

Stormwater BMP Inspection and Maintenance in North Carolina

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<https://www.bae.ncsu.edu/topic/bmp-im/>

NCSU Stormwater BMP Inspection & Maintenance Certification Workshops

Certification

Classes

List of Certified Professionals



Register Here!



BMP I&M

- NCSU has been teaching it for 10 years
- Just certified our 3000th person
- We teach it all over the country

In practice, who does the work

Inspections

- Engineers, Landscape Architects, and local govt. officials do annual inspections

Maintenance

- Private landscape companies
- Private BMP maintenance companies
- Local govt. maintenance crews

Trash rack



15 years later.....



15 years later.....



Why Are We Here?

Cary Stormwater BMPs 2008

- Approximately 425 BMPs in Cary
- According to one of Cary's inspectors: Timothy Grady, RLA:
- 95% of BMPs fail initial inspection as they require repairs
- Most repairs are maintenance related: erosion, trash removal, tree removal

Why Are We Here?

Cary Stormwater BMPs 2010

- Updated compliance tracking program developed by Town of Cary to ensure SCMs are inspected and functional each year by established deadlines.

Cary Inspection Program Requirements

- Annual report with photos
- Submitted electronically
- Inspection by qualified professional
- 30 days to correct if failed
- NOV and enforcement afterwards

Why Are We Here?

Cary Stormwater BMPs 2014

- Approximately 950 BMPs in Cary
- Cary has digital tracking system for BMPs
- Strong educational program for contractors
- Must pass initial inspection to get C/O
- ~ 95% pass first annual inspection now

Why Are We Here?

Cary SCMs 2014

- Owners List Requirement:
 - Recorded deed
 - O&M manual
 - O&M Agreement
 - Survey plat of structure with access easement
 - Maintenance security deposit
 - Recorded stormwater control structure and assess easement
 - Certification of SCM by PE
 - Record drawings and name of PE and contractor
 - Soils report for bioretention devices in Jordan watershed (P level)

Do we need SW management?



North Carolina Wildlife Resources Commission

Licensing ▾

Conserving ▾

Hunting ▾

Trapping ▾

Fishing ▾

Boating ▾

Learning ▾

Outdoor Activities ▾

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Learning > Species > Fish > Trout > Mountain Trout Fishing Economic Impact

North Carolina Trout Anglers Contribute Significantly to Economy

RALEIGH, N.C. (May 23, 2017) — Trout fishing opportunities provided by the N.C. Wildlife Resources Commission have substantial economic effects on North Carolina's economy, according to a recent study conducted by Responsive Management and Southwick Associates.

Nearly 149,000 trout anglers fished approximately 1.6 million days in 2014, and the effects these trout anglers had on North Carolina's economy totaled an estimated \$383 million, according to the study, "Mountain Trout Fishing: Economic Impacts on and Contributions to North Carolina's Economy." This dollar amount represents anglers' direct spending, such as purchase of fishing equipment, food, and accommodations, as well as secondary spending by businesses associated with trout angling and their employees.

The study also found that money spent on trout fishing in 2014 supported approximately 3,591 jobs.

\$383 million/25 counties=

\$15.32 million per mountain county

Professional Roles

- A Professional Engineer (PE) – and in many cases a Registered Landscape Architect (RLA) – must “sign off” on the initial construction/ performance
- A PE or RLA is needed to verify that a BMP is working
- Any recommendations that would affect the design of the BMP need to be made by a PE/ RLA.

Spraying.....

- If you 'spray for pay' you must have a commercial pesticide license
- You can spray on your own property yourself with no license

N.C. Ag. Chem. Manual

NC STATE EXTENSION

NC Cooperative Extension Resources

Resource Catalog

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2017 North Carolina Agricultural Chemicals Manual

2017 North Carolina Agricultural Chemicals Manual

Introduction

The North Carolina Agricultural Chemicals Manual provides extension specialists and agents, researchers, and professionals in the agriculture industry with information on the selection, application, and safe and proper use of agricultural chemicals. The manual is revised annually offering a wealth of up-to-date and reliable information covering pesticides, fertilizers, application equipment, specimen identification, growth regulators, and the control of insects, diseases, weeds, and animals.

