Stormwater Management Training for MS4 Municipal Employees

Grant Supported Through:
Ohio Environmental Education Fund

In Partnership:

- City of Cleveland Mayor's Office of Sustainability
- Chagrin River Watershed Partners, Inc.
- Cleveland Metroparks-Watershed Stewardship Center
- Cuyahoga Soil & Water Conservation District
- Cuyahoga County Board of Health
- Northeast Ohio Regional Sewer District
- Western Reserve Land Conservancy
- Holden Arboretum
- Central Lake Erie Basin Watershed Group

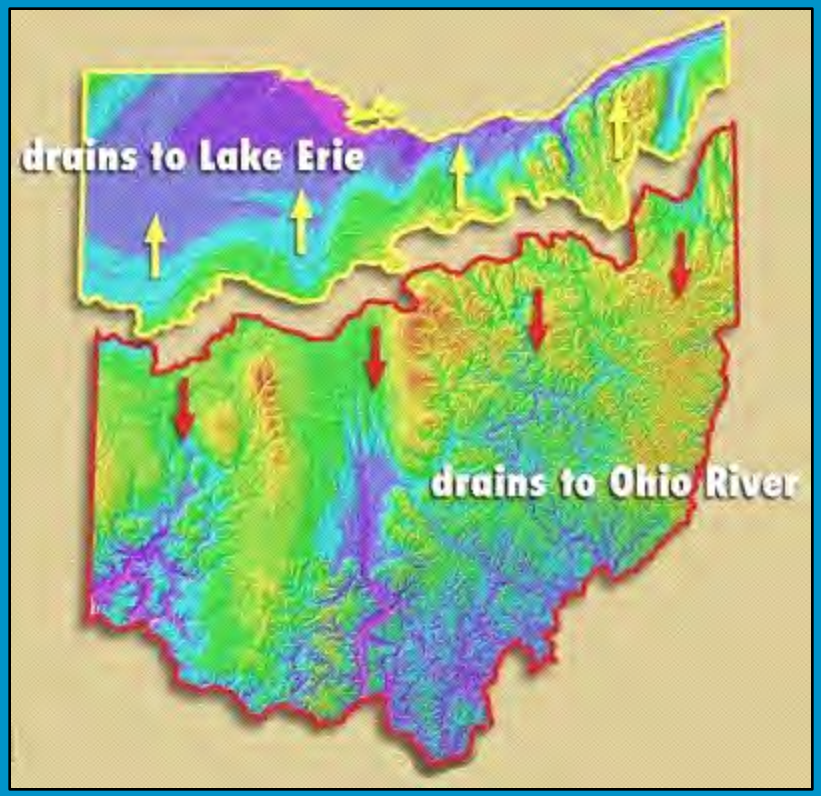
Overview

- Training Session Agenda
  - Pre-Training Survey
  - Presentation & Site Visit
  - Post-Training Survey
- Today's Selected SCM: ***Stormwater Basins***
- Presentation
  - Stormwater Overview
  - Basin Design
  - Basin Maintenance
  - Lessening Maintenance Costs

Other SCM Training Modules

- Bioretention/Rain Gardens
- Permeable Pavement
- Green Roofs & Cisterns
- Urban Re-Forestry

Stormwater Overview: What is a watershed?



Urbanization

% Imperviousness	Impact
2%	No detrimental effect, riparian
7-8%	Buffer remains sound
10%	Stream begins to erode
18%	Aquatic diversity declines
40%	Active stream widening
60%	Massive erosion, natural channel cannot be maintained

SOURCE: Watershed Protection Techniques, Vol. No 3, Fall 1994. The Importance of Imperviousness

Watershed	Impervious Cover (1994)
Euclid Creek	32.6%
Cuyahoga River	31.2%
Rocky River	25.6%
Chagrin River	21.1%
Black River	9.6%
Ashtabula River	8.0 %
Grand River	4.1%

