**Constructed Wetlands**

**Structural Stormwater Best Management Practice**

*This factsheet is part of our structural stormwater BMP series. To access this series and many other educational resources, please visit: spcwater.org.*

**Constructed Wetlands** (CWs), also known as stormwater wetlands, are shallow aquatic systems planted with emergent vegetation. They are highly effective at removing pollutants from stormwater; they also mitigate peak flow rates and reduce runoff volume. Beyond stormwater management, CWs provide wildlife habitat and aesthetic value. Design and maintenance is critical for the ability of this BMP to function and be sustainable over time.

Detention Basins, another Best Management Practice (BMP) that temporarily stores stormwater, are often retrofitted into CWs in order to maximize stormwater management function of the space and obtain the added benefits.

**Types of Constructed Wetlands**

CWs can be designed as either online (hydrologically connected to existing waterway) or offline (not hydrologically connected to an existing waterway). They are often used in conjunction with other stormwater BMPs that mitigate flow and sediment. They are grouped into the following categories:

- Shallow Wetlands
- Extended Detention Shallow Wetlands
- Pocket Wetlands
- Pond/Wetland Systems

**Water Quality Improvement**

CWs improve water quality through a variety of mechanisms that include settling, filtration, biological decomposition, and more. They are effective at removing many common stormwater pollutants such as phosphorus, nitrogen, suspended solids, and petroleum products.

Pollutant removal capacity can be affected by seasonal variations. Performance is typically highest during the growing season and lowest during the winter months.

**Examples of Wetland Plants**

A variety of native wetland plants should be used in the various vegetation zones. Below are native plants that thrive in a variety of the vegetation zones required for optimal performance of constructed wetlands. Constructed wetlands improve water quality, control peak flows, provide wildlife habitat, and much more. They can be used in a variety of land use situations, including retrofit and recreational spaces.

**Sensitive Fern**

*Onoclea sensibilis*

**Joe Pye Weed**

*Eupatorium fitulosum, PA Ecotype*

**Cotton Grass**

*Eriophorum L. Cottongrass*
**DESIGN AND MAINTENANCE CONSIDERATIONS**

Proper design and maintenance are critical for the long-term viability of constructed wetlands. Key considerations are listed below:

| Hydrology | • Flow contributions from rain, runoff, and groundwater are essential for long term performance  
| Water conditions associated with CWs, including flow, depth, drainage area, etc.  
| • Deeper areas should have a permanent water surface except during intense drought  
| • Drainage area should be 5 acres for pocket wetlands or 10 acres for other types of constructed wetlands  
| • A constant source of inflow can improve the health and functioning of constructed wetlands as well as reduce the drainage area requirements  |
| Underlying Soils | • Underlying soils must be identified, tested, and amended if necessary  
| Existing soils below CWs  
| • Synthetic or highly-compacted soil liners may be needed to avoid excessive infiltration  |
| Planting Soil | • Soils with very high organic content should be used due to their ability to serve as a sink for pollutants, retain high amounts of water, and support plant growth  |
| Soils used to plant vegetation  |
| Vegetation | • Vegetation serves many functions, including reduction of flow velocity, promoting settling of suspended solids, limiting erosion, promoting filter, and much more  
| Plants in CWs provide many functions such as slowing water velocity & evapotranspiring water  
| • A diverse variety of tough, non-invasive perennial plants should be used  
| • Several zones of vegetation are necessary; see table 6.6.1-1* in PA Stormwater BMP Manual for details  |
| Configuration | • Ideal length to width ratio is at least 2:1  
| Design and placement considerations  
| • Construction should occur at least 10 feet from property lines and at least 50 feet from private wells  
| • Critical components include forebay/inflows, vegetation and open water zones, outlets, and safety benches; see Chapter 6.6.1* in PA Stormwater BMP Manual for more detail  |
| Buffer | • Including a 25-foot buffer around the CW will improve habitat value, aesthetics, and wetland health  
| Undeveloped area around CWs  
| • Buffer should include trees, shrubs, and native ground covers; existing trees should be preserved  |
| Maintenance Access | • Stabilized and permanent maintenance access is needed at the forebay, outlet, and embankment  |
| Maintenance | • A maintenance plan is necessary  
| Vegetation and engineered systems need to be inspected and maintained to sustain CWs performance over time  
| • Private facilities may require an easement, deed restriction, and/or legal measures to prevent neglect or removal  
| • Vegetation inspections should occur every 2 to 3 weeks during the first growing season  
| • Full inspections should occur 4x/year and after major storms during the first 2 years  
| • Vegetation and sediment problems should be promptly corrected  
| • Once established, inspections should occur semiannually and after major storms  |

This information was adapted from the Pennsylvania Stormwater Best Practices Manual. Available for download at: [http://www.elibrary.dep.state.pa.us/dsweb/View/Collection-8305](http://www.elibrary.dep.state.pa.us/dsweb/View/Collection-8305)