NATURAL RESOURCES CONSERVATION SERVICE
ILLINOIS URBAN MANUAL
PRACTICE STANDARD

# URBAN STORMWATER WETLANDS

(acre)
CODE 800

(Source: Native Plant Guide for Streams and Stormwater Facilities in Northeastern Illinois)

## DEFINITION

A constructed system of shallow pools that create growing conditions suitable for emergent and riparian wetland plants explicitly designed to lessen the impacts of stormwater quality and quantity in urban areas.

## PURPOSE

Stormwater wetlands are designed and installed to maximize pollutant removal and create wetland habitat through the creation of a matrix of water, sediment, plants, and detritus that collectively provides temporary storage of urban stormwater runoff, and removes multiple pollutants from it through a series of complementary physical, chemical, and biological pathways.

## CONDITIONS WHERE PRACTICE APPLIES

This practice applies to watersheds in urban or urbanizing landscapes where stormwater quality and quantity control is needed to meet the diverse management objectives of developers and local governing units. Stormwater wetlands typically are not located within delineated natural wetland areas. Natural wetlands provide critical habitat and ecosystem benefits and are protected under local, state and federal statutes. Stormwater wetlands should also not be confused with created or restored wetlands that are used to mitigate for the loss of natural wetlands under permitting provisions of wetland protection requirements.

## CRITERIA

For maximum effectiveness, the following basic design criteria should be followed to achieve the major objectives of the stormwater wetland:

1. Capture and effectively treat the stormwater runoff produced by 90 percent of the storms in the urban watershed by designing a stormwater wetland to meet seven basic sizing criteria:
   a. Minimum treatment volume to capture and treat an amount equal to 0.5 watershed inch.

b. Surface area requirement - minimum wetland to watershed ratio:

| | |
|---|---|
| Shallow Marsh Wetland | 2% |
| Pond/wetlands | 1% |
| Extended Detention - (ED)/wetlands | 1% |
| Pocket wetlands | 1% |

Wetland types are defined in Reference 1.

c. Depth/Area allocation guidelines are shown in Table 2.
d. Treatment/Volume allocation guidelines are shown in Table 2.
e. Flow path length - dry weather flow path of 2:1 for length to width ratio.
f. Dry weather water balance - determine that inflow and ground water inputs are greater than infiltration and evaporation water losses for all designs except pocket wetlands.
g. Extended detention volume - consider extended volume, time, release, clogging protection, and water elevation.

2. Pre-treat the stormwater runoff before it reaches the wetland area to reduce water velocity, trap coarse sediments and associated pollutants. Examples of pre-treatment structures are pre-settling basins and forebays.
3. Create a diversity of depth zones within the wetland to meet the unique growing requirements of emergent wetland plants.
4. Establish a diverse and dense wetland plant community in the shortest possible time.
5. Create a functional pondscape within and around the wetland that augments pollutant removal, creates better wildlife habitat, and promotes a more natural appearance.
6. Reduce the future maintenance burden of the stormwater wetland through preventative management to protect its long-term function.
7. Provide habitat elements that promote greater wildlife and waterfowl use within the wetland and buffer, but avoid undesirable habitat outcomes.
8. Serve as an attractive, yet safe, community amenity for adjacent residents.
9. Reduce or avoid any undesirable secondary environmental impacts produced by the construction or operation of the stormwater wetland.

## CONSIDERATIONS

Avoid conflict with natural wetlands wherever possible. Employ design techniques to enhance pollutant removal performance of stormwater wetland systems (Table 1). Establish the plant community by transplanting stock native to the region and/or by utilizing mulch/topsoil from a nearby donor wetland scheduled to be developed. Plan habitat diversity to meet the feeding, breeding/nesting, and cover requirements for a wide range of aquatic, avian, and terrestrial species. Check with state and/or federal agencies that issue permits for wetlands about the regulatory status of stormwater wetlands and needed permits prior to construction.

## PLANS AND SPECIFICATIONS

Site suitability should be determined on each site by field observation by a qualified interdisciplinary design team with expertise in stormwater engineering, wetlands, landscaping, and pond construction. Construction specifications should be shown in a site-

specific construction plan or drawing. Design criteria for stormwater wetland designs are shown in Table 3.

## OPERATION AND MAINTENANCE

Both initial establishment and future development of a stormwater wetland require active management of the hydrology and vegetation, as it grows in biomass, diversity, and spatial coverage.

The design team must plan for the future operation and maintenance of the stormwater wetland in this stage, with a strong emphasis on the first three years. Maintenance activities must be fully vested with a responsible party through an enforceable maintenance covenant. The covenant should specifically include a projected schedule for inspections and forebay sediment cleanouts, and show evidence that dedicated funding will be available to perform this function.

Inspection Criteria -The stormwater wetland should be inspected twice a year in the first three years after construction, with an annual inspection thereafter. Inspections should be conducted with the as-built and pondscaping plans in hand, and should take specific note of species distribution/survival, sediment accumulation, water elevations, and condition of the outlet. Records should be stored so that the progressive development of the wetland system over time can be tracked.

Sediment Cleanout - Accumulated sediment in the forebay should be cleaned out every 3 to 5 years. Cleanouts are conducted after draining the forebay with the help of a skid loader or backhoe. The preferred disposal method is on-site land application at a pre-designated spoil area.