SOURCE: Ohio Nonpoint Pollution Control Program Plan

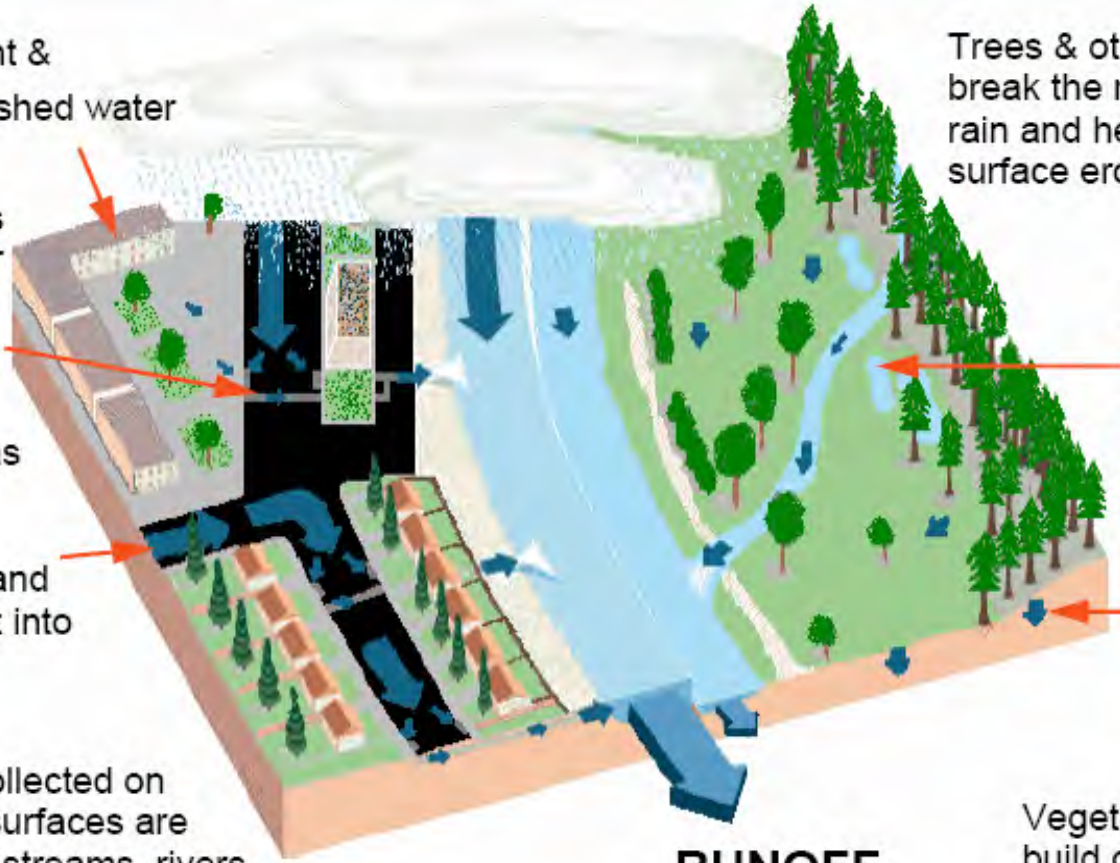
Stormwater

DEVELOPED LANDS

Rain pours more quickly off of city and suburban landscapes, which have high levels of impervious cover