This edition was prepared by the College of Agriculture and Life Sciences at North Carolina State University and by an editorial committee consisting of Joseph C. Neal, Horticultural Science, Chair; Alan York, Crop and Soil Sciences; Carl R. Crozier, Crop and Soil Sciences; Barbara Shew, Entomology and Plant Pathology; Hannah J. Burrack, Entomology and Plant Pathology; Travis Gannon, Crop and Soil Sciences; Christopher S. DePerno, Forestry and Environmental Resources; Gary T. Roberson, Biological and Agricultural Engineering; Wayne G. Buhler, Department Head Representative; Thomas A. Melton, Administrative Advisor; and James W. Burnette Jr., Structural Pest Control & Pesticide Division, North Carolina Department of Agriculture & Consumer Services.

Chemical Control of Aquatic Plants

Yards			
and Trade of Action Code	Amount of Formulation	Ingredient Rate or Concentration	Precautions and Remarks ¹
Algae, blue-green			
copper sulfate (various)	See label	0.5 to 1 ppm	Apply crystals or powder at early stage of growth by any method to give rapid and uniform dispersion. For best results, apply on a clear day. Do not apply to muddy water. Warning: Copper is toxic to fish. Formulated copper products have a greater margin of safety to fish.
sodium carbonate peroxyhydrate (various)	See label	0.3 to 1.7 ppm	Apply with 8 to 10 hours of daylight remaining. Do not reapply within 48 hours.
Algae, filamentous and planktonic			
copper complex (various)	0.8 gal/acre ft	0.2 ppm	Dilute with water in ratio of at least 3-to-1 and apply uniformly. For best results, apply on a clear day and break up floating mats of filamentous algae before treatment. Warning: Copper is toxic to fish.
copper sulfate (various)	See label	0.5 to 1 ppm	Same as under Algae, blue-green. For best results break up floating mats of filamentous algae before treatment. Warning: Copper is toxic to fish. Formulated copper products have a greater margin of safety to fish.
diquat (Ravant) 2.8 gal MCA 22	See label	0.18 to 0.37 ppm	For certain filamentous algae—Pithophora spp. and Zyngone spp. Check label for application instructions. For best results, break up floating mats before treatment.
Algae, macro, chara, sabella			
copper complex (Cultrine Plus Granular) 3.7 G	88 lb/acre ft	2.2 ppm	Distribute granular formulation evenly over infested area when plants are young. If chara is in water less than 3 ft deep or growth is near the surface, the liquid formulation may be used. Dilute with water in ratio of at least 3-to-1 and apply uniformly. Warning: Copper is toxic to fish.
Cultrine Plus 10.9 liquid (N-Tex) 0.8 gal/acre ft	1.2 gal/acre ft 1.7 to 3.4 gal/acre ft	0.4 ppm 0.0 to 1.0 ppm	
Algae, Pithophora and diatoms			
ferrous sulfate (Copper) 51% MCA 14	0 to 12 oz/A	3 to 6 oz/A or 100 to 400 ppm	Early morning applications may be more effective. If vegetation is dense, treat in sections to avoid reducing dissolved oxygen. Water pH greater than 7.8 will reduce effectiveness.

Consider low impact practices: Pulling willow seedlings



test

Stormwater BMP Maintenance & Inspection

Flame weeds rather than spray them....



Engineer/ Inspector



Our Team

Thanks for visiting Kris Bass Engineering. After 10 years at NCSU, I have started my own small engineering firm. My hope is to bring my experience with innovative and practical solutions to a wider range of projects and clients. I am passionate about providing accessible expertise and tackling challenging issues. We can provide turn-key design for many size projects and also provide specialized services for your team.

Experience

- 150+ stormwater inspections annually
- 20,000+ feet of stream restoration design
- 1,000+ acres of wetland restoration design
- 15+ stormwater wetland designs and at least 10 other stormwater BMP projects
- Provided support and instruction at over 20 workshops

Contact Us

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Raleigh, NC 27606

Areas of Expertise

Stormwater Inspection Services
Innovative Stormwater Design



Maintenance Contractor



Raleigh, NC 919-772-8548
Charlotte, NC 704-344-9800
888-LAKEMGT (525-3648)

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North Carolina
Stormwater BMP Specialists



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- [Price List](#)
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Stormwater BMP Compliance Inspections



Receiving Channel - Before



Receiving Channel - After



RLA/Inspector



G2 Design, PA has been on the forefront of providing stormwater treatment facility (BMP) consulting throughout North Carolina and remains an industry leader for BMP Inspections and related services. The depth of our BMP consulting is evidenced by our extensive on-site experience, commitment to education and dedication of company resources. Additionally, our working relationship with local municipalities and understanding of the varying inspection protocol requirements enables us to provide efficient and thorough services.

