DELAWARE DEPARTMENT OF
NATURAL RESOURCES AND
ENVIRONMENTAL CONTROL

Stormwater Facility Enhancements (bioretention/infiltration basin/vegetated channel)

Bioretention, infiltration basins, and vegetated channels are best management practices (BMPs) that capture and hold stormwater until it is absorbed into the soil medium.

Bioretention – This BMP has a bed of engineered soil media (biosoil) that filters runoff before it reaches the underlying soil. It is typically used to manage runoff from frequent, small-magnitude storms. See Delaware Post Construction Stormwater BMP Standards & Specifications for design options.

Infiltration basin – This shallow-water impoundment captures, stores, and infiltrates stormwater, increasing groundwater recharge and removing pollutants. Often designed with a berm, forebay, and overflow weir, it is usually installed downgradient of other BMPs.

Vegetated channel – This plant-lined open channel conveys a shallow flow of runoff. The vegetation slows and filters the water so it can infiltrate and recharge groundwater along the length of the channel.

Design Considerations

- Design all practices to allow access for necessary maintenance.
- Establish and maintain dense vegetation to help retain and infiltrate water. Select plants that filter pollutants and provide habitat.
- Obtain biosoil from a vendor approved by the Delaware Department of Natural Resources and Environmental Control.
- Engineer roads and parking lots with a gradient that allows water to flow into the management practices.
- Avoid sites with very flat or steep topography or with poorly drained soils. Areas with fast-flowing runoff can be vulnerable to erosion and may require a more rigorous engineered design.
- Ensure the sides of structures are not very steep to reduce the chances of erosion during storm flows.
- Add culverts or walkways to practices next to roads or pedestrian areas to allow access over the practice. Pedestrians or vehicles can damage the practice by disturbing plants and compacting the soil.
- Include a pretreatment mechanism at every inlet.
- To protect groundwater quality from highly polluted runoff, include pretreatment or use an underdrain and impermeable liner to direct the runoff for added treatment before infiltration occurs.

Benefits

- Improves water quality and reduces flooding and erosion.
- Traps particulate pollutants from roadways, parking areas, and other paved surfaces, thus reducing pollutant discharges.

Top: *Bioretention. Bottom: left, vegetated channel; right, infiltration basin*
(Source all: Chesapeake Bay Program)

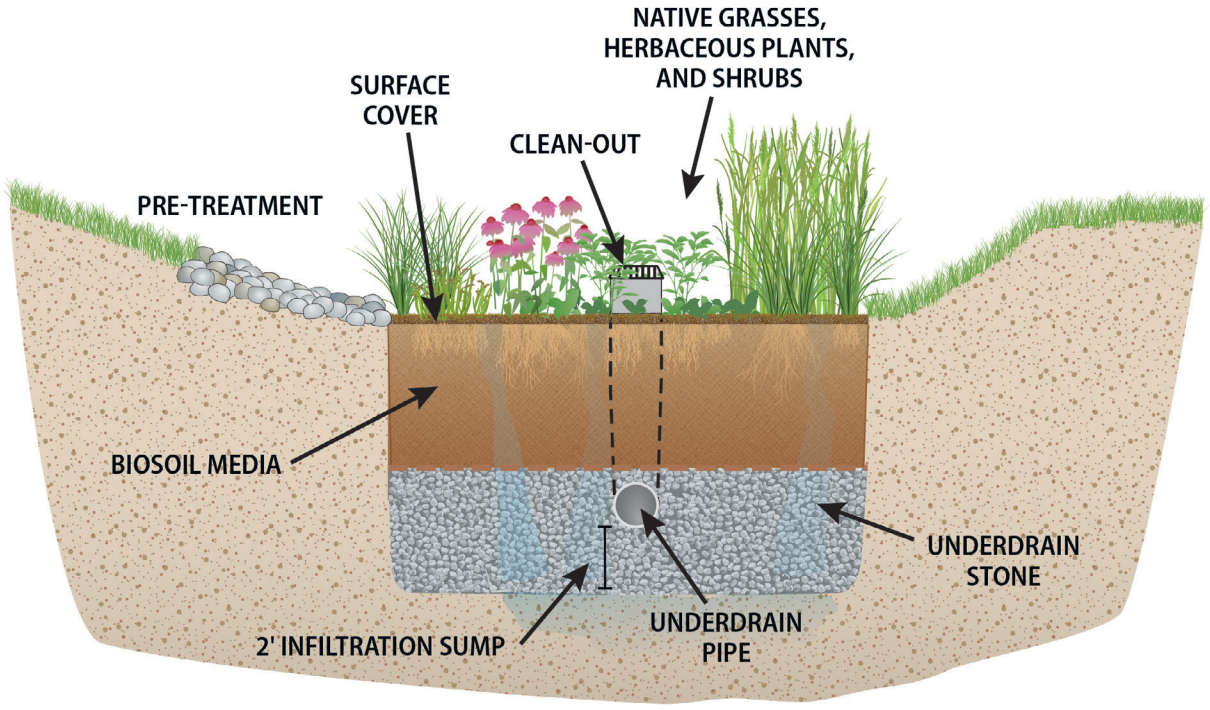
- Reduces the volume and velocity of stormwater runoff.
- Provides habitat benefits for native species.
- Increases urban tree canopy and enhances community aesthetics.

