##### Possible MDCs for Stormwater Wetlands

Blue font = from Wet Pond MDC the team agreed on.

Black font = from the current version of the BMP Manual

Red font = suggestions from Larry Ragland and Annette Lucas

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| 1. | SITING. If the stormwater wetland is within 50 feet of a jurisdictional wetland, then the design permanent pool elevation (the first outlet of the wetland outlet structure) shall not be greater than 6 inches below the SHWT elevation.  |
| 2. | TEMPORARY PONDING DEPTH AND SURFACE AREA. The maximum depth ponding depth for the design storm shall be ~~12~~ 18 inches above the permanent pool. The surface area of the wetland is based on the surface area at the designed temporary pool elevation. The surface area shall be sized sufficiently to limit the ponding depth to ~~12~~ 18 inches. The wetland may be designed to pond storms exceeding the design storm at a greater depth for flood control.We think this will provide equivalent protection but reduce the wetland footprint to 2/3 of its current size. |
| 3. | MAINTENANCE OF THE PERMANENT POOL. The permanent pool shall be maintained by either:* Installing a natural or synthetic liner with a minimum infiltration rate of 0.01 in/hr beneath the bottom of the deep pools and shallow water areas.
* Locating the permanent pool elevation within six inches of the SHWT.

Suggestion: **Remove** this item and allow the wetland to infiltrate if the soils/SHWT allow. Below we suggest removing the shallow water zone altogether, which will eliminate the concern about water-loving plants not staying wet. |
| 4. | TOPSOIL. At least 4 inches of appropriate topsoil must be added to the planting surfaces to promote plant growth.Suggestion: **Remove** this item and replace with: SOIL AMENDMENTS. Soil amendments that enhance the water-retaining capacity of the soil shall be incorporated into the top 12 inches of the soil in the temporary inundation zone. |
| 5. | MINIMUM TREATMENT VOLUME. The minimum treatment volume for a stormwater wetland shall be 3,360 cubic feet. Lesser volumes may be approved on a case-by-case basis. |
| 6. | LOCATION OF INLET AND OUTLET STRUCTURES. The inlet and outlet structures shall be located in a manner that avoids short circuiting in the wetland.  |
| 7. | FOREBAY AND OUTLET POOL. A forebay shall be provided at the inlet to the stormwater wetland and an outlet pool shall be provided adjacent to the outlet structure. The forebay and the outlet pool shall each comprise approximately 10~~-15~~% of the wetland surface area. The forebay and outlet pool depths shall be 24-40” deep with respect to the permanent pool. The forebay entrance shall be deeper than the exit. |
| 8. | ~~NON-FOREBAY~~ DEEP POOLS. Deep pools shall be provided throughout the wetland. ~~A deep pool shall be located adjacent to the outlet structure to prevent clogging.~~  The ~~non-forebay~~ deep pools shall comprise ~~5-15~~10-20% of the wetland surface area and shall be 18-36” deep with respect to the permanent pool. |
| 9. | SHALLOW WATER ZONES. Shallow water zones shall comprise approximately 40% of the wetland surface area and shall be 3-6” deep with respect to the permanent pool. Suggestion: **Remove** shallow water zones because it is very difficult to hit the water level just right and achieve survival of these plants. Based on Bill Hunt’s comments about vegetated shelves in wet ponds not providing significant additional pollutant removal, we were doubtful that the shallow water zone provides much benefit for water quality. |
| 10. | TEMPORARY INUNDATION ZONES. Temporary inundation zones shall comprise ~~30-40~~60-70% of the surface area of the stormwater wetland. They shall be 0-~~12~~ 18” above the permanent pool elevation. |
| 11. | CONVEYANCE OF STORMS EXCEEDING THE DESIGN STORM. The stormwater wetland shall include a method for safely conveying storm events exceeding the design storm in a manner that prevents catastrophic failure of the device. |
| 12. | DRAWDOWN TIME. The stormwater wetland shall be designed so that it draws down to its permanent pool level between 2 and 5 days after the design storm.  |
| 13. | DISCHARGE RATE. The wetland shall discharge the storage volume at a rate equal to or less than the predevelopment discharge rate for the one-year, 24-hour storm. Bill Hunt will propose an alternative by December 1, 2014 and present it to the MDC Team. |
| 14. | LANDSCAPING PLAN. A landscape plan prepared by a qualified design professional licensed in North Carolina must be provided. The landscaping plan shall include:* Delineation of planting zones
* Plant layout with species names and locations
* Total number and sizes of all plant species
* Source of plant materials
* Sequence and timing for planting activities (including soil amendments, initial fertilization, watering, etc.)
* Specifications for ~~growing medium~~ soil amendments
* Specification of supplementary plantings to replenish losses.
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| 15. | SHALLOW WATER PLANTINGS. The shallow water zone shall be planted at a density of 50 herbaceous plants per 200 square feet (equivalent to 2 foot on center spacing). The minimum size of plants shall be 4 cubic inch containers.Suggestion: **Remove** because this is no longer relevant.  |
| 16. | TEMPORARY INUNDATION ZONE PLANTINGS. The temporary inundation zone shall be planted according to one of the following options:* 50 herbaceous plants per 200 square feet (equivalent to 2 foot on center spacing). The minimum container size is 4 cubic inches.
* 8 shrubs per 200 square feet (equivalent to 5 foot on center spacing).
* 1 tree and 40 grass-like herbaceous plants per 200 square feet. The minimum container size for the herbaceous plants is 4 inches.

