marked, graded, and planted. Stormwater should flow along the swale slowly and steadily, which usually requires a 1 percent minimum slope. Smaller swales can be hand dug and graded. An engineer or grading contractor might need to be consulted on larger, wider, and longer swales or on swales in property right of ways or easements.

Selection of grass type depends on local climate and what may already be in the landscape. Both warm- and cool-season grasses grow in Virginia, and a perennial type of grass should be used. Refer to the Virginia Tech turfgrass variety recommendations (see Resources) for which grasses will grow best and how to establish them in your area. The goal is to establish the solid cover of grass as quickly as possible to stabilize the swale, prevent erosion, and filter the runoff. Regular inspection and maintenance will keep the swale functioning properly.

Cost

Grass channels are a relatively inexpensive stormwater management practice compared to other BMPs. While there may be a cost for designing the swale, the biggest costs are for the equipment and labor to grade the swale so it flows properly. Another cost is establishing and maintaining a thick, healthy stand of grass.

Swales are an investment for homeowners just like any other part of the landscape. The returns include stormwater management, which reduces flooding and improves water quality, and an attractive landscape that increases property value. Some cities and counties offer incentive programs that encourage residential stormwater management practices. The incentives could include rebates, utility bill credits, or cost sharing for installation. Homeowners should contact their local stormwater, public works, or soil and water conservation office to find out about these programs.

Maintenance

Maintenance for grass swales is low and on an as-needed basis.

- Mow the swale at the maximum height for the type of grass growing in it. Usually the swale is an extension of or adjacent to the home lawn. The areas would be fertilized and mowed with the same frequency and at the same height so they blend together.
- Apply fertilizer based on a soil test report in the correct amount and at the correct time for the type of grass to maintain a dense healthy stand and excess amounts do not become pollutants.
- Remove any trash, debris, or accumulated leaves that could clog the swale.
- Monitor the bottom of the swale and the side slopes for erosion and bare areas. Also look for bare soil areas or erosion in the parts of the landscape draining into the swale. Replant or reseed those areas to maintain a thick, 100 percent grass cover so sediment does not become a pollutant.
- Periodically check during and after rain events to make sure water is flowing and isn't standing in the swale. Ideally water should infiltrate or flow through the swale within four days after rainfall because mosquitos breed in seven days. If this is not the case, *aeration* may be necessary to improve infiltration.

More information on turfgrass types and maintenance schedules can be found at www.ext.vt.edu under the Publications and Resources tab.

Resources

Chesapeake Bay Program, "How-To's and Tips" – www.chesapeakebay.net/action/howtotips

Chesapeake Conservation Landscaping Council, "The Eight Essential Elements of Conservation Landscaping" – www.ChesapeakeLandscape.org

Chesapeake Stormwater Network, "Homeowner BMP Guide" – https://chesapeakestormwater.net/homeowner-bmp-guide/

Virginia Cooperative Extension, "Best Management Practice" fact sheet series on urban stormwater management practices, 426-119 – 426-134, by D. Sample – http://pubs.ext.vt.edu/

Virginia Cooperative Extension, "Stormwater Management for Homeowners" fact sheet series, HORT-293P–HORT-298P, by L. Fox – http://pubs.ext.vt.edu/

Virginia Cooperative Extension, turfgrass variety recommendations and maintenance calendars – http://pubs.ext.vt.edu/

Virginia Department of Forestry, "Rain Garden Technical Guide" – https://dof.virginia.gov/wp-content/uploads/Rain-Gardens-Technical-Guide_pub.pdf

Glossary

Aeration – The act of manually or mechanically poking holes into the ground; reduces soil compaction, creating channels through which oxygen, water, and nutrients can penetrate into the soil.

Aquifer – A natural underground storage area for water.

BMP (best management practice) – An action or device meant to manage runoff.

Buffer – An area of vegetation next to the water's edge that protects water quality by slowing runoff, filtering pollutants and sediment, providing infiltration, and stabilizing shorelines. Buffers also add plant diversity to the landscape and provide wildlife with food, habitat, and movement corridors.

Erosion – The loss of soil on property, often due to water flow.

Grass swale – A graded, linear, shallow, open channel covered with plants, usually grass; used to slow down, spread out, and filter stormwater.

Impervious surface – A surface that does not allow water to flow through it.

Infiltration – The process by which water enters the soil or other materials.

Perc, perk, or percolation test – A test to measure the speed at which water infiltrates unsaturated soils.

Permeable pavement – Pavement with a top layer that allows water to infiltrate due to spaces in the paving material or spaces between the pavers.

Pervious surface – A surface that allows water to flow through it.

Pollutants – Materials that have a negative impact on human or environmental health.

Rain barrel – A small collection tank installed at the end of a downspout to collect and temporarily store rainwater runoff from a roof for later use.

Rain garden – A planted shallow depression that temporarily holds runoff from impervious areas until it evaporates, is absorbed by plants, or infiltrates into the ground.

Rooftop redirection (disconnection) – A stormwater management practice that moves the runoff collected from rooftops through gutters and downspouts into the landscape where it can spread out, slow down, and infiltrate instead of moving the runoff directly into a storm drain system.

Runoff – Water that runs off impervious surfaces during rain events, often associated with urban areas. Runoff can also occur from pervious surfaces if the precipitation rate is greater than the infiltration rate. Also called "stormwater."

Sediment – Soil, rock, or biological material particles formed by weathering, decomposition, and erosion.

Stormwater – Water that runs off impervious surfaces during rain events, often associated with urban areas. Also called "runoff."

Stormwater pond – A pond that is used to temporarily hold and treat water pollution; used in residential developments to manage runoff from roads, driveways, and roofs.

Water table – The depth at which soils are fully saturated with water.

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