Monitoring Study Designs To Protect Your Stormwater Investment

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About the Center for Watershed Protection

- Non-profit 501(c)3, non-advocacy organization
- Work with watershed groups and local, state and federal governments
- Provide tools to manage watersheds and protect and restore streams, lakes and rivers
- 20 staff in Ellicott City, MD
- 2 websites

  www.cwp.org

  www.stormwatercenter.net

CENTER FOR WATERSHED PROTECTION

Monitoring to Demonstrate Environmental Results: Guidance to Develop Local Stormwater Monitoring Studies Using Six Example Study Designs

- Guidance manual for NPDES Municipal Separate Storm Sewer System (MS4) communities
- Monitoring as part of stormwater program portfolio of tools
- Move from output to outcome based

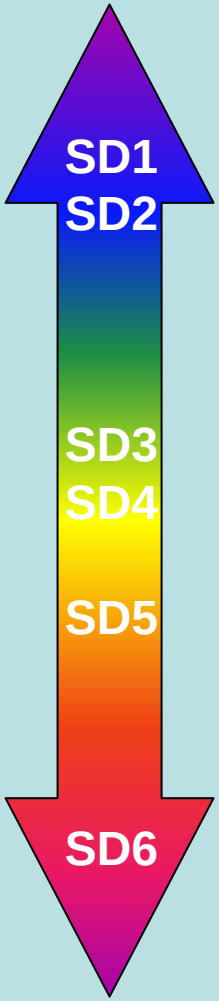
- *6 "minimum management measures" for NPDES Phase II communities:*
  1) Public education/outreach
  2) Public participation/involvement
  3) Illicit discharge detection
  4) Construction site sediment and erosion control
  5) Post-construction runoff control
  6) Pollution prevention

General approach to develop and implement an monitoring plan

I. Determine local monitoring needs
II. Scope out a specific study
III. Implement the monitoring plan

Six Monitoring Study Designs:
Key aspects of stormwater program

- **Study Design 1**: Quality of Stormwater at the Outfall
- **Study Design 2**: Source Area Monitoring
- **Study Design 3**: Performance Monitoring of Individual Stormwater Treatment Practice
- **Study Design 4**: Implementation and Longevity Surveys of Stormwater Treatment Practices
- **Study Design 5**: Monitoring Public Education Programs to Improve Water Quality
- **Study Design 6**: Cumulative Effect of Treatment at the Catchment Scale: Paired Watershed Studies



"Just getting started"

"Well established"

Study Design 6: Cumulative Effect of Treatment at the Catchment Scale

Study Design 6: Cumulative Effect of Treatment at the Catchment Scale

- Do these stormwater practices and programs really make a difference to improve our streams?
- Examples
  - Jordan Cove, CT (2007)
  - Lake Champlain, VT (2007)
  - City of Burnsville, MN (2006)

Study Design 6: Cumulative Effect of Treatment at the Catchment Scale

I. Determine local monitoring needs
   - Define monitoring objective
   - Relate management issue to monitoring objective

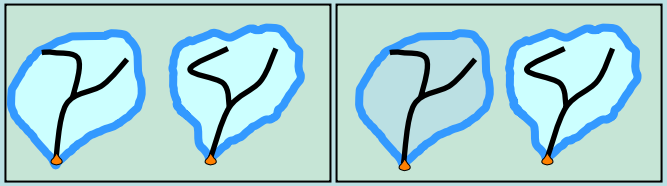
Management issue: The effectiveness of stormwater treatment in meeting water quality goals or criteria

Monitoring objective: Determine the runoff reduction and nutrient removal that can be achieved from bioretention practices that receive runoff in a residential catchment

Study Design 6: Cumulative Effect of Treatment at the Catchment Scale

II. Scope out monitoring study

- Select study design
- Determine data &resource needs
- Select study sites
- Develop monitoring plan (to incl. QA/QC)



(From Meals and Dressing, 2008)

Study Design 6: Cumulative Effect of Treatment at the Catchment Scale

Determine the runoff reduction and nutrient removal that can be achieved from bioretention practices that receive runoff in a residential catchment

- Select study design
  - Paired watershed
  - 2 similar watersheds (control and treatment)
  - 2 study periods (calibration and treatment)