Suggestion: **Remove** the above language and replace with the following. The reason for this change is that woody plants have deeper roots and have been shown in the field to have better survival rates. Also, most wetland species are adapted to partial shade rather than full sun. This also reduces temperatures.TEMPORARY INUNDATION ZONE PLANTINGS. The temporary inundation zone plantings shall be as follows:* The grade transition zone between the permanent pool and the typical elevation of the temporary inundation zone shall be planted with herbaceous plants at a density of 50 herbaceous plants per 200 square feet (equivalent to 2 foot on center spacing). The minimum container size for the herbaceous plants is 4 cubic inches.
* The remainder of the temporary inundation zone shall be planted with one shade tree and eight shrubs per 200 square feet.
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| 17. | EMERGENT WETLAND PLANTS. Five or more species of emergent wetland plants shall be selected.Suggestion: **Remove**. |
| 18. | VEGETATION 1. Trees and woody shrubs with root depths exceeding 12 inches shall not be planted on the dam structure. |
| 19. | VEGETATION 2. Cattails are not to be planted.  |
| 20. | VEGETATION 3. All trees and shrubs should be set back so that the branches will not extend over the basin. The team discussed removing this during the meeting, but since then one team member has expressed concern that doing so could compromise side slopes. DEMLR will check into this and get back to the team.Suggestion: **Remove**.  |
| 21. | VEGETATION 4. Turf grass or ground cover type shrubs with less than 12 inch rooting depths shall be provided on the tops of berms and on the exterior slopes of containment berms. ~~Centipede grass is recommended.~~ |
| 22. | VEGETATION 5. Weeping love grass on the vegetated side slopes because it does not provide long-term slope stabilization.  |
| 23. | TRASH RACK. A trash rack or other device shall be provided to prevent large debris from entering the outlet system. |
| REC | OUTLET 1. A drawdown orifice should have a turned-down elbow in order to prevent trash or other material floating on the surface from clogging the pipe. |
| REC | OUTLET 2. The design engineer should calculate flotation force for any outlet design subject to flotation forces.  |
| REC | OUTLET 3. Measures should be provided along the barrel of the principal spillway to prevent piping.  |
| REC | Soil bioengineering techniques such as the use of fascines, stumps, logs and coconut fiber roles can be used to create shallow land cells in areas of the wetland that may be subject to high flow velocities.Suggestion: **Remove**. |
| Temp REC | SHADING. Trees and shrubs can be planted to maximize wetland shading, primarily along the south, east, and west sides of the basin to reduce temperature impacts.  |