

Stormwater Preventative Maintenance

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Overview

- What is Preventative Maintenance?
- Types of Stormwater Management Systems
 - Specific preventative maintenance per system
- Preventing invasive plant invasions
- Preventing algal blooms



Compliance and Functionality

- Preventative maintenance –basic maintenance to maintain compliance and functionality
 - Inspect structures: inlets, outfalls, rip-rap, pipes etc.
 - Unclog structures
 - Trash
 - Organic debris
 - Sediment
 - Basic Vegetation management
 - Mow access areas around inlets and outfalls
 - Prevent establishment of invasive plant species



Types of Stormwater Management Systems

- Wet Pond
- Dry Pond
- Infiltration
- Bioretention Facility
- Swales
- Ditch systems
- At home stormwater management

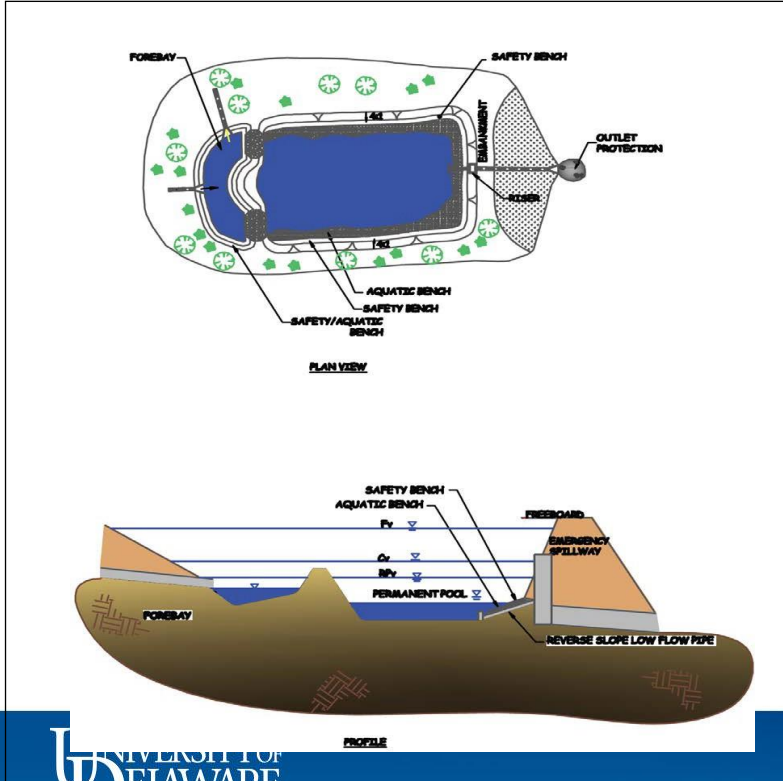


Wet Pond

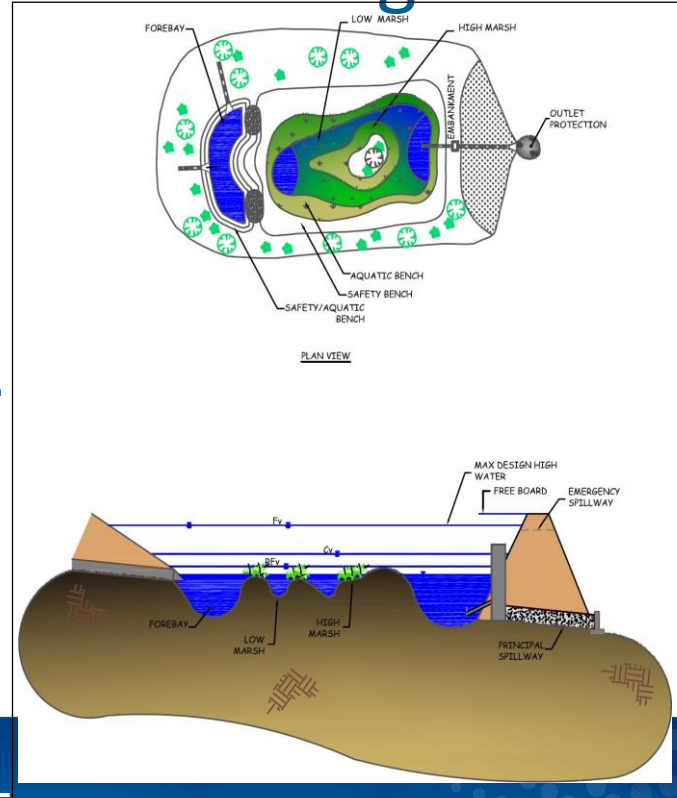
- Permanent pool
 - Contains water year round
 - Management is difficult due to water quality issues within the pond
 - algae
 - Public safety issues (require bench shelf)
- Vegetative Buffers
 - Embankments, vegetative buffer 25' outward from the high water level
- Proactive Management Opportunities



