

# **Returning To Our Roots**

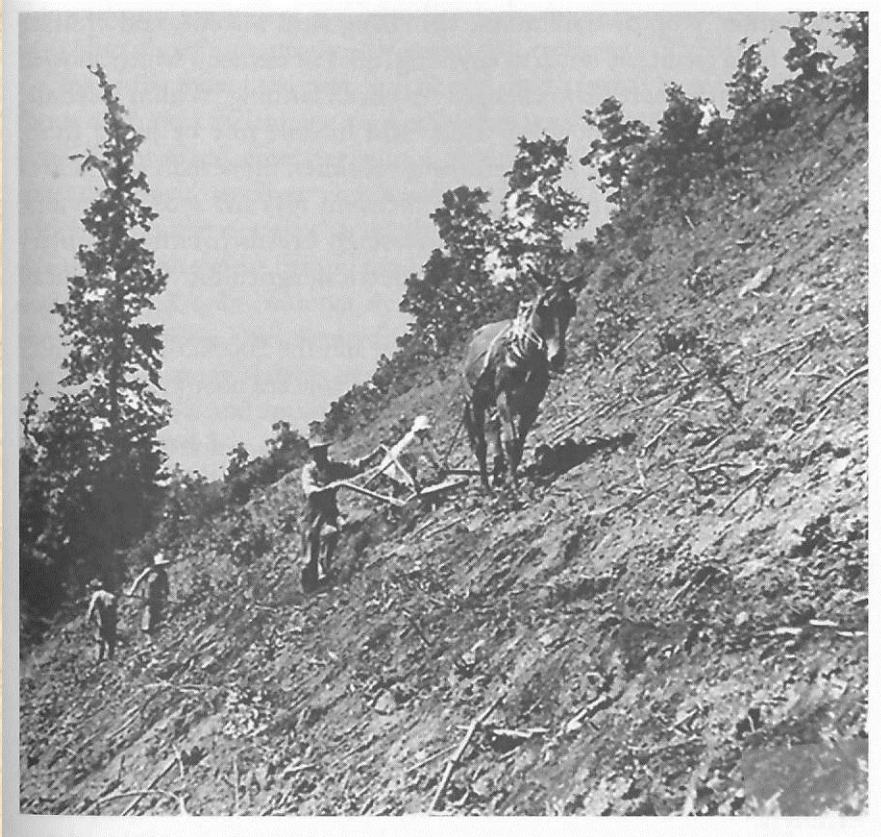
## **Opportunities in Urban Soil Husbandry as a Core Element of Land Transformation**

Stu Schwartz  
Center for Urban Environmental Research and Education  
University of Maryland Baltimore County

**Sustainable Opportunities Through Soil**  
**Healthy Soils: Helping Local Communities Move from Grey to Green Infrastructure**

Ocean County College  
Toms River, NJ  
29 May 2012

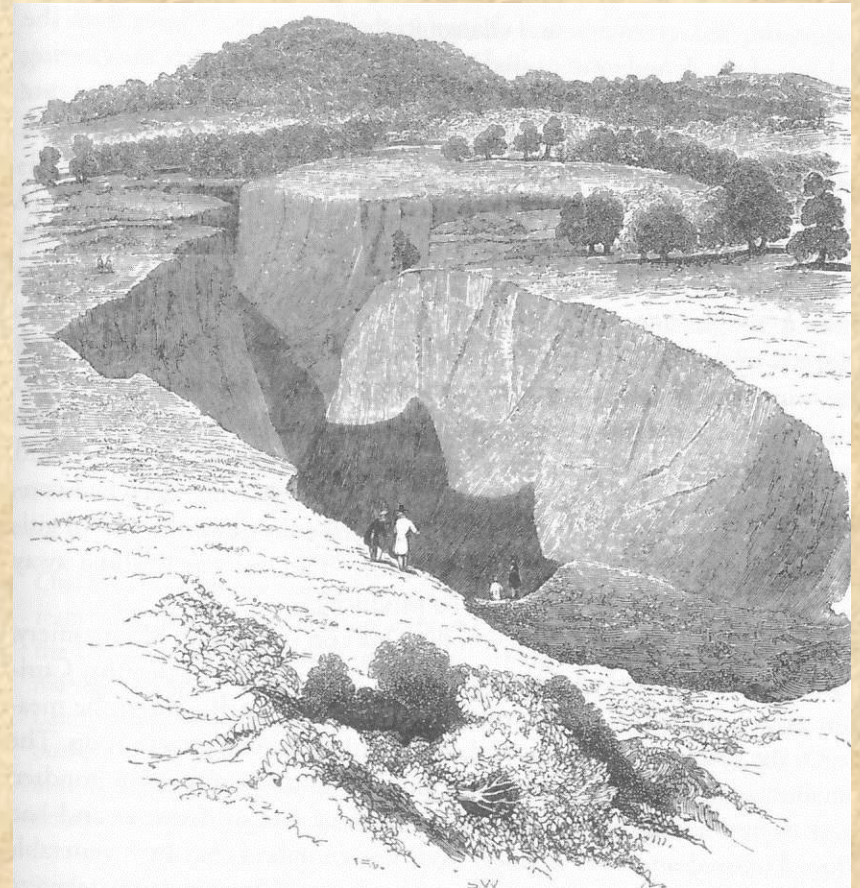
# Soil Husbandry



Jefferson: “Horizontal Plowing”

Madison (1839) Soil Improvement in  
Virginia. Farmers Register Vol 1, 1839

from: Dirt: The Erosion of Civilization – Dave Montgomery



Lyell (1849) A Second Visit to the United States of North America



# Pervious Form and Function are Decoupled

Pervious function – for site design, Major runoff source

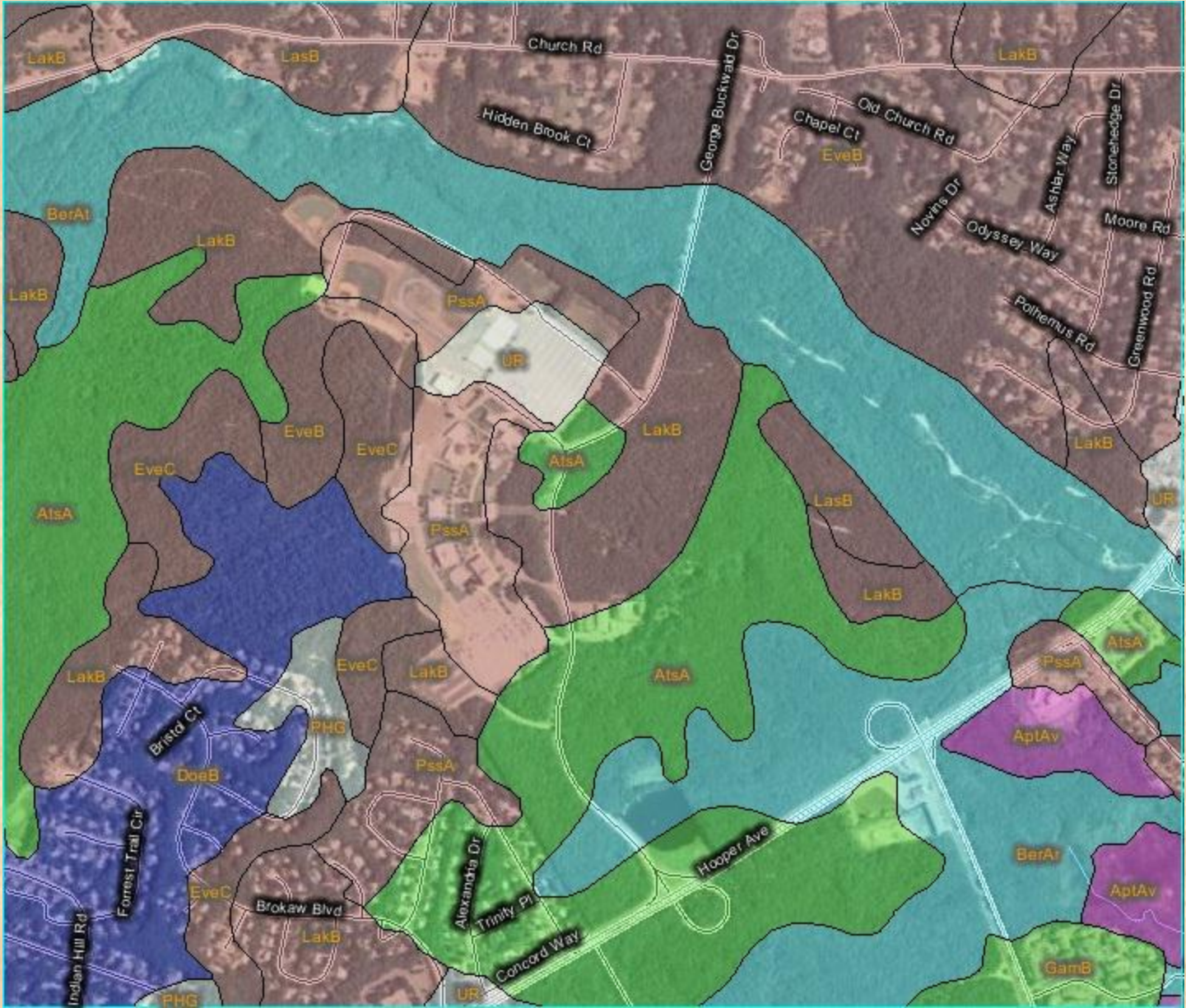
Restore hydrologic function with tillage and amendment