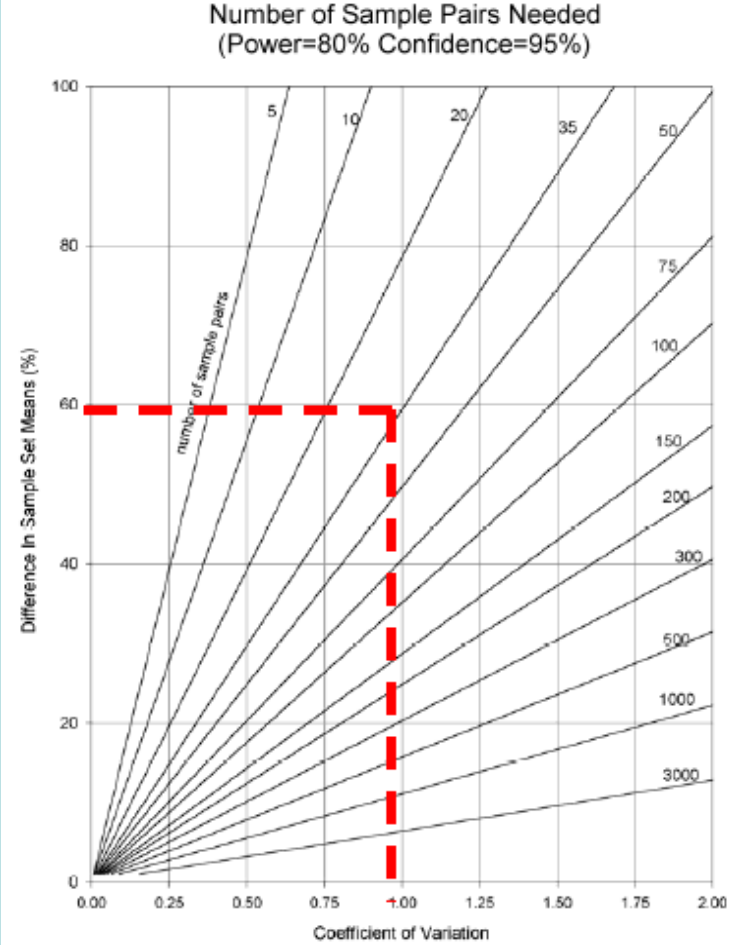
Period	Catchment	
	Control	Treatment
Calibration	Undeveloped, no STPs	Undeveloped, no STPs
Treatment	Undeveloped, no STPs	Developed, STPs

Study Design 6: Cumulative Effect of Treatment at the Catchment Scale

- Data & resource needs
  - Select parameters – *runoff volume, nutrients (N, P)*
  - Monitoring effort *to get reliable data* – *staff and homeowner involvement, flow and water quality data*

Getting reliable data

How much data?



Who is going to collect it?

Study Design 6: Cumulative Effect of Treatment at the Catchment Scale

- Data & resource needs
  - Select parameters – *runoff volume, nutrients (N, P)*
  - Monitoring effort *to get reliable data* – *staff and homeowner involvement, flow and water quality data*
  - Equipment needs – *automated samplers, construction*
  - Budget – *monitoring and construction equipment, sample analyses, supplies, training*

Select study sites

Catchment type	Recommended Characteristics
All study catchments	•Similar physical characteristics, size and location •Homogenous land use •No recent land use changes
Control	•No planned changes •Represents conditions in treatment catchment prior to development or pre-treatment
Treatment	•Treatment applied across catchment •No planned changes other than treatment