NATURAL LANDS

Trees, brush, and soil help soak up rain and slow runoff in undeveloped landscapes



http://cawalup.usc.edu:3455/cawalup/Home

Stormwater Rules

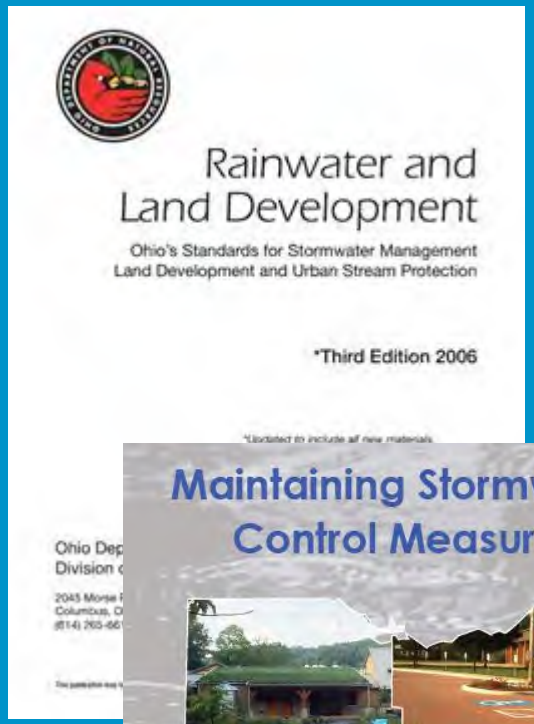
- Municipal Separate Storm Sewer System (MS4)
- Federal Clean Water Act
  - Regulates MS4s in urbanized areas
  - NPDES permit required to discharge from MS4
- State of Ohio
  - ORC 6111 and OAC 3745-39

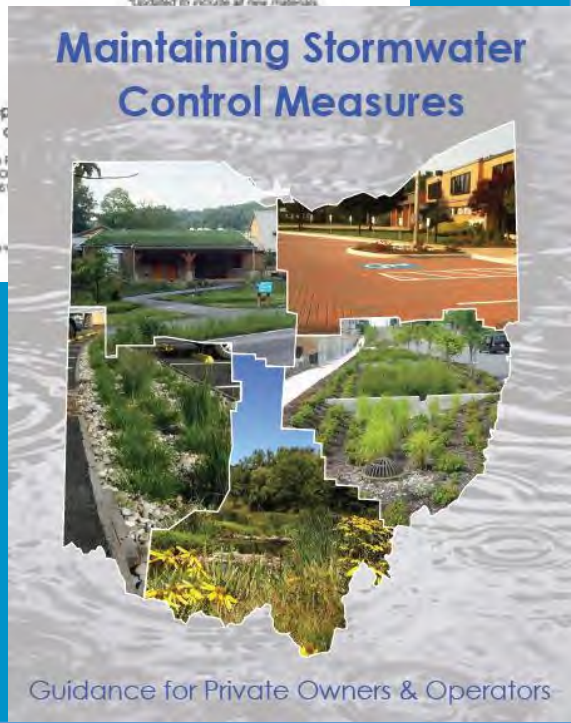
Stormwater Rules

- Communities (MS4s) in urbanized areas must implement six minimum control measures
  1. Public Education & Outreach
  2. Public Involvement & Participation
  3. Illicit Discharge Detection & Elimination
  4. Construction Site Runoff Control
  5. Post-Construction Storm Water Management
  6. Pollution Prevention & Good Housekeeping for Municipal Operations

Stormwater Rules

- Communities (MS4s) in urbanized areas
  - develop and enforce ordinances or resolutions
  - ensure SCM function
  - maintain publicly-owned SCMs
- Landowners
  - maintain privately-owned SCMs





