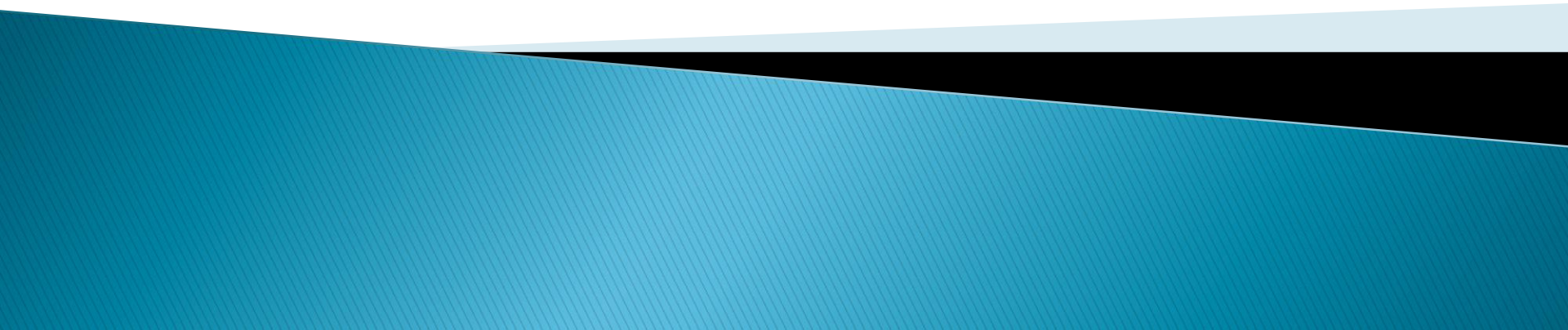


MDOT Forested Wetland Mitigation



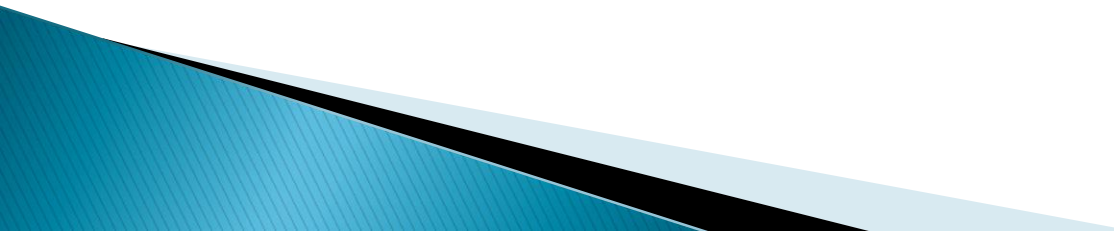
MDOT Wetland Mitigation Summary

- ▶ MDOT has tracked wetland mitigation for the past 25+ years
- ▶ MDOT mitigates for every wetland impact
 - Executive Order 11990

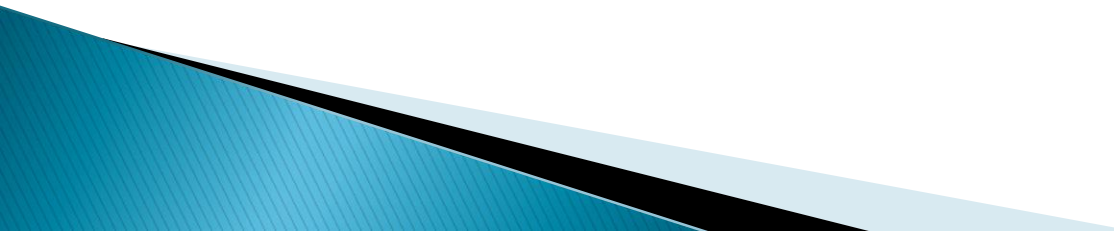
Wetland Mitigation Acreage

| | FORESTED | SCRUB-SHRUB | EMERGENT | OPEN WATER | TOTAL |
|--------------------|--------------|-------------|--------------|-------------|--------------|
| DELINEATED (71) | 286.4 | 86.2 | 419.7 | 85.8 | 878.2 |
| DESIGN EFFICIENCY | 60.9% | 51.5% | 119.4% | 237.7% | 85.7% |
| ESTIMATED (51) | 97.4 | 46.9 | 401.0 | 46.1 | 519.6 |
| TOTAL | 383.8 | 133.1 | 820.7 | 131.9 | 1397.8 |
| REQUIRED BY PERMIT | 443.1 | 126.1 | 550.1 | 38.3 | 1157.5 |
| EXCESS/DEFICIT | -59.4 | 7.0 | 270.7 | 93.7 | 240.2 |