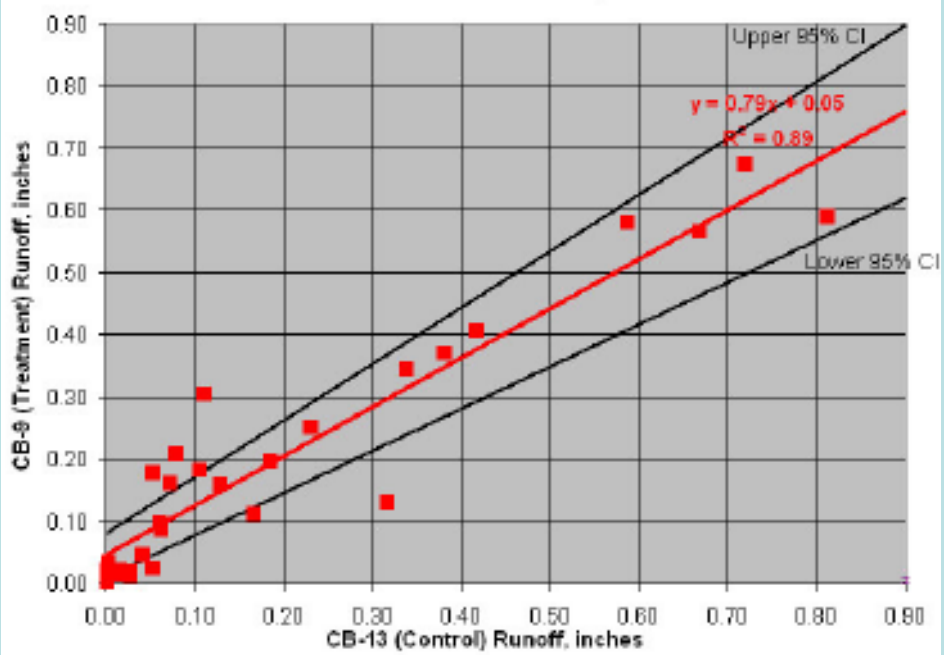
Most appropriate scale 50 – 500 acres

From Barr (2006)

Study Design 6: Cumulative Effect of Treatment at the Catchment Scale

III. Implement Monitoring Plan

- Collect field data
  - Calibration
  - A phased approach

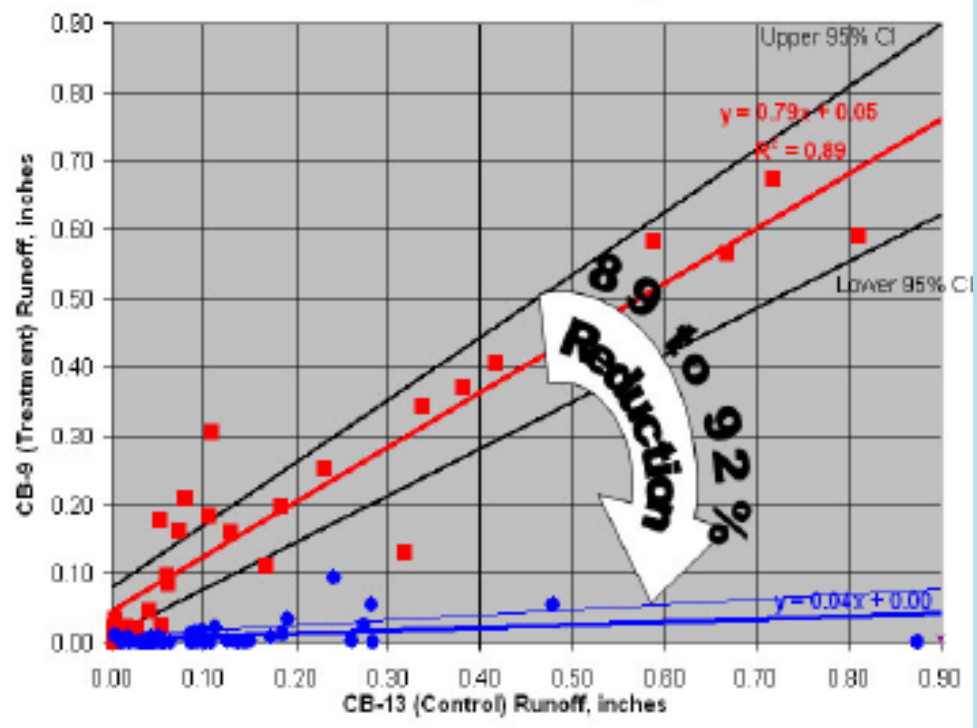


A phased approach is useful to identify issues/problems

- The only thing predictable about monitoring is that it is unpredictable
- Accounting for the ‘human factor’
  - Why isn’t it raining?
  - Where’s the rain gauge…again?
  - What’s this spike in TSS about?
  - Where did these lawn clippings come from – they’re blocking the sampling intake?
  - Why wasn’t I invited to the party? (aka ‘public’ access issues at the monitoring site)

III. Implement monitoring plan

- Lab analysis
- Evaluate data and report
  - Treatment period regression
  - Is there is difference and if so, what is the magnitude of the difference?



Monitoring

- Results provide information to support stormwater program
  - Investment ‘tracking’
  - Tangible results
  - Increased understanding of local needs
- Guidance manual available June 2008

http://www.cwp.org

Stormwater Institute

Does this about sum up your Stormwater program?

The Southeast Stormwater Institute is an intensive, interactive three-day learning experience specifically designed to help public and private sector stormwater professionals:

- Develop or improve municipal stormwater programs, particularly NPDES Phase II permit programs;
- Strengthen stormwater design, construction, and maintenance skills for innovative practices in coastal and non-coastal settings; and
- Understand and apply volume reduction criteria, green infrastructure credits, and the new Georgia Coastal Stormwater Supplement.

SAVE THE DATE!
October 14-16, 2008
Savannah, GA

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Registration coming soon: www.cwp.org