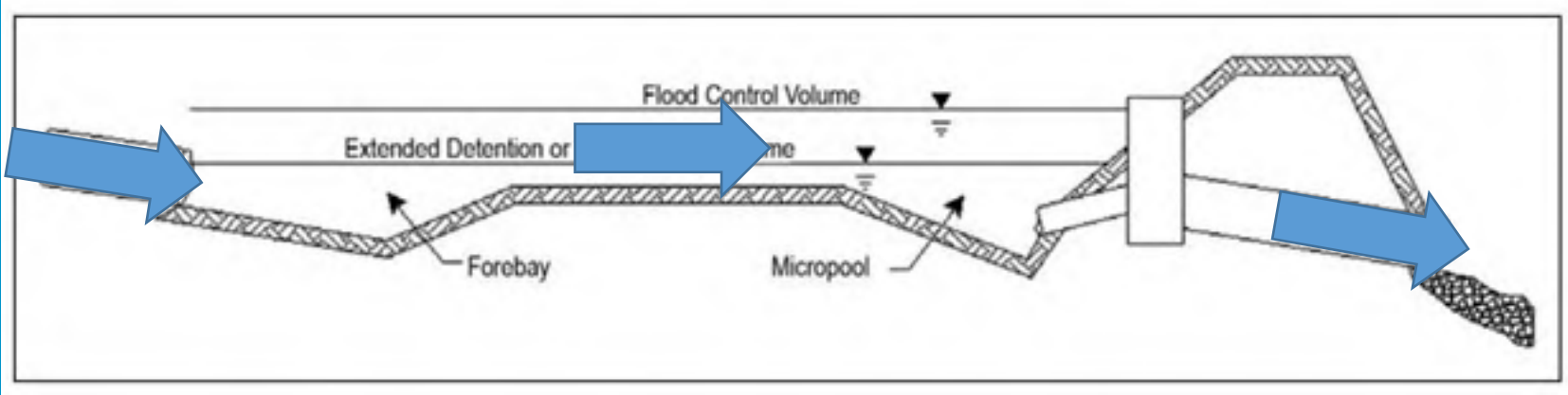
Basin Purpose & Design

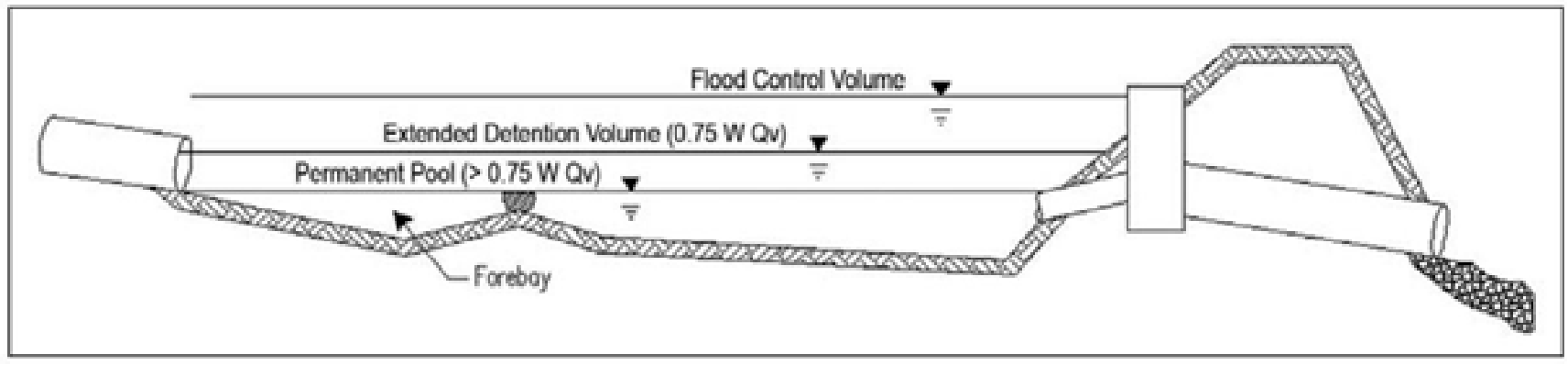
- Control runoff and flooding
- Water quality improvements
- Landscape and aesthetic value
- Designed by licensed engineer specialized for site conditions
  - Watershed size
  - Available space
  - Target pollutant removal
  - Soil types