Cultivate pervious landuse credits –

## **Green vs. Gray Infrastructure**

- Function
- Validation
- Inspection & Maintenance
- Cost Effectiveness
- Service Delivery





## 630.0702 Disturbed Soils

As a result of construction and other disturbances, the soil profile can be altered from its natural state and the listed group assignments generally no longer apply, ***nor can any supposition based on the natural soil be made that will accurately describe the hydrologic properties of the disturbed soil.*** In these circumstances, ***an onsite investigation should be made*** to determine the hydrologic soil group. . . . .

# Urban Soil Husbandry: Quantifying Site Infiltration

## IIHR Digital Infiltrrometer Controller





## Wade Park 1892

*Courtesy: University Circle Inc.*



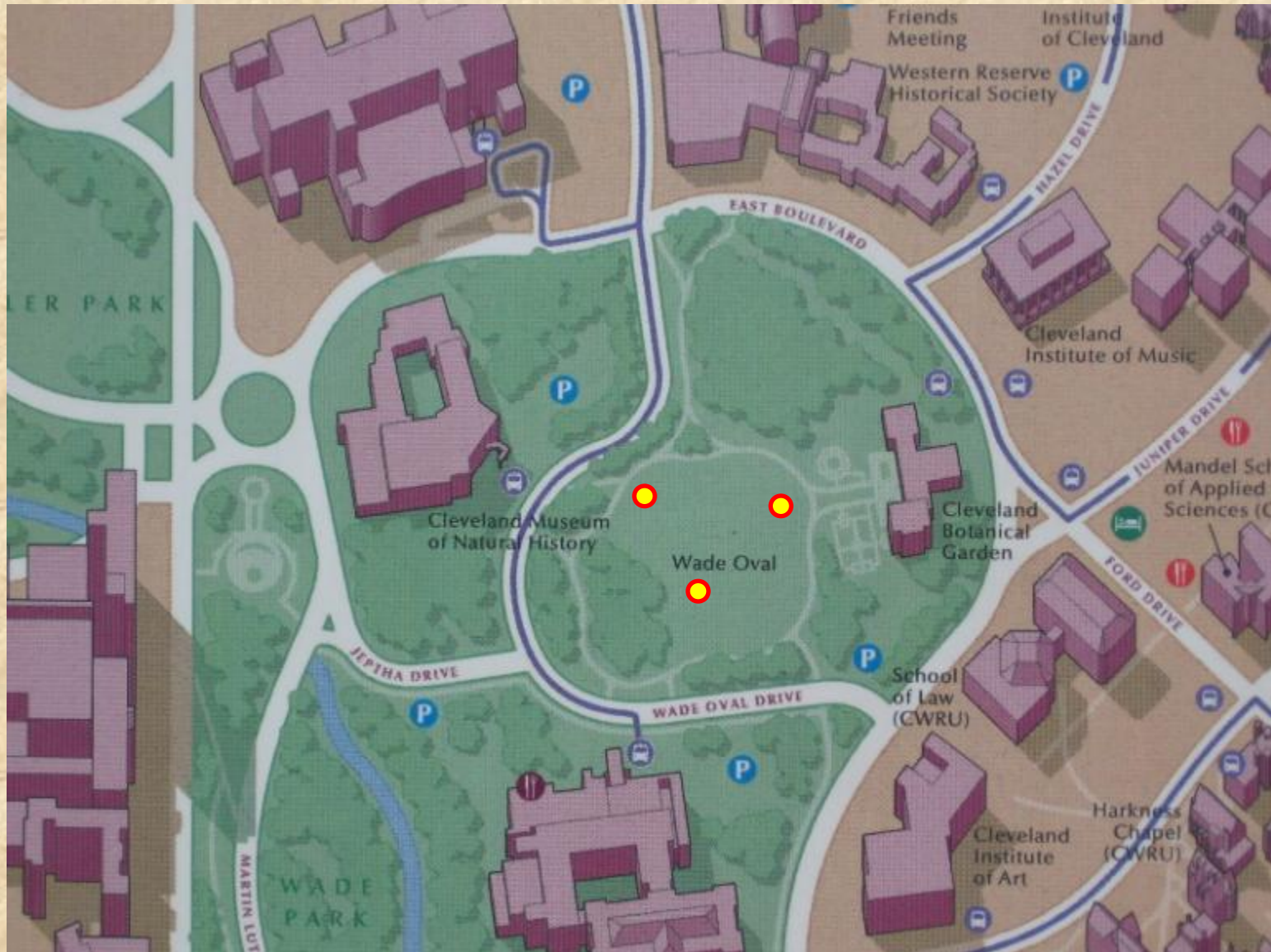




© 2007 Sanborn

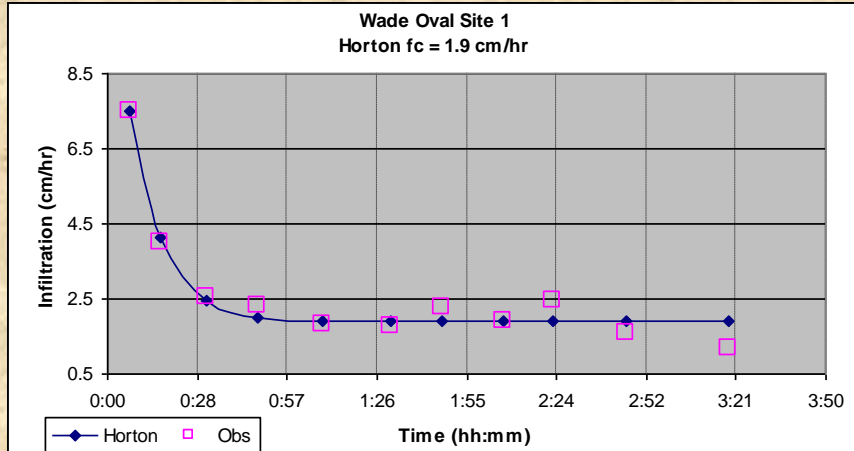
© 2006 Google



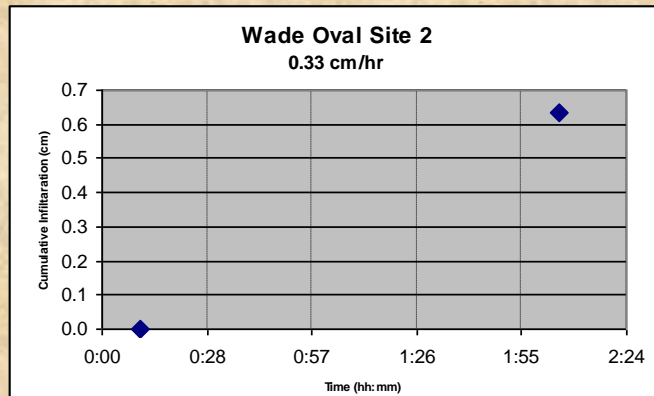


# Wade Oval Infiltration

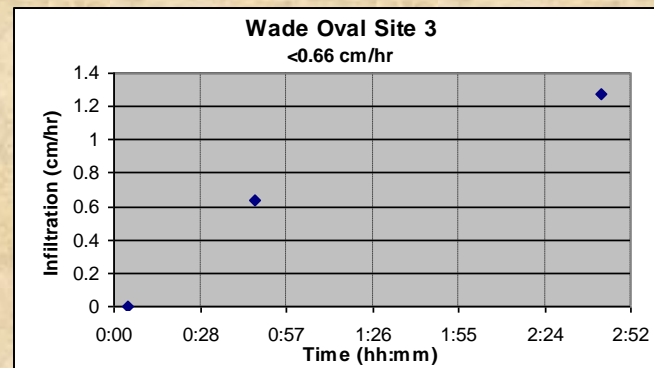
Cuyahoga Sustainability Network



**1.8  
cm/hr**



**0.33  
cm/hr**



**< 0.3  
cm/hr**





# **Beyond Impervious Area-**







Lost Water Holding  
Capacity in the Pervious  
Landscape





**“Engineered Topography”**







# Woodmere-Beachwood Gated Community

0 0.00.02 0.04  
Miles



Parcels



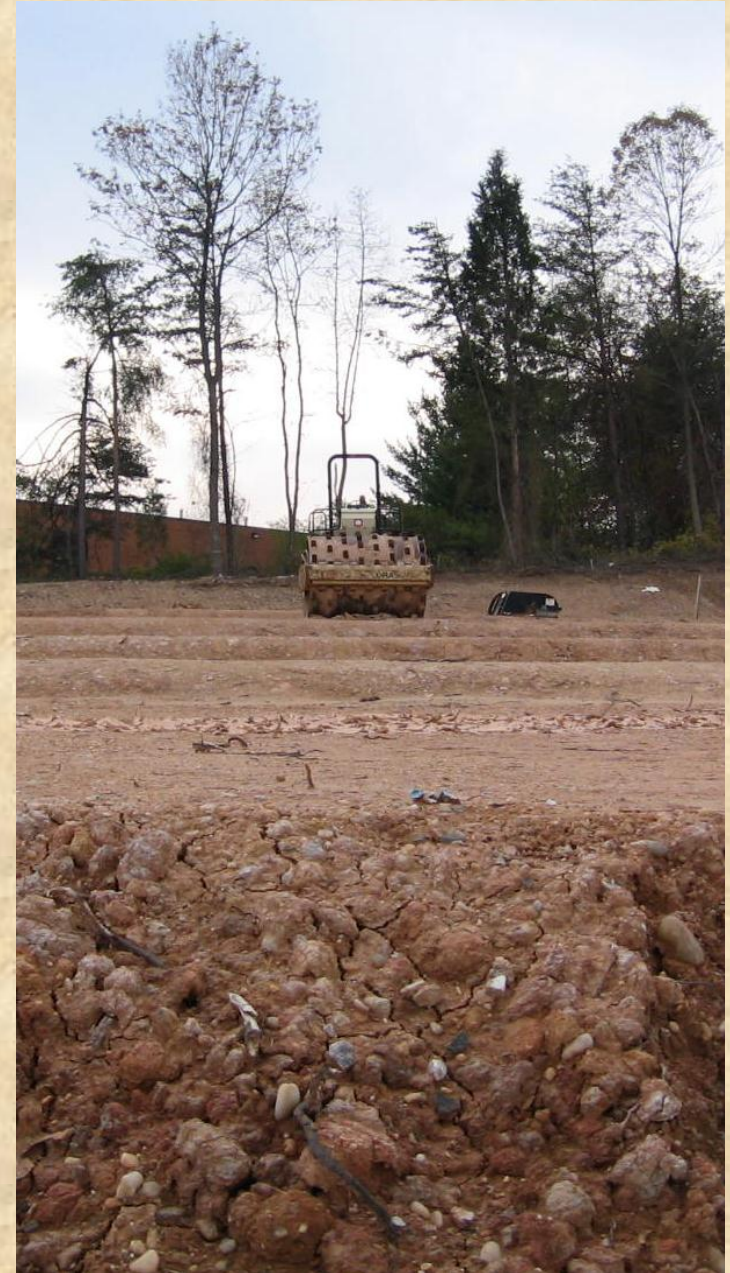


Modern Land Development is not exactly Mountain top Mining but . . .