Serving a diverse range of clients from the single BMP/property owner to clients with multiple BMP's such as HOA's, commercial management companies and national retail chains, our services cater to the specific and unique needs of each. A comprehensive approach separates us from other consultants that offer one-dimensional services providing only inspections. *G2 Design* provides a "cafeteria style" selection of BMP services that addresses issues on all levels. Ultimately this approach allows you the flexibility to choose what best accommodates your needs, benefiting you directly by reducing liability as well as saving you money on future repairs.

G2 Design is fully licensed, insured and certified to assist you throughout North Carolina with the following **BMP Services**:

- ◆ **Annual Maintenance Inspections**
- ◆ **Multi-BMP Site Inventory, Inspections and Administration for Municipal, Corporate and National Clients**
- ◆ **Pre-Certification Construction Observation**

Pond Repair Case Study

- Commercial development wet pond was modified to overflow – riser began to leak
- Inspection showed lack of anti seep collar
- Pond was drained
- Concrete anti- seep collar was retrofitted
- \$13,000 repair job

Inspector/Diver/Maintenance













SCHWING WP 750-18X



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*On time.
Done right.*

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919.5

Greenscape / Greenscape News & Blog / Company News / Green Team Member Earns Certification in Stormwater BMP Inspection & Maintenance

Green Team Member Earns Certification in Stormwater BMP Inspection & Maintenance

January 9th, 2015 by Greenscape

Fuquay-Varina, NC – Greenscape Inc. today congratulated team member **Michael Bird** for his recent training and certification in stormwater BMP inspection and maintenance. The BMP certification will enable Bird to inspect and maintain these necessary water quality treatment devices in North Carolina.

“We’re proud of Michael for taking the initiative to learn more about stormwater management and become certified to inspect and maintain BMPs,” says Daniel Currin, President and CEO of Greenscape. “Greenscape has always been very focused on training for our team members. We’re excited that Michael has added another skill to his industry knowledge base.” Bird is an Associate Client Relations Manager. He joined the Green Team in 2013.



Opportunity via Regulation

The screenshot shows the EPA website's navigation bar with links for 'Learn the Issues', 'Science & Technology', 'Laws & Regulations', and 'About EPA'. A search bar is located on the right. The main content area is titled 'National Pollutant Discharge Elimination System (NPDES)' and features a sidebar with a tree view of program areas. The 'Stormwater' section is expanded, showing sub-categories: 'Construction Activities', 'Industrial Activities', 'Municipal Sources', and 'Transportation Sources'. The main content area displays the 'NPDES Stormwater Program' title, followed by a list of program areas and a list of links for more information. A 'Problems with Stormwater Pollution' section is also visible at the bottom.

EPA US Environmental Protection Agency

Learn the Issues Science & Technology Laws & Regulations About EPA

Search EPA.gov

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National Pollutant Discharge Elimination System (NPDES)

NPDES Stormwater Program

NPDES stormwater program areas:

- [Stormwater Discharges from Construction Activities](#)
- [Stormwater Discharges from Industrial Activities](#)
- [Stormwater Discharges from Municipal Sources](#)
- [Stormwater Discharges from Transportation Sources](#)
- [Oil and Gas Stormwater Permitting](#)
- [EPA's Residual Designation Authority](#)
- [Stormwater Maintenance](#)
- [Long-Term Stormwater Planning](#)

For more information on the stormwater program:

- [Long-Term Stormwater Planning](#)
- [Stormwater rules and notices](#)
- [Stormwater webcasts](#)
- Customizable stormwater outreach materials - Coming Soon

Problems with Stormwater Pollution

Stormwater runoff is generated from rain and snowmelt events that flow over land or impervious surfaces, such as paved streets, parking lots, and building rooftops, and does not soak into the ground. The runoff picks up pollutants like trash, chemicals, oils, and dirt/sediment that can harm our rivers, streams, lakes, and coastal waters. To protect these resources, communities, construction companies, industries, and others, use stormwater controls, known as best management practices

Maintenance is part of the permit in many places

The screenshot shows the EPA website's National Pollutant Discharge Elimination System (NPDES) page. The main heading is "Stormwater Maintenance". A sub-heading reads "Mark your calendars. It's time for spring cleaning." Below this is a small image of a tree and a paragraph of text. To the right of the text is a quote in italics. A left-hand navigation menu lists various NPDES program areas, with "Stormwater" selected.