Basins

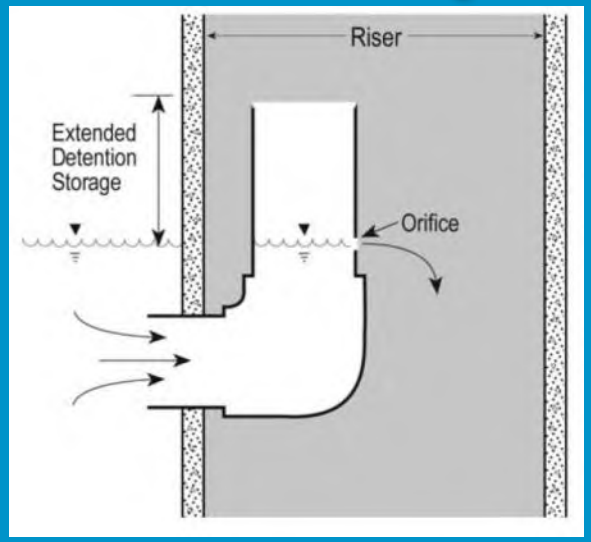
- Designed to store and slowly release stormwater
- Detention (Dry)
- Retention (Wet)
- Quality versus Quantity

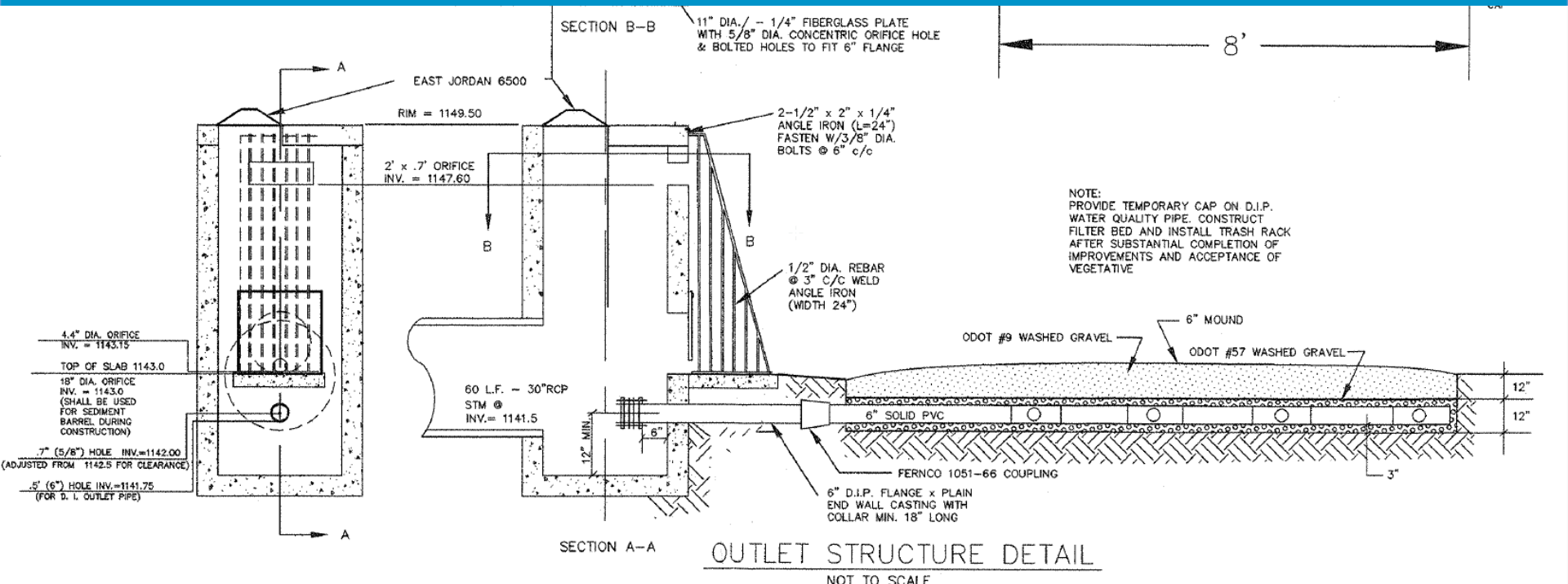
Basin Design



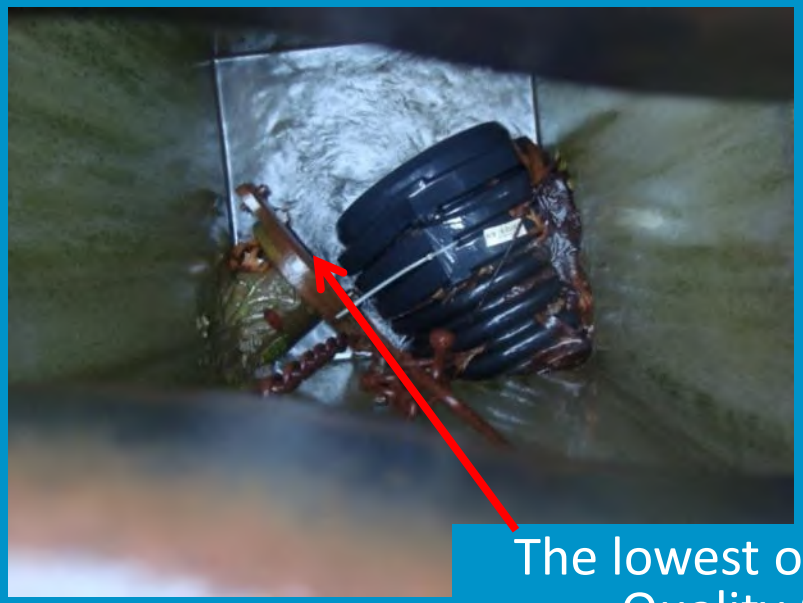


Riser Outlet/Structure



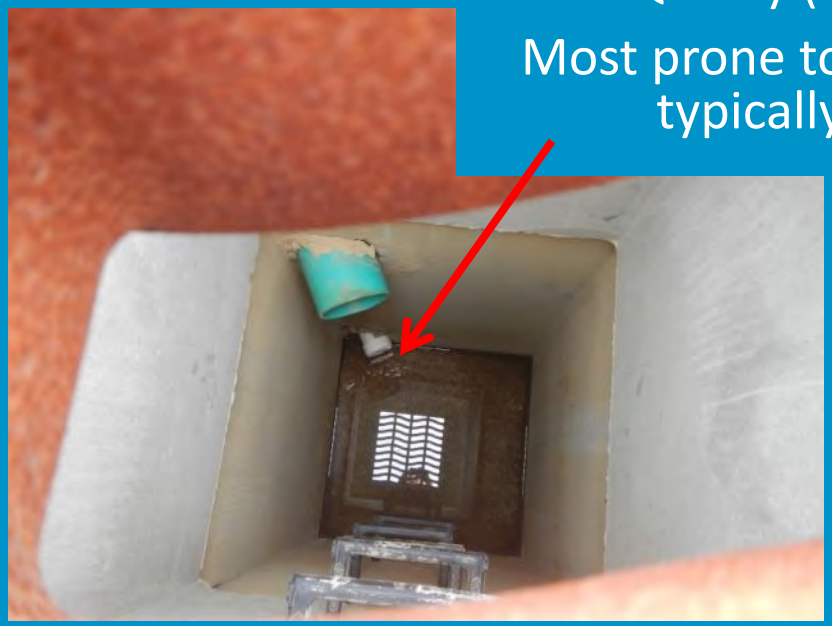


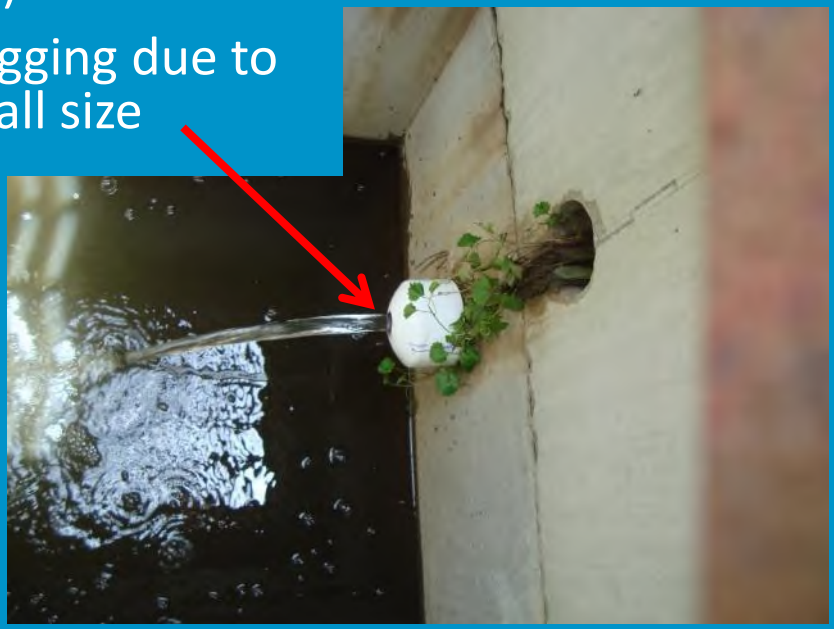
Drawdown Device



The lowest orifice is the Water Quality (WQv) orifice

Most prone to clogging due to typically small size





Emergency Spillway

Trash Rack

Forebays and Micropools

Basin Maintenance

- Why Maintain?
  - Drainage
  - Legal requirements
  - Investment
  - Aesthetics

If a SCM looks good, people are more inclined to respect them and take care of them

Maintenance Categories

- Function
  - Hydrologic (Water)
  - Water Quality
- Aesthetics
- Safety

- Clogged Outlet
- Dying Plants
- Algae Blooms