## *Cuyahoga Sustainability Network*

















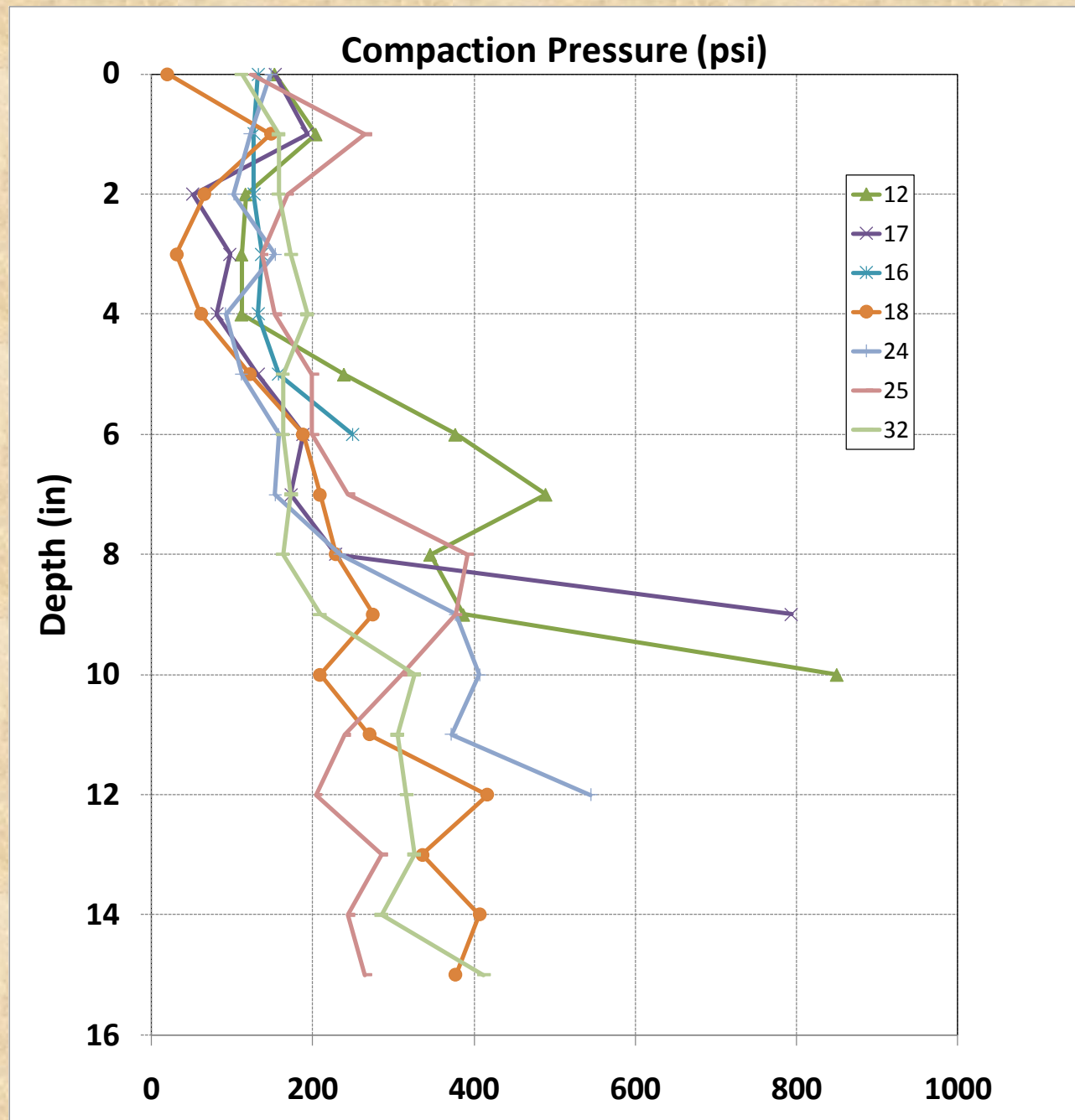
# Measuring Compaction









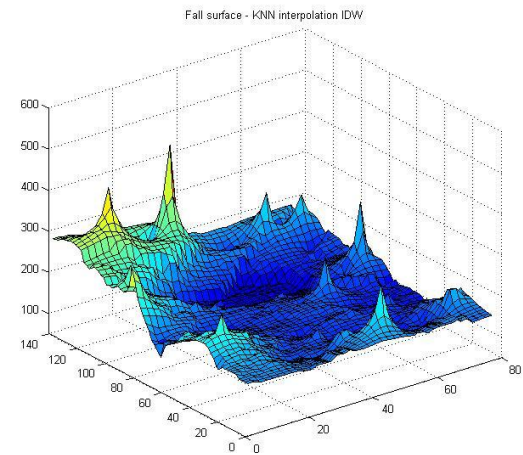
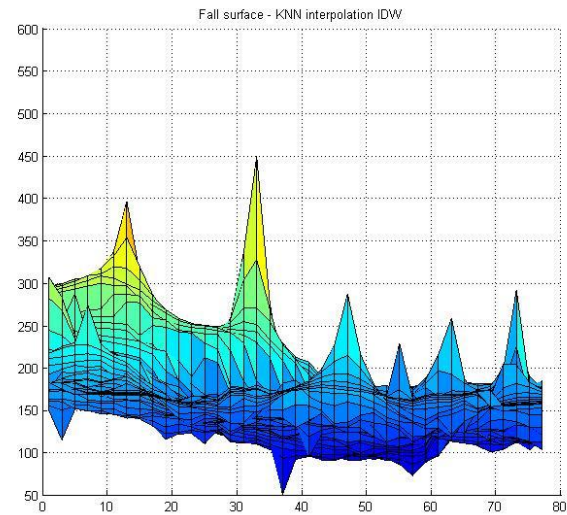
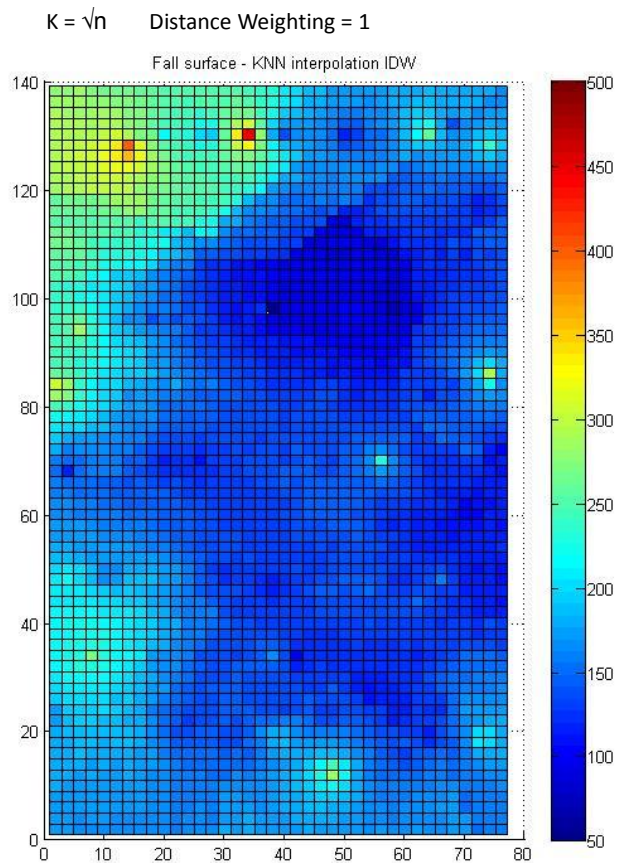






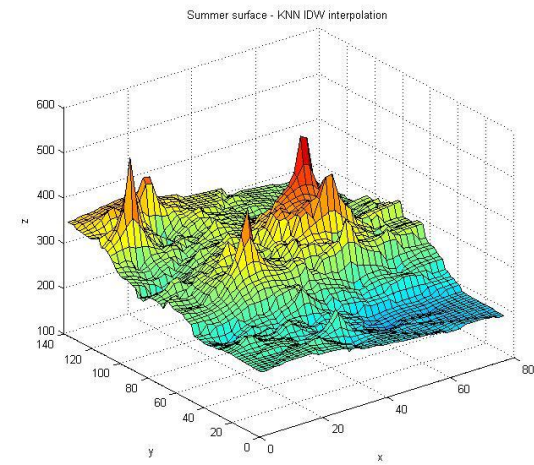
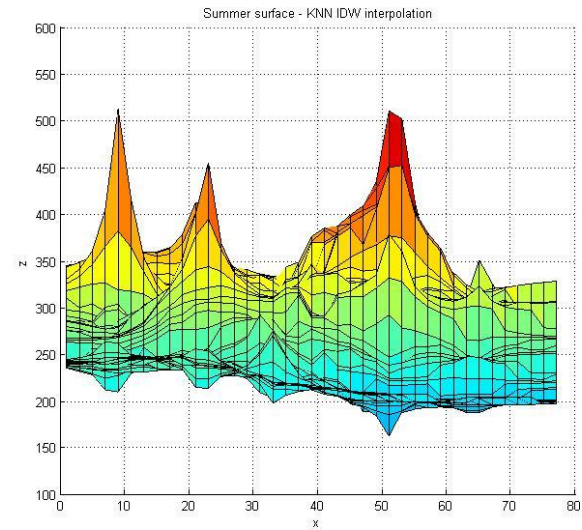
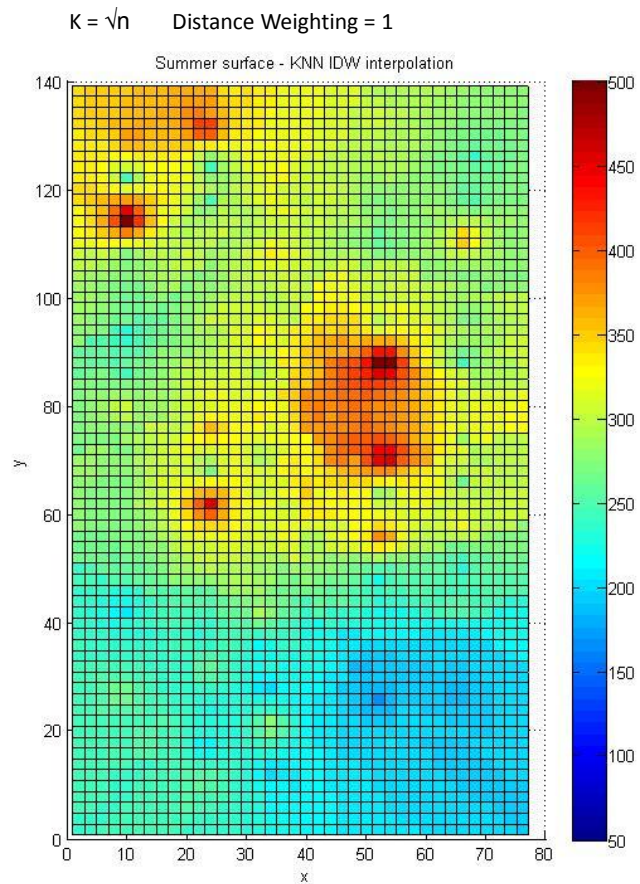