Maintenance

- Check and remove accumulated trash or debris.
- Monitor vegetation for decline or mortality; replace as needed.
- Monitor and control invasive species and unwanted vegetation.
- Periodically trim vegetation to maintain safety, visibility, and plant health. To protect wildlife, mow in February/March.
- Add mulch and soil to damaged or eroded areas.
- Water new trees and shrubs every few days in the first month and then weekly during the growing season as needed.

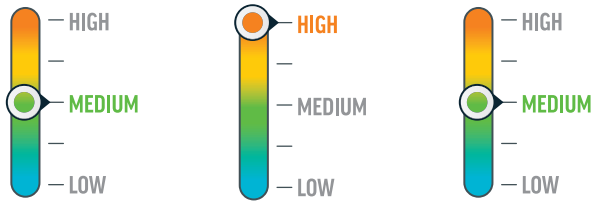
Limitations

- Maintaining stormwater BMPs, especially bioretention basins, is more complex than curb and gutter systems.
- High sediment loads in runoff can clog practices, reducing effectiveness. Standing water can support mosquitoes.
- These practices might be impractical in areas with flat grades, steep topography, or poorly drained soils. They are not suitable in areas with a high groundwater table.
- Designs must ensure adequate treatment occurs (e.g., in areas with highly polluted runoff).
- If a large storm event exceeds the design capacity of a vegetated channel, the existing vegetation might not be adequate to prevent erosion and pollutant resuspension.
- Vegetated channels and infiltration basins need a lot of space.



Traditional bioretention underdrain design (Source: Tetra Tech)

Implementation Considerations



Land Requirement | Level of Engineering | Maintenance Burden

Cost

$$–$$$

Additional Resources:

Coastal Municipalities Impervious Surface Coverage Report, August 2019. https://documents.dnrec.delaware.gov/coastal/Documents/ResilientCommunityPartnership/Coastal%20Municipalities%20Impervious%20Surface%20Coverage%20Report.pdf

Delaware Post Construction Stormwater BMP Standards & Specifications, February 2019. https://documents.dnrec.delaware.gov/Watershed/Sediment-Stormwater/Regulatory-Guidance/BMP%20Stds%20and%20Specs%20-%20EFF%20FEB%202019.pdf

Green Infrastructure Primer A Delaware Guide to Using Natural Systems in Urban, Rural, and Coastal Settings, January 2016. https://documents.dnrec.delaware.gov/GI/Documents/Green%20Infrastructure/Green_Infra_Primer2016_FINAL%20web%20version.pdf

Standard Guidelines for Operation and Maintenance of Stormwater BMPs, February 2019. https://documents.dnrec.delaware.gov/Watershed/Sediment-Stormwater/Maintenance/Std%20Guidelines%20for%20OandM%20_EFF%20FEB%202019.pdf

Environmental and Homeowner Benefits

Beautification/ Property Values Increased

Flood Control/Reduction

Biodiversity/Habitat Improved

Groundwater Recharge/Infiltration

Contaminants Reduced

Stormwater Runoff Reduced

Erosion Control

Stream Health Improved