DELAWARE DEPARTMENT OF
NATURAL RESOURCES AND
ENVIRONMENTAL CONTROL

Constructed Wetlands

A constructed wetland is a best management practice (BMP) used to treat urban stormwater. It mimics a natural wetland area by capturing runoff and holding it in permanent pools. Shallow water less than 1 foot deep covers most of the wetland surface area. Deeper-water wetland areas include the pools and forebay—the storage space that traps incoming sediment. Because constructed wetlands are heavily vegetated, they serve as a natural filter for urban runoff and help to slow the water flow and replenish groundwater. Constructed wetlands have many advantages as an urban BMP, including reliable pollutant removal, longevity, adaptability to many development sites, ability to be combined with other BMPs, and excellent wildlife habitat potential.

Choosing the type of constructed wetlands best suited for a particular location is influenced by site-specific factors such as soil suitability, hydrology, the size of the area, and vegetation. For more information on constructed wetland types, see Delaware Post Construction Stormwater BMP Standards & Specifications.

Design Considerations

- Maximize the use of native species; do not plant invasive species.
- Provide easy access for maintenance.
- Integrate the design within the natural topography of the site.
- During planning, consider extreme weather and climate conditions (storms, floods, and droughts).
- Keep the system simple.
- Ensure the area provides adequate space.
- Locate it conveniently near the source of the stormwater.
- Consider possible effects on neighboring land.
- Place it above the water table.
- Keep the system out of the floodplain.

Benefits

- Improves water quality.
- Filters excess nutrients and contaminants from surface runoff.
- Absorbs floodwaters and buffers storm surges.
- Reduces erosion.

Constructed wetland (Source: Delaware Department of Natural Resources and Environmental Control)

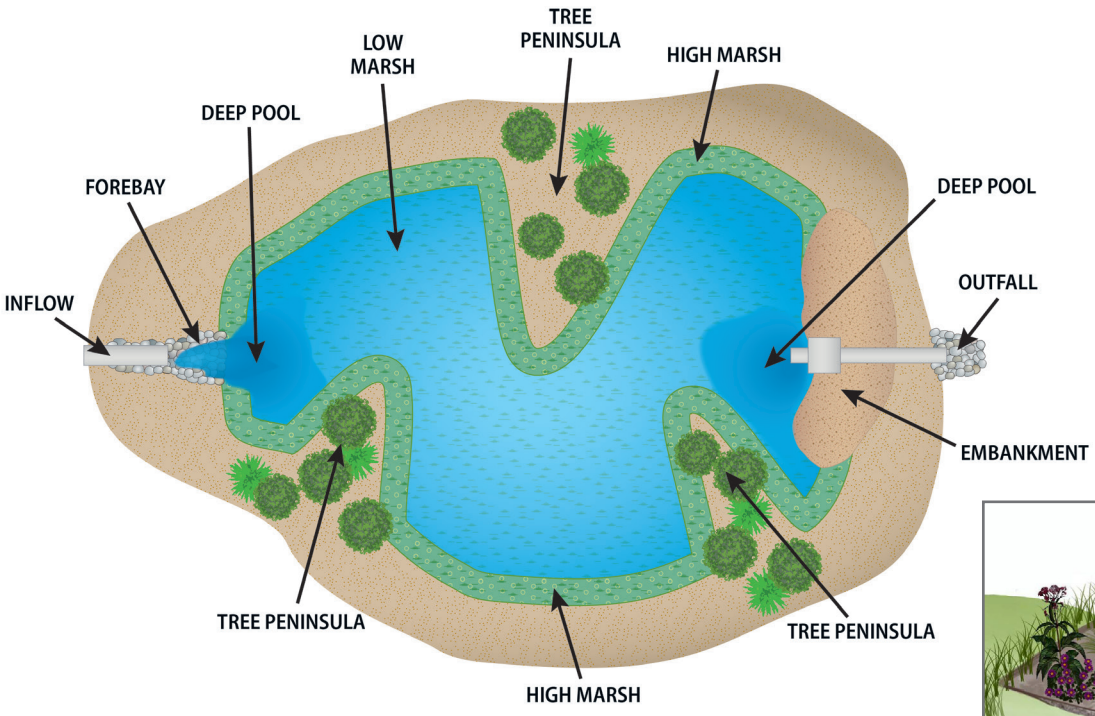
- Captures carbon dioxide from the atmosphere and stores it in plant tissues and soil.
- Provides habitat for valuable wildlife and plant species.
- Increases property values as an aesthetically pleasing landscape.

Maintenance

- Prevent the filling of wetlands by sand, gravel, solid wastes, or structures.
- Protect the wetland's water supply by controlling the pumping of streams and groundwater if part of the design.
- Protect wetland soils from dredging, the removal of topsoil, or compaction from heavy equipment and vehicles.
- Maintain the natural circulation of wetland waters by avoiding the use of dikes, dams, and ditches.
- Prevent degradation of wetland vegetation by controlling invasive plants or encroachment of nonnative species.

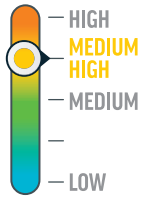
Limitations

- A large area is required.
- Performance efficiency relies on consistent environmental and meteorological conditions. Adverse weather conditions (e.g., extreme cold or dry spells) can lead to treatment variability.
- Minimum water levels must be maintained. A complete drought can be lethal to the system.
- The system's biological components can be sensitive to toxic chemicals, such as ammonia and pesticides.
- Treatment efficiency can be temporarily reduced following transient influxes of contaminants or high water flows.



Typical traditional constructed wetland plan view (Source: Tetra Tech).
Inset: typical wetland swale section view (Source: Delaware Department of Natural Resources and Environmental Control)

Implementation Considerations



Land Requirement

Level of Engineering

Maintenance Burden

Cost

$$-$$$

Additional Resources:

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

Land Use Decision Making and Wetland Protection: A Guidebook for Public Participation. https://www.inlandbays.org/wp-content/uploads/Wetlands-Public-Participation-Guidebook-Final-1.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

Air Quality Improved

Erosion Control

Beautification/ Property Values Increased

Flood Control/Reduction

Biodiversity/Habitat Improved

Groundwater Recharge/Infiltration

Contaminants Reduced

Stormwater Runoff Reduced