## Four Inch Compaction Surface Using KNN Inverse Distance Weighted Interpolation for Fall 2009





## Four Inch Compaction Surface Using KNN Inverse Distance Weighted Interpolation for Summer 2010





## Profile of a Disturbed Soil



08/15/2010 19:00



## Routine Vehicle Traffic Compacts Soils

What about “natural decompaction”?

Roots?

Freeze-thaw?

Expanding Clay soils?



Hunt Valley Recreational Fields







Oregon Trail near Baker Oregon

Paint Branch, MD Turf Grass Research Center



Hunt Valley Recreational Fields



**Santa Fe Trail near Ft. Dodge KS Outside of Dodge City ~130 years old.**





# What Can We Do?

Hydrologic Services can be restored in compacted urban soils:

Suburban Subsoiling = Subsoiling + Soil amendment

Subsoiling equipment (practitioner)

Hydrologic Soil Group Effective Curve Number (designer & regulator)

Can this be institutionalized?

Validation

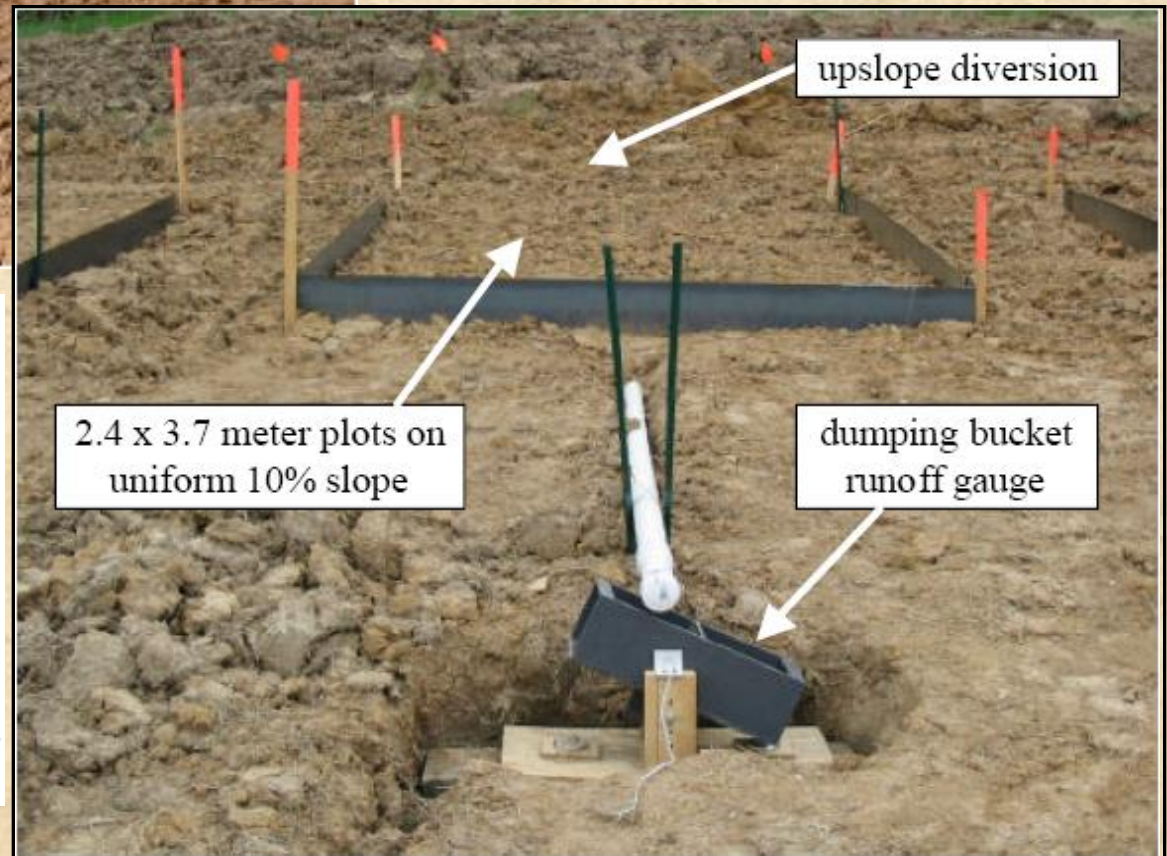
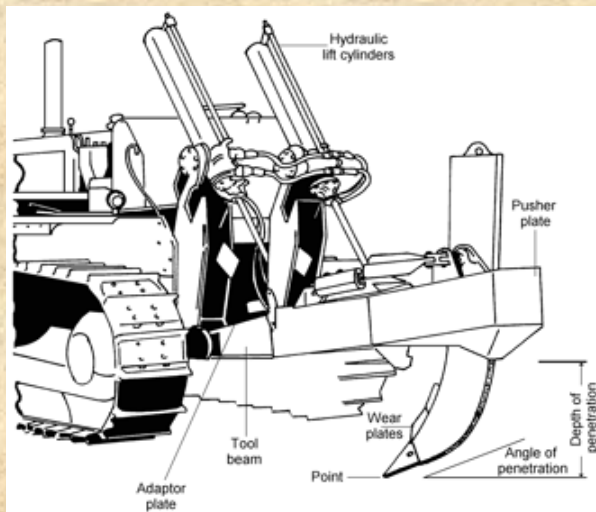
Testing & inspection – How long does it last?

Maintenance – How can we tell if it's still working? Then what?