EPA US Environmental Protection Agency

Learn the Issues | Science & Technology | Laws & Regulations | About EPA


Search EPA.gov

National Pollutant Discharge Elimination System (NPDES)

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Stormwater Maintenance

Mark your calendars. It's time for spring cleaning.



With the advent of spring and the beginning of summer, we are taking this opportunity to focus on some "spring cleaning" activities. It's time for maintenance! So break out your list of stormwater controls, maintenance schedules, and inspection forms, find a pen, pencil, or computer, and let's start prioritizing and cleaning!

Now is the time to consider developing an operation and maintenance (O&M) plan or manual if you don't already have one. O&M plans may include basic elements such as:

- Identification of the parties responsible for maintenance
- Maintenance schedules
- Inspection requirements
- Frequency of inspections
- Easements or covenants for maintenance
- Identification of a funding source
- Description of basic maintenance activities like weeding,

"All stormwater management systems, whether gray or green, require maintenance. Appropriate operation and maintenance activities ensure that stormwater practices will continue to function properly and yield expected water quality and environmental benefits, protect public safety, meet legal standards, and protect

NPDES Home
About NPDES
All NPDES Program Areas
Animal Feeding Operations
Aquaculture
Forest Roads
Industrial Wastewater
Municipal Wastewater
National Pretreatment Program
Pesticide Permitting
Stormwater
Vessels Incidental Discharge Permitting
Water Quality Trading
NPDES Technical Resources

BMP I&M is good for Business *and* the Environment

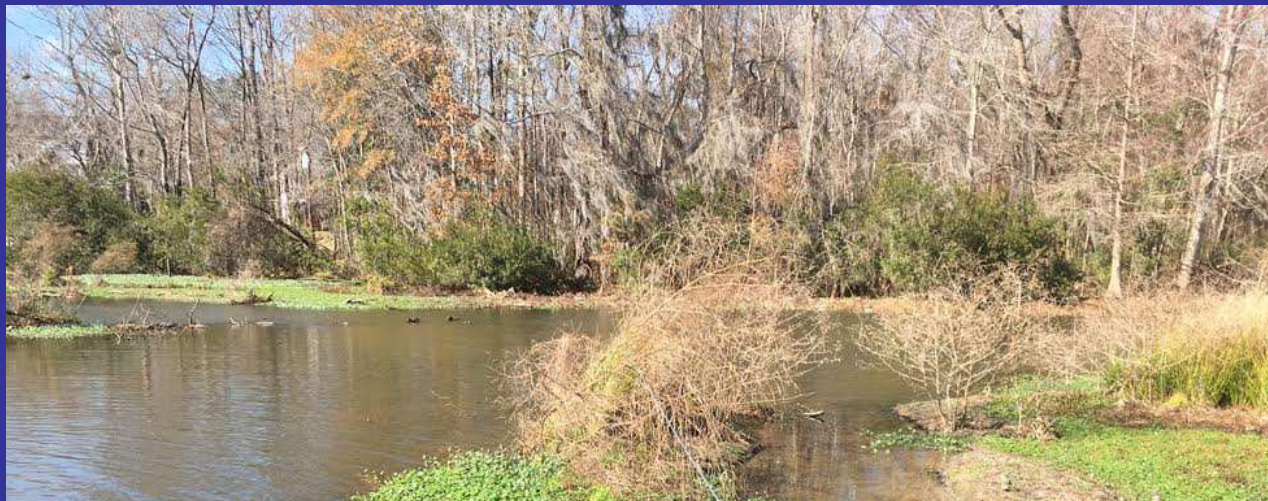
- Landscape maintenance business goes up and down with the economy
- BMP I&M is required by many communities
- Companies are starting (and flourishing) that do nothing but BMP I&M



Mobile Dredge

courtesy of DragonFly Pond Works







'Low input' Maintenance

EDGE ENVIRONMENTAL, INC

All you have to do is call – We'll take care of the rest.

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Welcome to the web home of Edge Environmental, Inc!

Edge is a locally-owned, North Carolina Triangle-based company, and we're proud to be the Triangle's premier company for stormwater pond management!

We have been in business for over 10 years, and our staff brings together 40 years of experience, offering you:

- Full Service Pond Management Specialists
- Professional Erosion Control
- License in North Carolina Storm
- Water BMP Inspection & Maintenance
- On Staff CPESC, CPSWQ with a MS & BS in Environmental Science

At Edge...

We make life easy for property managers by coordinating all work related to the inspection and maintenance of the stormwater management system. All you have to do is call - we will take care of the rest.