Elements of Basin Maintenance

- Not the same as Landscape Maintenance
- Good Housekeeping – Prevention of problems
  - Inspect regularly
  - Use a maintenance checklist
  - Focus on preventative maintenance to avoid costly corrective repairs

Basin Needs

- Regular inspection of components
- Specialized mowing – not scalping
- Specialized pruning and landscaping
- Plant management
- Water level management
- Protection from sediment
- Regular trash cleaning

Basin Maintenance

Routine Maintenance:

- Outlet Structures: Keep outlets such as principle spillway pipe, water quality orifice pipe and emergency spillway free from blockage by sediment, debris, or trash.
- Dam/Embankment: Mow grassed dam and embankment of dry pond to prevent establishment of woody vegetation.
- Erosion and Scour: Repair soil erosion or scouring on the side slopes leading into the dry pond or within the bottom or forebay of the dry pond.
- Vegetation Management: Remove woody vegetation from ponding area of dry pond.
- Sediment and Debris: Remove accumulated sediment, debris and trash from the dry pond forebay, low flow channel and ponding area.

Non-Routine Maintenance:

- Excessive Sediment: Remove sediment accumulation from the forebay and ponding area once 50 percent of the ponding storage volume is lost within the dry pond.
- Invasive Vegetation: Treat and remove invasive vegetation from ponding area, side slopes and emergency spillway.
- Outlet Structure: Repair or replace damaged outlet structure.
- Erosion Protection: Repair or replace riprap or stone protection at pipe inlets, pipe outlets or emergency spillway.
- Dam/Embankment: Seek professional consultation if seepage or leaks appear during ponding or erosion is discovered on the dam or embankment of the dry pond.