Life Cycle Cost Analysis (LCA) – payback on “better” landscaping

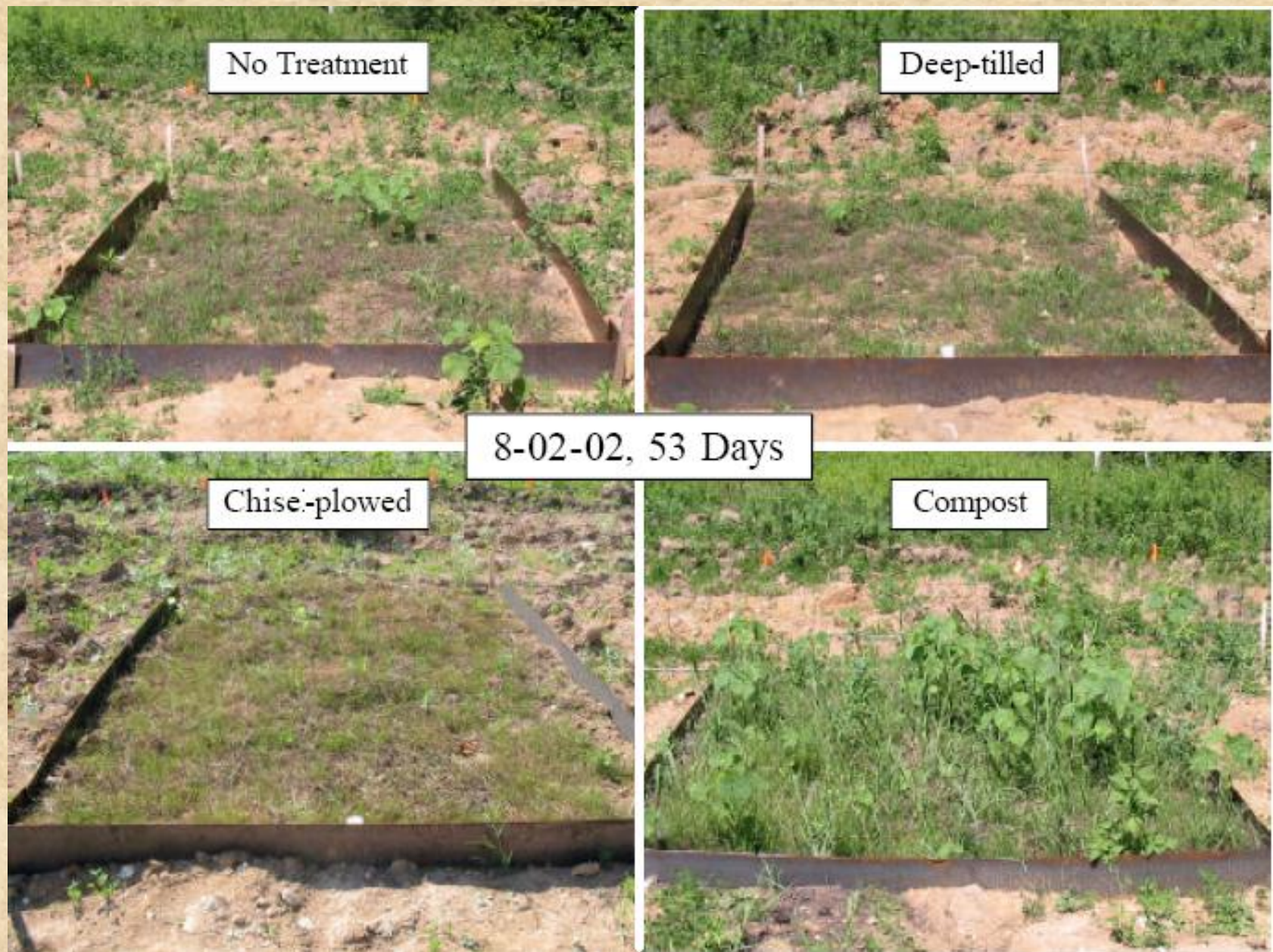
NO MAGIC BULLET





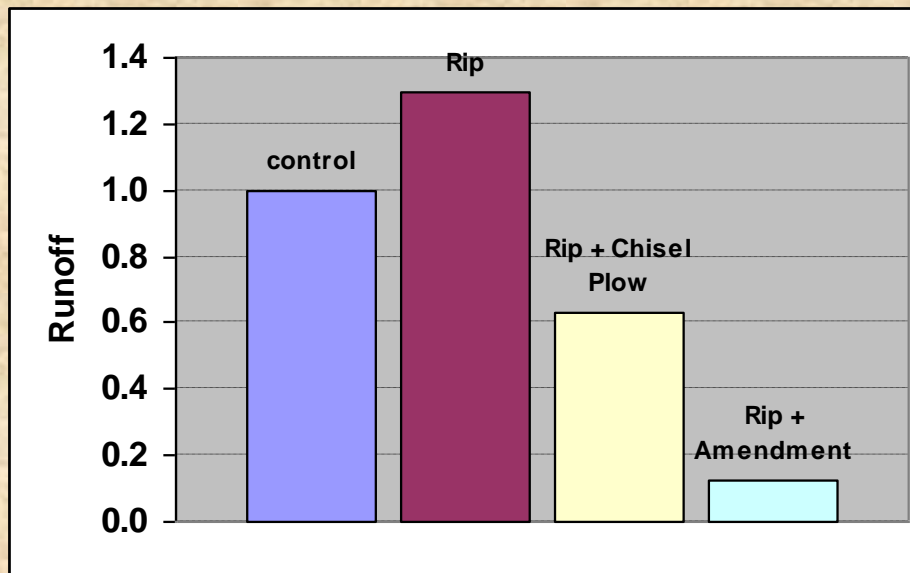
from: Balousek, J.D. Quantifying Decreases in Stormwater Runoff From Deep Tilling, Chisel Plowing, and Compost-Amendment. Dane Co. Wis. SWCD







# Credit

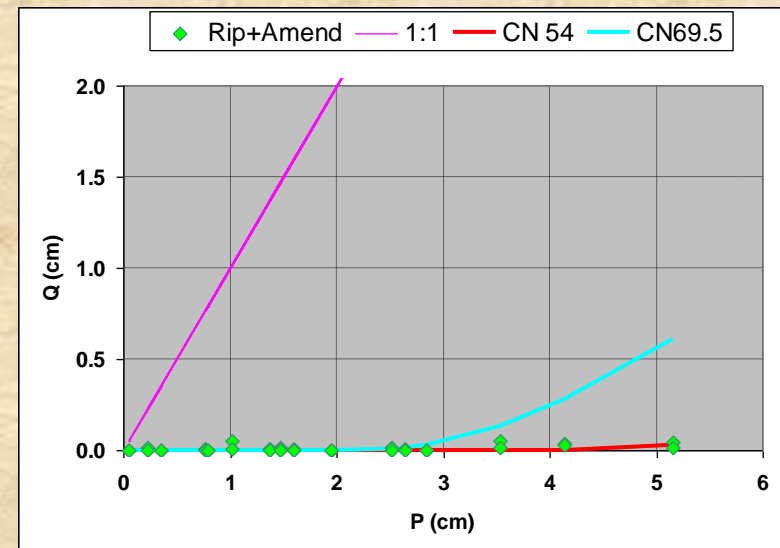
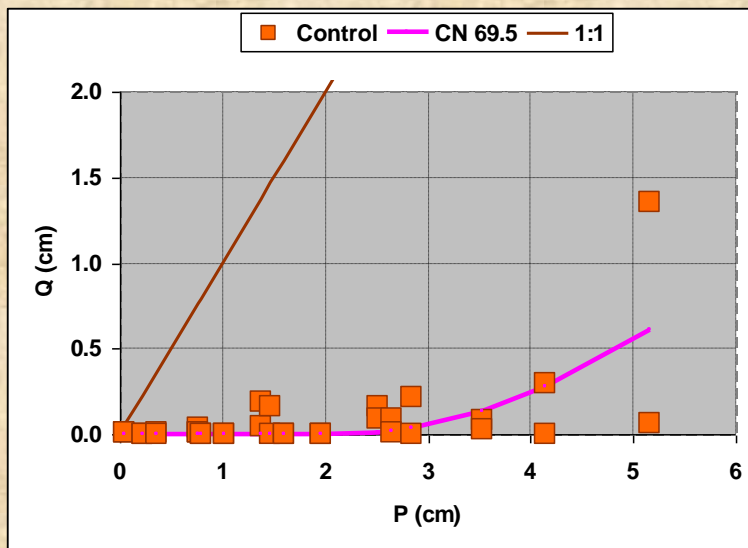