Wet Pond Standard Design



Drawings from
DNREC Division
of Watershed
Stewardship



Permanent Pool

- Water quality Issues
 - Nutrient load and sedimentation
 - Algae growth
 - Turbidity
 - Dissolved Oxygen deficiency
 - Fish kills



Causes of algae blooms

- Stagnant waters
- Shallow water
- High nutrient load
 - Nitrogen and phosphorus
 - Sheet runoff
 - Stormwater runoff
 - Fertilizer runoff
 - Canada goose excrement
 - Sedimentation



Long term management

- Take actions to reduce the amount of available nutrients in the water column
 - Phosphorus precipitation (Lanthanum and clay or aluminum sulfate applications)
 - Removal of accumulated sediment from forebays and pond bottoms
 - Riparian buffers
 - Bench shelf plantings with native beneficial
 - Winter organic material removal
 - Aeration
 - Rain gardens
 - Rain barrels



Sediment removal

- Forebays must be cleaned out regularly
- Full pond dredges may be required
- Stabilize areas at risk of eroding

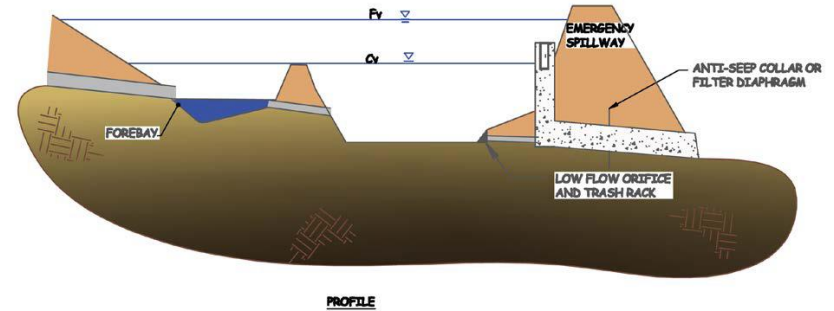
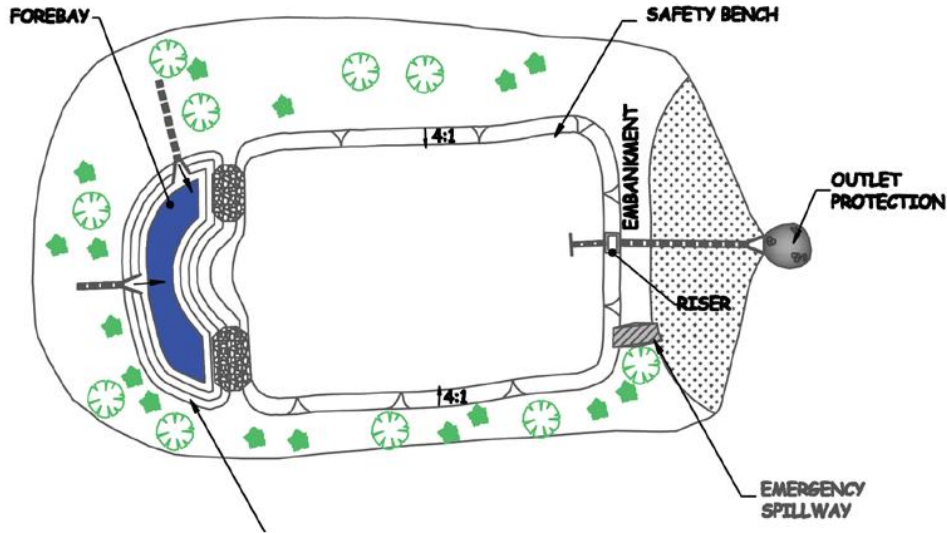


Dry Pond

- No permanent pool
 - Little to no issues with algae growth
- Vegetation Management is more difficult
 - Pond bottom will be difficult to manage for vegetation due to periods of varying moisture levels



Dry Pond Standard Design



Bioretention Facility

- No permanent pool
 - Filters with biosoil
 - Sand, lignin(polymer which makes plants rigid and woody), and organic matter
 - Treated water can be piped back to conveyance or allowed to infiltrate
- Vegetative cover
 - Shrubs
 - Herbaceous cover
- Weed pressure