Outlet Inspection & Cleanout

- Clean outlets regularly
- Clear inlet and outlet flow paths
- Fix any riser structure problems
- Make sure final outlet structures were installed

Bank Mowing and Stabilization

- Erosion and sedimentation
- Mowing high (>3 inches)
- Remove grass clippings
- Fertilize initially
- Don’t over fertilize

Trash Removal & Aeration

- Clogs outlets

*A boat may be required

- Stagnant Water = Mosquitos

Dam Mowing and Stabilization

- Keep clear of trees and shrubs
- Mow dams on a schedule
- Look for saturated soil, sediment deposits, flowing water at base or rear face of dam
- Look for seepage, cracks, leaks and rust stains, or bulges

Vegetation Management

- Constant maintenance required
  - Remove invasive mat-forming vegetation
  - Remove algae (can be composted!)
- Consider subletting aquatic weed control
  - Mechanical and chemical options
  - License required for herbicide application

Forebay Cleanout

- Remove sediment from forebay and regrade
  - accumulated sediment exceeds 50% of forebay volume
  - sediment depth is 1 ft from water surface
  - see design
- Typical forebay sediment is NOT toxic and can be land applied

Sediment Removal

- Drain and Excavate
  - Equipment access?
  - Area for de-watering?
- Shore Excavation
  - Long reach excavator
  - Suitable for small basins
- Barge Excavation
- Suction Dredging
  - Certified divers needed
- Portable Hydraulic Dredge
  - Floating Vacuum

SOURCE: http://www.aquaticweedcontrol.com/

SOURCE: http://www.dredgeamerica.com/

Rodent Management

- Address Burrows
- Hole filling and stomping
- Hire a licensed trapper if needed

Security

- Attractive nuisance
- Maintain fencing and gates
- Signage to discourage vandalism
- Grate unsafe inlet or outlet openings

Typical Maintenance Activities Schedule

- Routine Maintenance
  - Monthly – mowing, removal of trash and debris
  - Annual – Remove woody vegetation, monitor sediment accumulation
  - Semi-annually – inspect and treat/remove invasive plants
- Non-Routine Maintenance
  - 3-7 Years – Remove sediment from Forebay
  - 15-20 years – Dredge basin

Schedule	Activity
Monthly	Mow embankment and clean trash and debris from outlet structure. Address any accumulation of hydrocarbons.
Annually	Inspect embankment and outlet structure for damage and proper flow. Remove woody vegetation and fix any eroding areas. Monitor sediment accumulations in forebay and main pool.
Semi-Annually	Inspect wetland areas for invasive plants.
3-7 years	Remove Sediment from forebays.
15-20 years	Monitor sediment accumulations in the main pool and clean as pond becomes eutrophic or pool volume is reduced significantly.

Table 2.6.3
Ohio DNR Rainwater and Land Development Manual

Basin Maintenance Required

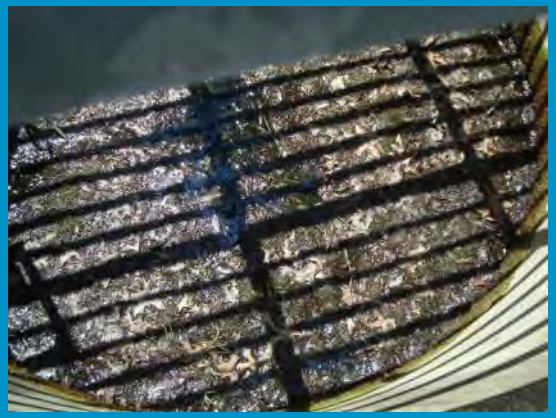
Excessive Sediment

Dam, bank, or spillway erosion, blockage, woody veg

Algae blooms over 1/3 pond surface

Blocked orifice, micropool, forebay

Basin Maintenance Required



Blocked Outlet

Erosion

72+ Hour standing water

Excessive or invasive vegetation

Animal burrows or beavers in the plunge pool

Basin Maintenance Required

Water Seepage

Foul Odors

Perimeter Fencing

Lessening Maintenance Costs

- No neglect
- No dumping
- No pet waste
- Vegetate bare soils
- Don’t over fertilize
- Protect from salt
- Keep the watershed clean
- Plant native vegetation

Field Site Visit

- Place site specific photo here


Questions?