**Runoff Reduction  
70-90%**

**Effective Curve Number (ECN) - ~1/2 ac. Residential 25% IA**

**Control ECN = 69.5**

**Rip + Amend ECN = 54**















08/04/2010 14:52





08/19/2010 13:47



# Organic Compost Amendment







10/01/2010 11:28



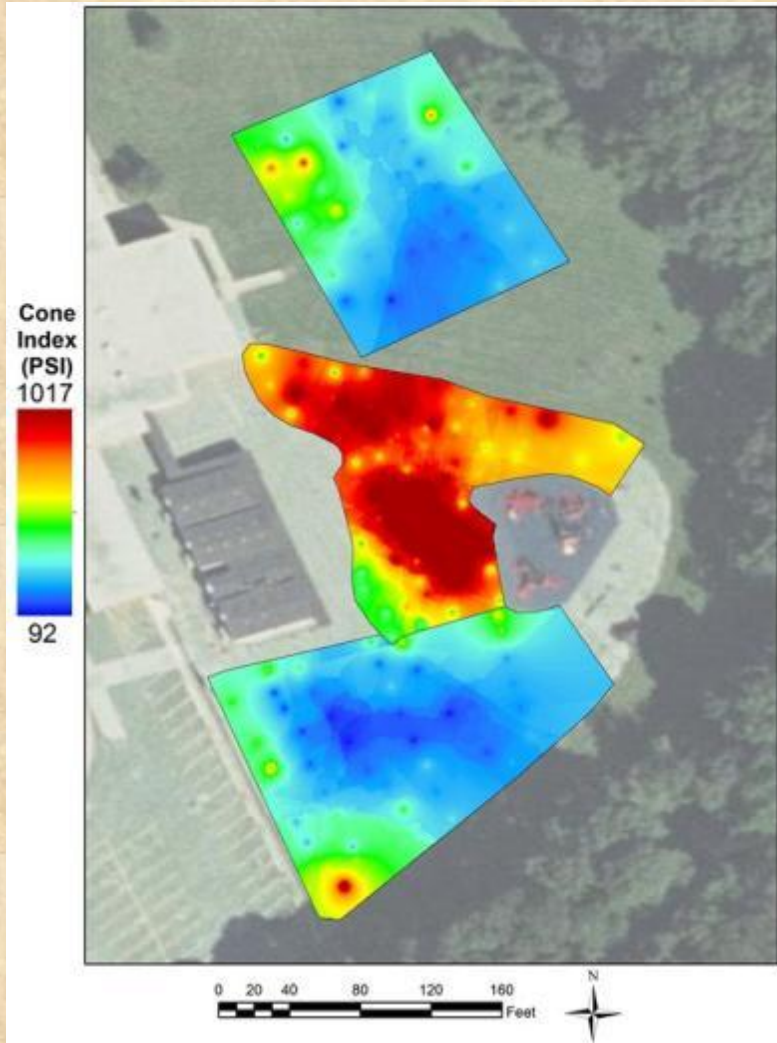








# Yorkwood Elementary School August 2011





# Reciprocating Soil Spader



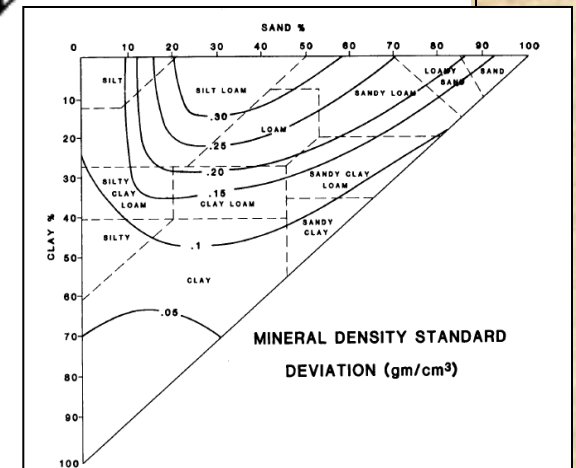
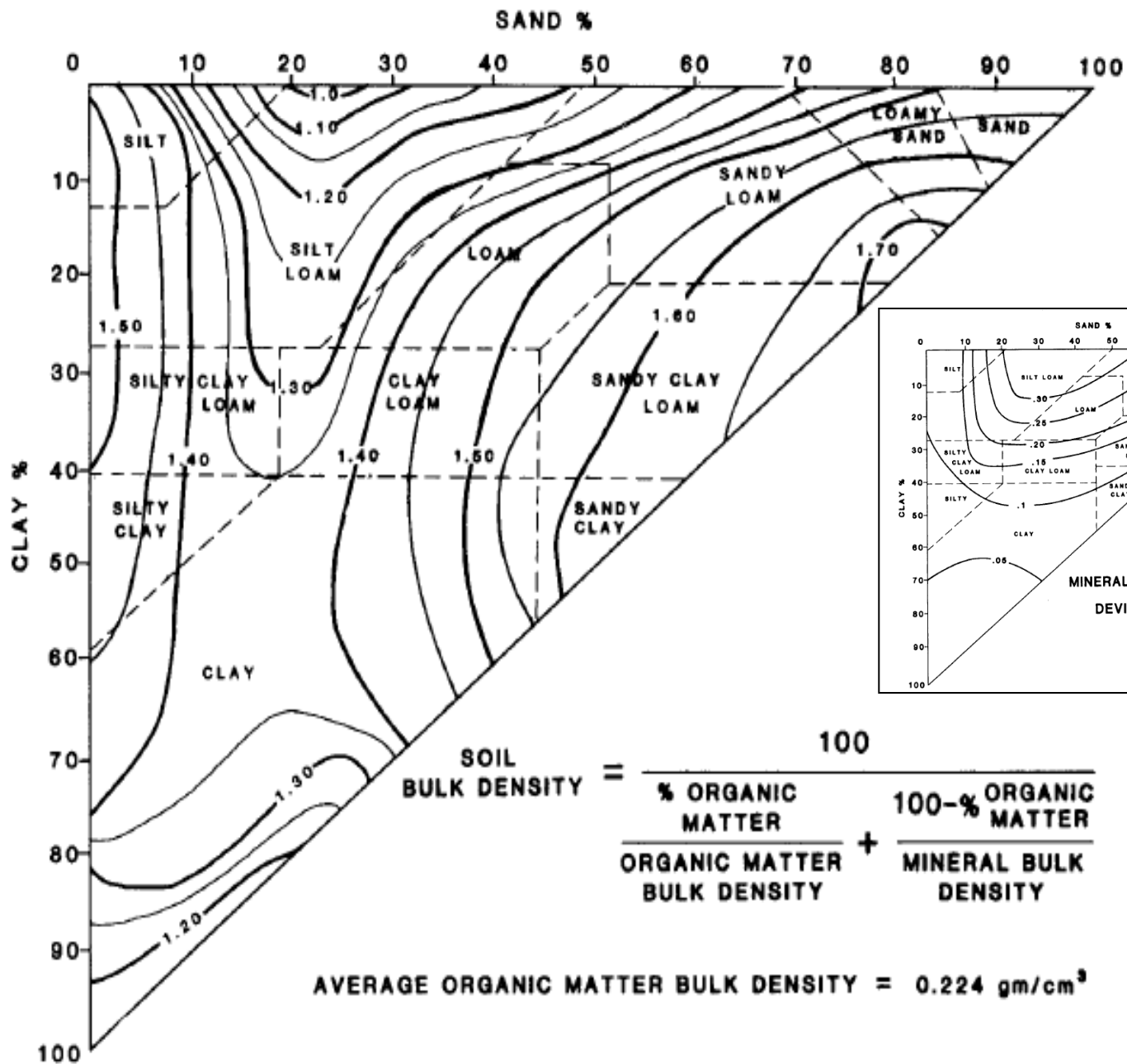