Recent Projects

- Bedford at Falls River
- Briar Creek Shopping Center
- Triangle Town Center
- Wakefield Plantation
- Heritage of Wake Forest
- Southbridge
- Walmart Stores
- Long Lake
- McCrimmon at the Park

Call Us



Seining Algae





Wet filter strip below LS



#1 Filter Strip Complaint



Solution: plant wetland plants





About BMP East, Inc

Retention Pond Maintenance, Service and Management

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BMP East, Inc.

John Brown started BMP East, Inc. after years of living on the East Coast and observing, first hand, the damaging effects of poorly managed water resources. John's background is research-based, and his education is in applied cultural anthropology with a minor in oceanography. He has been involved in numerous water-based research grants and CAMA (Coastal Area Management Act) access issues. It was through this research John first realized how harmful poor water quality is to the environment and humans. As an ongoing effort to better the quality of water, improve coastal living, and protect the environment, John started BMP East, Inc. specializing in stormwater management.

Our staff is college educated and certified as BMP specialists. We have the highest level of certification by NC's DOT as level 1 NC DOT Erosion & Sediment Control Specialists, and we are certified as NC Stormwater Best Management Practices Inspection & Maintenance Professionals. We have an extensive background in research and implementation of regulatory issues. All of which, have built the foundations of our BMP management practices.

BMP East, Inc. cares about clean water for all.

Case Study: Vegetation repair

- Poor vegetative cover and eroding soils are one of the most common reasons for NOVs on ponds, wetlands, and bioretention
- One contractor specializes in soil and ground cover remediation



Maintenance Techniques.... 'Sorry Soil Remediation.....'



Maintenance Techniques.... 'Sorry Soils.....'



Maintenance Techniques.... 'Sorry Soils.....'



Maintenance Techniques.... 'Sorry Soils.....'



Maintenance Techniques.... 'Sorry Soils.....'



Maintenance Techniques.... 'Sorry Soils.....'





test

Stormwater BMP Maintenance & Inspection

Keep it Simple: Pull vs Spray?



SMURF case study

- Santa Monica California
- High value water resource: Beach
- High value urban landscapes
- Scarce and expensive irrigation water











Every day, water travels into the Santa Monica Bay from our storm drain system, collecting garbage, pollutants and germs along the way. When the Santa Monica Urban Runoff Recycling Facility (SMURRF) cleans the water from the Pico-Kenter and Pier Storm Drains, the Bay is cleaner. As a result, you, your family and our marine life are all healthier and safer.

HOW DOES SMURRF PROTECT THE BAY?