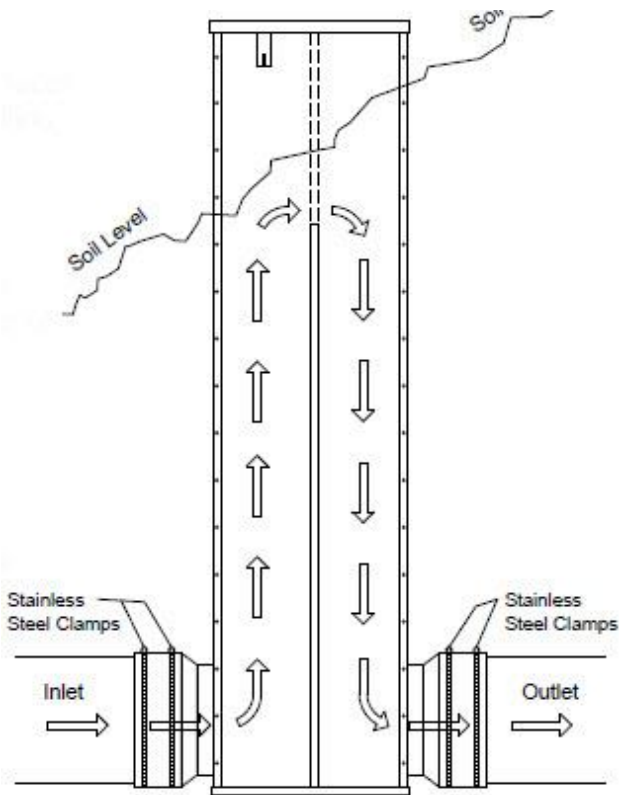
Wetland Hydrology

- ▶ Single most important factor affecting the success of restoration efforts
 - ▶ Nationally most wetlands are designed too wet
 - ▶ Wet tolerance of planted stock increases with age
 - ▶ Hydrology must be monitored and/or manipulated to ensure long term success
 - ▶ Some design elements reduce risk of improper hydrology
- 

Hydrology Recommendations

- ▶ Adjustable water control structures
 - ▶ Electronic monitoring wells
 - ▶ Elevations of all structures/wells should be surveyed and adjustments should be tracked
 - ▶ For forested wetlands, stop logs should initially be set 6" to 1' below finished grade
 - ▶ May need to leave sites dry for 2–3 years for survival of trees/shrubs
- 

Maintaining Hydrology



Agri Drain In-Line Water Control Structure



Grading

- ▶ Forested, scrub–shrub and wet meadow wetlands must be graded at the same elevation per wetland cell (most sites)
 - 3 inch tolerance between emergent and upland
 - Ideally uniform water control across site
- ▶ Incorporate microtopography or drainage swales to increase tree/shrub survival

Grading Examples



Drainage Channel



Rough Grading



Flat Grading



Pit and Mound
Topography

Planting

- ▶ Spring or fall planting during dormancy acceptable
 - Fall may have more frost heaving
 - Bare Root Stock has been used extensively due to low cost and high planting densities
 - Root-Pruned Managed (RPM) stock is more costly; however may yield better survival
- ▶ May need to control water (keep dry) for 2–3 years
- ▶ Popular Planted Tree Species
 - Silver maple (*Acer saccharinum*)
 - Swamp white oak (*Quercus bicolor*)
 - Pin oak (*Quercus palustris*)
 - Sycamore (*Platanus occidentalis*)
 - Bur oak (*Quercus macrocarpa*)



Volunteer Species

- Eastern cottonwood (*Populus deltoides*)
- Silver maple (*Acer saccharinum*)
- Green ash (*Fraxinus pennsylvanica*)
- Red maple (*Acer rubrum*)
- Black willow (*Salix nigra*)
- Balsam poplar (*Populus balsamifera*)



Adaptive Management / Corrective Action

- ▶ Installing larger water control structures to remove excess water quickly
- ▶ Invasive species control
- ▶ Lowering water levels for cattail eradication
 - Can convert to wet meadow in 2–3 years
- ▶ Plugging tiles missed during construction
- ▶ Re-planting trees/shrubs/plugs

Final Thoughts

- ▶ Wetland hydrology control/management is key to success
 - ▶ Certain wetland types (forested/scrub-shrub) are difficult to establish
 - ▶ Initial prevention/control of invasive species is essential
 - ▶ Factors often arise after construction that need to be addressed
 - ▶ Other unknown variables affecting tree mortality
- 