Bioretention Facility Basic Design

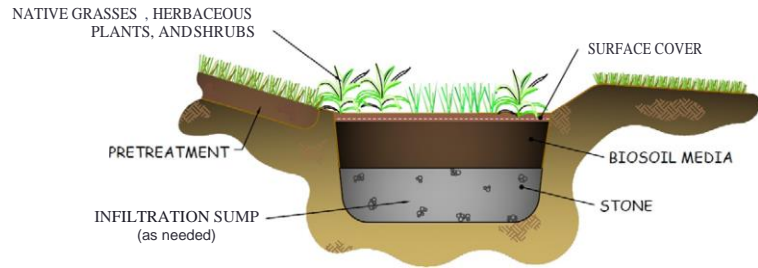


FIGURE 2.2: TRADITIONAL BIORETENTION INFILTRATION DESIGN

Drawings from DNREC
Division of Watershed
Stewardship

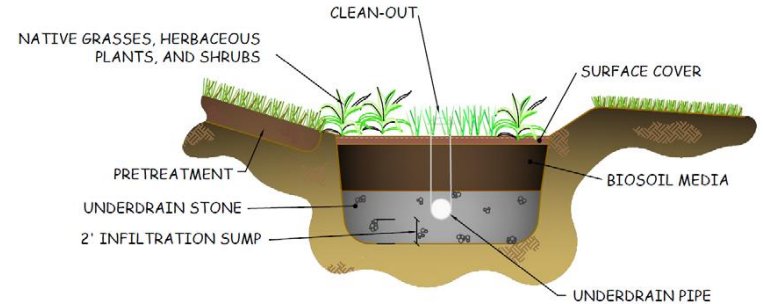


FIGURE 2.1: TRADITIONAL BIORETENTION UNDERDRAIN DESIGN

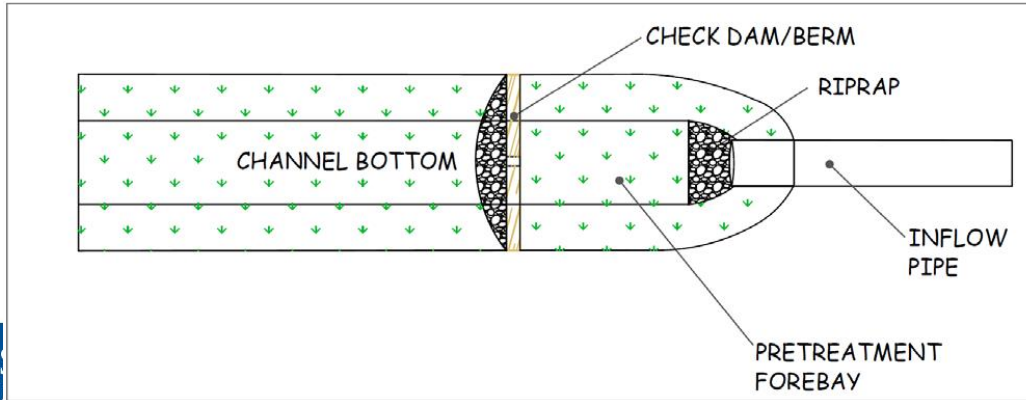
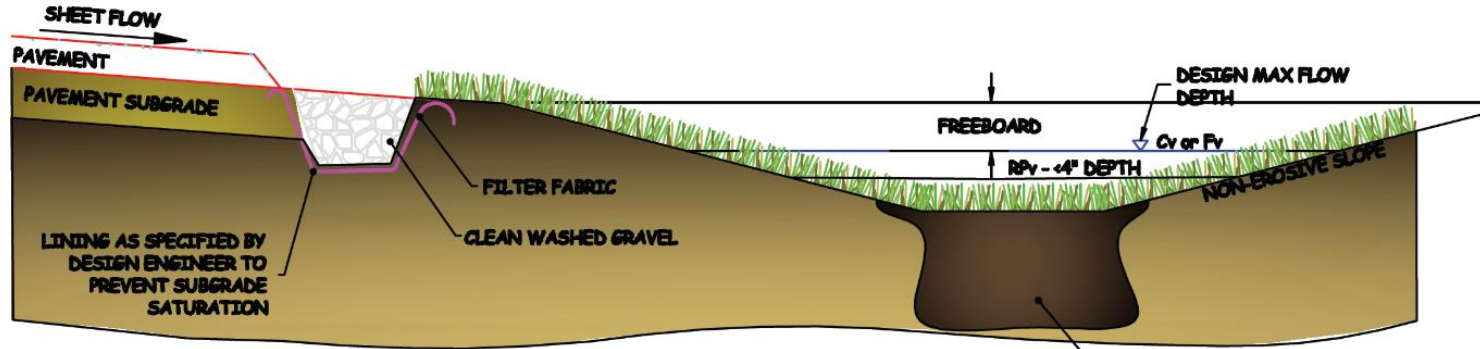


Vegetated Channels

- Depressions that serve to direct water to a management system
- Should be vegetated with herbaceous plants, no woody plants that would inhibit flow