Mowing - The maintenance access, maintenance bench and embankment should be mowed once a year to prevent woody growth. All remaining areas can be managed as a wet meadow or forest.

## REFERENCES

Schueler, Thomas R.;1992. Design of Stormwater Wetland Systems: Guidelines for Creating Diverse and Effective Stormwater Wetlands In the Middle-Atlantic Region. Metropolitan Washington Council of Governments, Washington, DC

Washington State Department of Ecology, 1991. Stormwater Management Manual for the Puget Sound Basin (Public Review Draft), WA

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TABLE 1

DESIGN TECHNIQUES TO ENHANCE
POLLUTANT REMOVAL PERFORMANCE OF STORMWATER
WETLAND SYSTEMS

1. Increase the Volume of Runoff Treatment
    - Capture greater percentage of annual runoff volume
    - Provide for longer residence time in wetland for most storm events
2. Increase the Surface Area to Volume Ratio
    - Increase the total area of the wetland, or
    - Increase the internal structural complexity of the wetland, by adding complex microtopography and establishing extensive and dense wetland plant cover
3. Increase the Effective Flow Path Through the Wetland
    - Extend distance between the inlet and outlet berms
    - Maximize sinuosity of dry weather flow path with high marsh wedges
    - Create some areas with extremely shallow flow path (i.e., high marsh)
    - Use multiple cells within the wetland system
4. Provide Runoff Pre-Treatment and Energy Dissipation
    - Use forebay or pond cell near inlet, with broad crested weirs to spread flow between cells
5. Utilize Redundant Pollutant Removal Pathways
    - Provide extended detention to keep removal rates reliable during non-growing season, or
    - Utilize permanent pool to increase algal uptake and sedimentation

From Table 7, Schueler, 1992.

TABLE 2

GUIDELINES FOR THE ALLOCATION
OF DEPTH ZONES AND TREATMENT VOLUME IN
STORMWATER WETLAND SYSTEMS

| TARGET ALLOCATIONS | Stormwater Wetland Systems | | | |
|---|---|---|---|---|
| | Design No. 1 SHALLOW MARSH | Design No. 2 POND/ WETLAND | Design No. 3 ED WETLAND | Design No. 4 POCKET WETLAND |
| Percent of Surface Area | | | | |
| Forebay | 5 | 0 | 5 | 0 |
| Micropool | 5 | 5 | 5 | 0 |
| Deepwater | 5 | 40 | 0 | 5 |
| "Low Marsh" | 40 | 25 | 40 | 50 |
| "High Marsh" | 40 | 25 | 40 | 40 |
| "Semi-wet" | 5 | 5 | 10 | 5 |
| Percent of Treatment Volume | | | | |
| Forebay | 10 | 0 | 10 | 0 |
| Micropool | 10 | 10 | 10 | 0 |
| Deepwater | 10 | 60 | -- | 20 |
| "Low Marsh" | 45 | 20 | 20 | 55 |
| "High Marsh" | 25 | 10 | 10 | 25 |
| "Semi-wet" | 0 | 0 | 50 | 0 |

Deepwater - One to six feet below normal pool (includes forebays, micropools, pool and channel)
Low Marsh - Six to 18 inches below normal pool
High Marsh - Zero to six inches below normal pool
Semi-wet - Zero to two feet above normal pool (includes ED)

Note: The allocations are only general guidelines and will vary according to design and site constraints.

From Table 11, Schueler, 1992.

TABLE 3 - DESIGN CRITERIA FOR STORMWATER WETLAND DESIGNS

| DESIGN CRITERIA | Design No. 1 SHALLOW MARSH | Design No. 2 POND/ WETLAND | Design No. 3 ED WETLAND | Design No. 4 POCKET WETLAND |
|---|---|---|---|---|
| Wetland/Watershed Ratio | .02 | .01 | .01 | .01 (target) |
| Minimum Drainage Area | 25 acre | 25 acre | 10 acre | 1-10 acre |
| Length to Width (minimum) | 1:1 | 1:1 | 1:1 | 1:1 (target) |
| Extended Detention | No | No | Yes | No |
| Allocation of Treatment Volume (pool, marsh, ED) | 40/60/0 | 70/30/0 | 20/30/50 | 20/80/0 |
| Allocation of Surface Area (deep, low, high) | 20/40/40 | 45/25/30 | 20/35/45 | 10/40/50 |
| Cleanout Frequency | 2-5 yrs. | 10 yrs. | 2-5 yrs. | 10 yrs. |
| Forebay | Required | No | Required | Optional |
| Micropool | Required | Required | Required | Optional |
| Outlet Configuration | Reverse-slope pipe or hooded broad crested weir | Same | Same | Hooded broad crested weir |
| Propagation Technique | Mulch or Transplant | Mulch or Transplant | Mulch or Transplant | Volunteer |
| Buffer (feet) | 20 to 50 | 25 to 50 | 25 to 50 | 0 to 25 |
| Pondscaping Plan Requirements | Emphasize wildlife habitat marsh micro-topography, buffer | Emphasize wildlife habitat and high marsh wedges | Emphasize stabilization of ED zone, project pondscaping zones | Pondscaping plan optional |

From Table 16, Schueler, 1992.