



# BIOSWALES

## STORMWATER MANAGEMENT

### What are Bioswales?

Bioswales are linear, vegetated, depressions in the landscape that convey and treat runoff from a variety of surfaces. Runoff may be piped or channeled. As water passes through the swale, some runoff infiltrates into the soil, and vegetation naturally filters water prior to reentering a stormwater system.

### Types of Bioswales

#### Dry Swale

Drains quickly, usually vegetated or grassy. There is an underlying filter bed that allows them to drain more rapidly between storms.

#### Wet Swale

More marsh-like, can be located in areas with high groundwater tables or poorly draining soils.

### Bioswale Sizing

The size of bioswale is dependent on the volume of water it will receive. Flow depths should not exceed 6 inches, as water quality treatment decreases after this depth. For runoff flowing over and out of the facility, 9 minutes is the minimum recommended retention time for adequate water-quality treatment.



Dry Bioswale in Sunriver, OR.

A bioswale can be designed in the following cross-sectional shapes:

- Trapezoidal (most frequent, easiest to maintain, causes the least scouring, creates the least runoff, but most difficult to build due to soil)
- Parabolic (acceptable if its width is equal to trapezoidal design)
- Triangular or v-shaped (acceptable as curb replacement in low-density areas)

### Soil Testing

Native soils should be tested in the proposed swale location to determine the soil infiltration rate.

Soils with low permeability (ex. clay) should incorporate soil amendments. Infiltration rates should be high enough to pass at least small storms through the soil column from treatment, but not so high that stormwater doesn't have enough "retention time" in the soil (ex. too much sand). The ideal infiltration rate is between ½ inch and 12 inches per hour. The top 18 inches of soil is typically amended with organic compost and soil mixtures to create a sandy loam soil. The resulting soil mix should be 60% sandy loam and 40% compost (free of weeds and pollutants)

For plant establishment and stormwater treatment, the soil pH should be between 5.5 and 7.5.

### Plants

Bioswales with more vegetation have a greater capacity to treat and filter stormwater. Appropriate bioswale vegetation will reduce, slow and filter water flow, prevent erosion, and control weeds.

# BIOSWALES

Vegetation should be selected based on the following characteristics:

- Four to five inches tall
- Deep root systems
- Tolerance to flooding
- Survivability in the local climate conditions without fertilizers, herbicides, or insecticides
- Drought tolerant, little maintenance and watering needed
- Native plants are preferred. They provide habitat to insects and birds, and are resilient to the native landscape

## Pollutant Removal

Bioswales remove pollutants by settling out sediments, infiltration through soils and media, and biological uptake through plantings within the facility. The Center for Watershed Protection estimates the concentration phosphorus-removal rates are 20-40%, and nitrogen-removal rates 25-35%. Grassy swales have been found to have lower removal rates than vegetated swales.

## Bioswale Features

- Dimensions:** in low-density areas where the bioswale is often used in place of curbs, a minimum length of 100 feet is recommended. The bottom width of a bioswale ranges from 2 to 8 feet.
- Check Dams:** berms used to slow velocities and ensure that water flows down into the soil and not out of the outlet too quickly. Check dams can be constructed of stone or timber (but never use treated wood) and are generally 3 to 6 inches high. Within the facility, slopes greater than 5% could cause high flow velocities, potentially leading to erosion. In this case, check dams should be installed (*Oregon Sea Grant*).
- Energy Dissipaters:** rocks (commonly referred to as riprap) are often placed at the entrance of bioswale inlets to reduce the effects of erosion and to slow water flow. Rough materials

are recommended in order to slow flow, such as thick vegetation, baffles, or even modified catch basins.

- Soils and Medium:** to reduce erosion, 2.5 to 3 inches of rock mulch is recommended. This is preferred over bark mulch because the latter tends to float. Feeding the plants as needed with compost tea will supply needed nutrients.

## Construction

Swales should be constructed before impervious surfaces are installed and allowed to establish before runoff is directed to them. For infiltration facilities, equipment should only be operated along the sides of swales, rather than on the bottom, in order to prevent soil compaction and disturbance. If the soils are exposed to rain, fine soil particles that are picked up and moved around may clog the native subgrade soils, so it is important to rake the surface to loosen soil before proceeding. If the swale is dug by hand, raking will also be required, since foot traffic in the facility area may be unavoidable.

### Construction placement

Do not construct a bioswale within 10 feet from a foundation or 5 feet from a property line.

## Materials List

- Rocks**
  - Washed drain rock (3/4 inches, 12-inch layer)
  - Rocks to create swale
  - Rocks for overflow
- Piping**
  - PVC piping for overflow and outflow
- Plants**
  - Refer to plant list and design for plants and placement
- Compost and Soil**
  - For amendments and berms
- Mulch**
  - For water retention and weed suppression

[Resource Factsheets: Water 2](#)

## Installation Instructions

- 1. Observe and map your site**
  - Assess how water flows on the property.
  - Create a property map, mark existing features, storm drain locations, etc.
- 2. Determine the location of the bioswale**
  - Bioswales are designed convey and treat water. Common placements are along contour lines or in place of where a pipe would go, commonly between an impervious surface and storm drain.
- 3. Assess soil**
  - Refer to “soil testing” section
- 4. Determine the length of the bioswale**
- 5. Constructing a bioswale**
  - Create channel
  - Install drains, if needed
  - Install rock
  - Install soil
  - Install plants
  - Install mulch
- 6. Maintain the bioswale**

## Maintenance

Regular bioswale maintenance is important to ensure low stormwater velocity and increased filtration

- Inspect swales once every 3 months
- Remove sedimentation buildup at least once a year and after each large storm event
  - Also remove when it builds to 4 inches, covers grasses, or reaches 25% of desired volume
- Reseed & revegetate as needed
- Repair eroded areas
- Regrade as needed
- Manage vegetation pests
- Avoid fertilizers, herbicides, and pesticides for all areas draining to and within the bioswale
- Mow grassy swales at least once a year
- Do not irrigate beyond establishment period; unnecessary irrigation will impact infiltration rates and alter the natural drainage patterns.

## Ordinances

Ask Jackson County if this triggers a plumbing permit, depending on overflow setup. For systems under 2500 square feet, with simple overflow designs, a permit likely will not be triggered.

### Call Before You Dig!

Before you dig your bioswale, dial **8-1-1** and request a free utility locate for your entire property; ensure all of your utilities are marked prior to breaking any ground. This service is completely free, and the call center is open 24/7.

### Resources

JSWCD “Bioswale Plants” plant list

Oregon Sea Grant Extension “Swales” Factsheet



**Vegetated Swale**

Source: Clean Water Services