

Stormwater BMP Design Updates

WFH, 1/2004

Note to user: This information is used to accompany existing Design Guidance Materials provided by NCSU at Stormwater BMP Academies.

Stormwater Treatment Wetlands

1. DESIGN POINT: Aquatic Shelves
 - Aquatic Shelves DO appear to deter Geese
 - For Geese Control, Aquatic Shelf does not need to be wide
 - Aquatic Shelf vegetation growth can be RAPID
2. DESIGN POINT: Mosquito Control
 - Diverse System of Herbaceous Plants tends to limit mosquito population by attracting dragonflies and other predators
 - *Gambusia affinis* (Eastern & Central NC)
 - *Gambusia holbrooki* (Western NC)
3. DESIGN POINT: Swale Bottom
 - If “Wetland Bottom” is not diverse, perhaps perimeter can be.
 - MAY help keep mosquito population down
4. DESIGN POINT: Outlet Structure
 - Design Flexibility in Outflow Structure
 - NCSU suggests maybe use variation in Flashboard Riser
5. DESIGN & MAINTENANCE POINT: Drawdown
 - Small Orifice Needed for Small Drawdown
 - Inspection/Cleaning Required
 - Use Trash rack/ down turn pipe
6. DESIGN POINT: Flow Bypass
 - If Actual Surface Area > 0.80 of Required Design Surface Area, you do NOT need to bypass flow
7. SITING CONSIDERATIONS
 - Availability of Water
 - Depth to Water Table (Coastal Plain & Sandhills)
 - Flatness
 - Proximity to Unattended Children
 - Forested or Cleared Land
 - Outlet for Water
 - Ease in Maintenance

8. DESIGN POINT: Soil

- Add 2-4 inches of topsoil or wetland seed bank to aid in vegetation growth

9. DESIGN POINT: Watershed Size

- Wetlands have been sited and successfully grown on watersheds as small as 1 acre
- If small watershed, must be comfortable of stable water source

10. DESIGN POINT: Shallow Water Depth

- ◆ Shallow Water is Usually Too DEEP
- ◆ Ideal depth: 1-6'

11. MAINTENANCE POINT: Wetlands

- ◆ Consider Keeping Wetland in Adolescent State
- ◆ Outlet inspection/ debris removal essential
- ◆ Forebay Cleaning

12. MARSH WETLAND PLANTING COSTS: Conservative Estimate

Surface Area (sf) • \$1.00 +
Number of Plants • \$0.35

Bioretention

1. DESIGN POINT: "Forebays"

- If possible, include pre-treatment (e.g. swale or filter strip) with Bioretention Area

2. DESIGN POINT: Ponding Depth

- Some states use 3-6"
- Deeper ponding allowable, IF B-R area is maintained.
- NCSU suggests 6-9" with inspection/ maintenance

3. DESIGN POINT: Mulch

- Need Mulch for TN removal
- Mulch will float
- Coarse Hardwood mulch Best
- Must Reapply Mulch

4. DESIGN POINT: Soil Depth

Vegetation	Depth (ft)	Comments
Grass	1.5 – 2.0	Minimum
Trees/Shrubs	2.5 – 3.0	Minimum (be careful with vegetation selection)
Trees/Shrubs	3.5 – 4.0	Optimum
Trees/Shrubs	Greater than 4.0	Sufficient but Extra \$

5. DESIGN POINT: Water Table Depth

- Manual states 6' is closest high w.t. can be to the surface? Is that too restrictive?
- Depends on Depth of Bioretention area
- Recommend: No W.T. within 2 feet of bottom

6. CONSTRUCTION POINT-

- Sequencing is Essential
- B-R areas will CLOG
- Install @ End of Project

7. DESIGN & MAINTENANCE POINT: Vegetation

- Many B-R areas are planted too densely
- All B-R areas need to be pruned unless “wild look” is desired

8. DESIGN POINT: Parking Lot Drainage

- Sheet Flow may be essential in Coastal Plain Applications
- Standard Parking Lot Configuration may change

9. SITING CONSIDERATIONS

- Flat or Sloped Terrain
- Water Table
- Surface Hydrology
- Soil Type
- Maintenance/Access
- Landscape Ordinances
- Safety/ Liability

10. DESIGN POINT: From Bioretention Research in MD:

- B-R efficiency did NOT decrease with time
- For pollutant removal purposes (metals), B-R areas may not need to be deep
- Tighter fill media better removal rates

11. DESIGN POINT: From Bioretention Research in PA

- Keep Organic Matter (mulch) in Soil for TN removal
- A tight soil (K= 1-2 in/hr) has good TN removal rates

12. DESIGN POINT: From Bioretention Research in NC

- Adjust TN removal rate from 25% to 35% (Could go higher with more research)
- Do NOT use Agricultural Soil as B-R Fill media
- Only Allow Low P-Index Fill media
- Incorporate Urban Buffers to treat water which exfiltrates BR cell
- K=1-2 in/hr Best for TN removal
- Anaerobic Configuration may be best for TP, but was not for TN