Vegetated Channels Basic Design



SOIL AMENDMENT
(OPTIONAL)

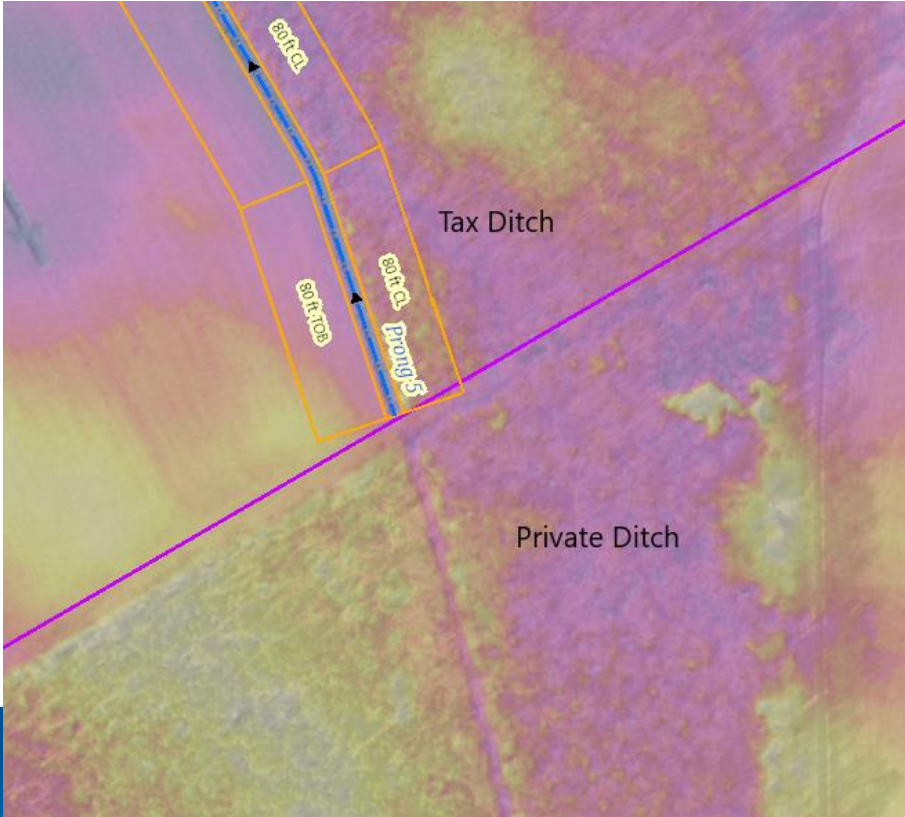


Ditch Systems

- Tax Ditches
 - Governmental subdivision within the state overseen by a Tax Ditch association
 - Tax Ditch organization includes all landowners within the tax ditch watershed and officers must be from the organization
- Private ditches
 - Ditches that have been constructed by private landowners

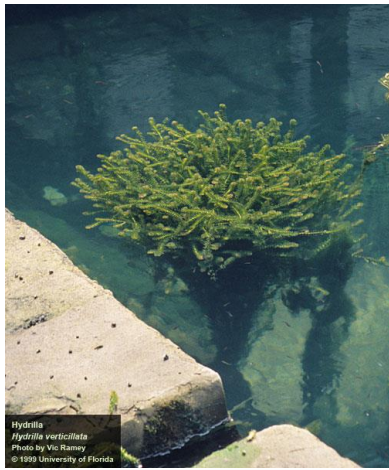


Ditch Systems



Delaware Tax Ditch Map





Hydrilla
Hydrilla verticillata
Photo by VIG Ramey
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Invasive Plant Species

- Delaware Invasive Species Council
- The Delaware Wetland Plant Field Guide



J. Miller, C. Evans



photo by Chris Evans University of Illinois



At Home Stormwater Management

- Rain barrels
- Rain gardens
- Turf conversion to meadow, trees, shrubs, etc
 - Opportunities to diversify services
- Buffers
- Direct gutters away from impervious surface
- Pervious hardscapes



At Home Stormwater Management



Figure 5: Interlocking Pavers in Oxford, MD. Photo by Eric Buehl.



Stormwater Management Resources

- DNREC Division of Watershed Stewardship
 - <http://www.dnrec.delaware.gov/swc/Pages/SedimentStormwater.aspx>
- Conservation Districts
 - Sussex - <https://www.sussexconservation.org/>
 - Kent - <http://kentcd.org/>
 - New Castle - <http://newcastleconservationdistrict.org/>
- Private Consultants



In Summary

- Preventative maintenance is necessary to keep systems functional and in compliance
- Regularly scout stormwater management systems
 - Check flow orifices before rain events, especially bigger storms
- Preventative maintenance will help protect against major system failures



Questions?

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