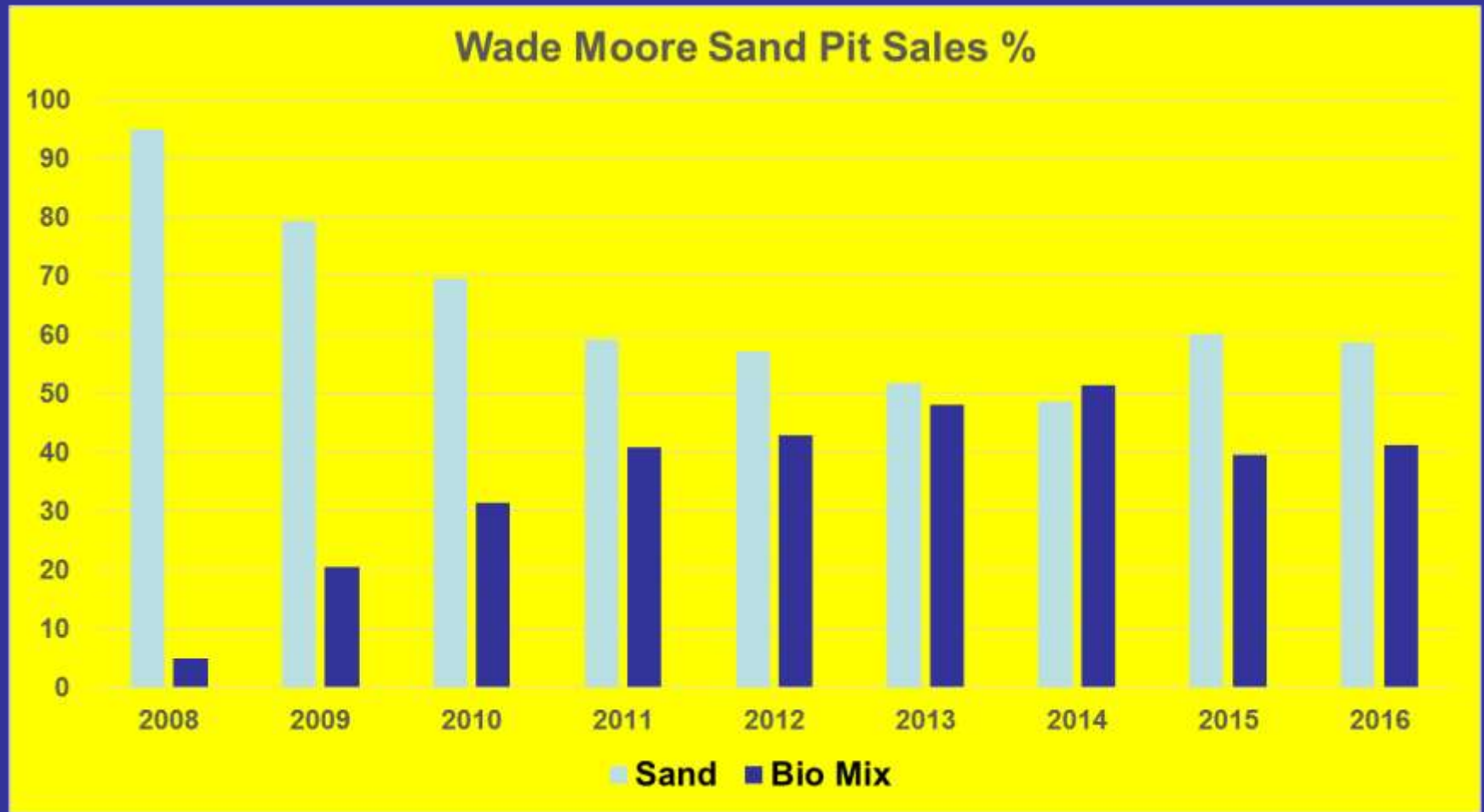


The Business of BMP I&M suppliers

- Wade Moore Sand Co.,
Louisburg, NC
- Concrete sand \$8.00/T
- Bioretention mix
\$14.00/ton



The Business of BMP I&M suppliers



Maintenance Techniques: Simple media sampling



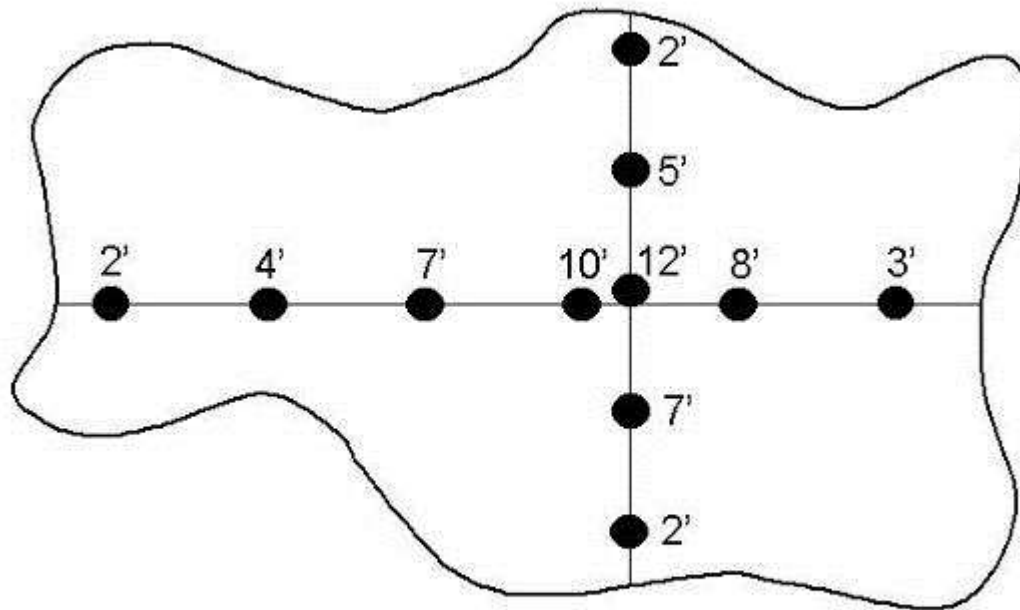
Simple pond and forebay depth measurement

- Get a set of plans to determine design depth or create benchmark depth at first inspection
- Measure forebay depth if present



Pond or forebay capacity measurement

(measure across 2 transects)



Remote Depth Measurement







A Depth Finder!