# Soil Characteristics for Diagnosis & Inspection

Simple “standard” field protocols to assess soils

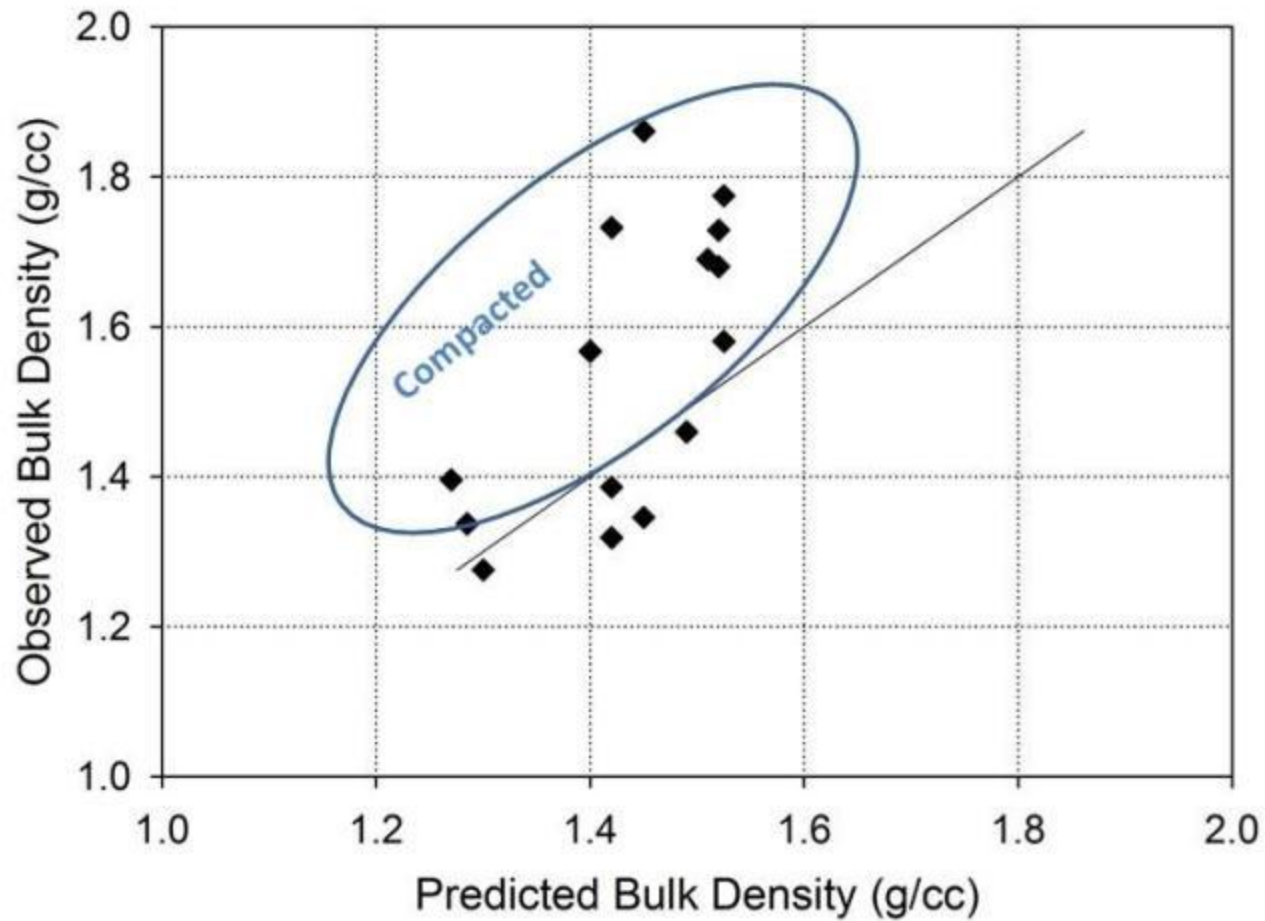
- Soil Texture
  - Cone Index/Bulk Density/Soil Moisture
  - Single Ring Infiltrometer
- 
- Identify Compaction Mitigation Candidates
  - Monitor & Maintain Infiltration Credits
  - Characterize Parcel-Watershed Function







## Soil Compaction





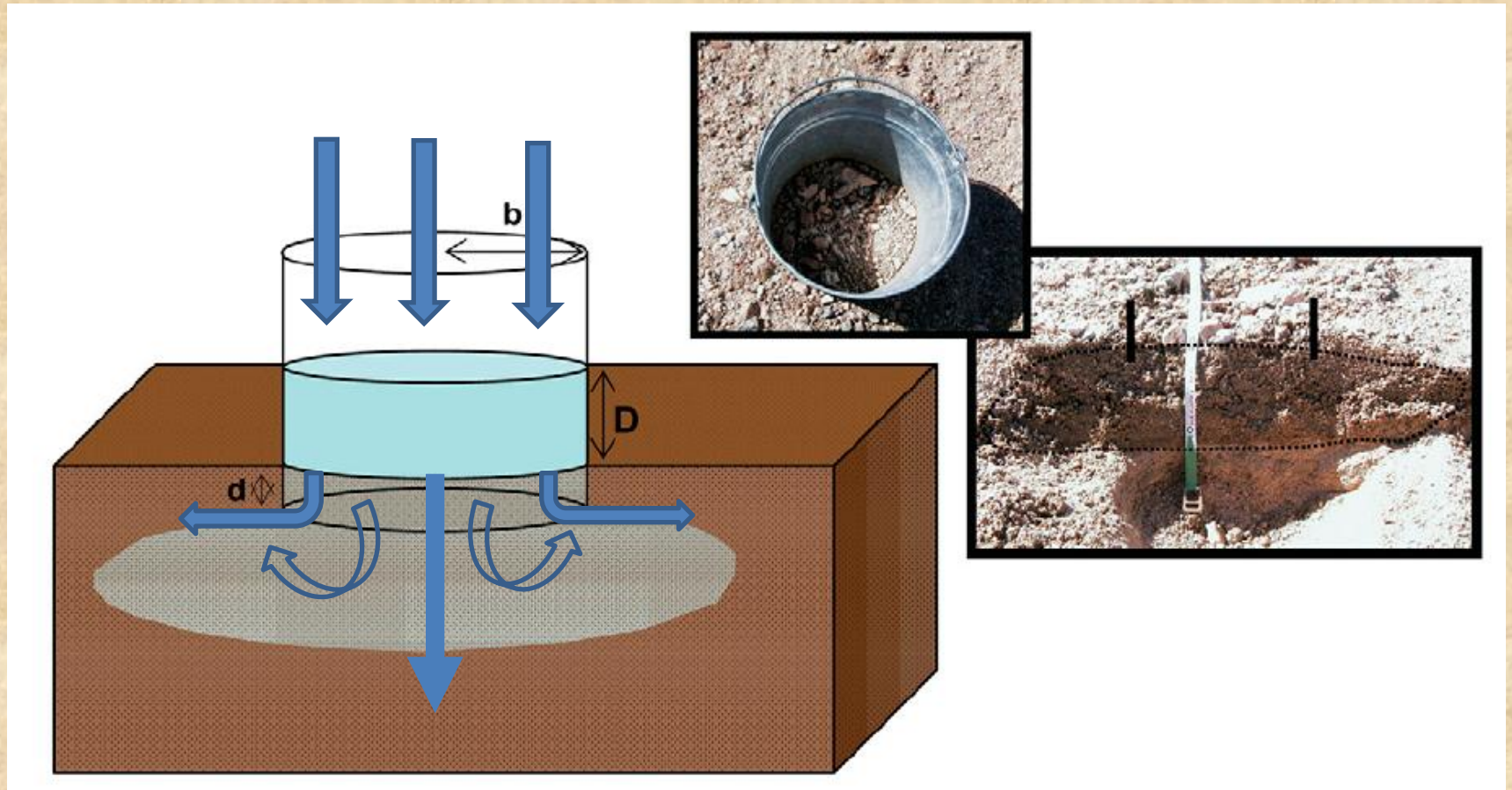
# Probe and Penetrometer



SRFH Infiltration



# Water Movement in Soil: Infiltration & Percolation





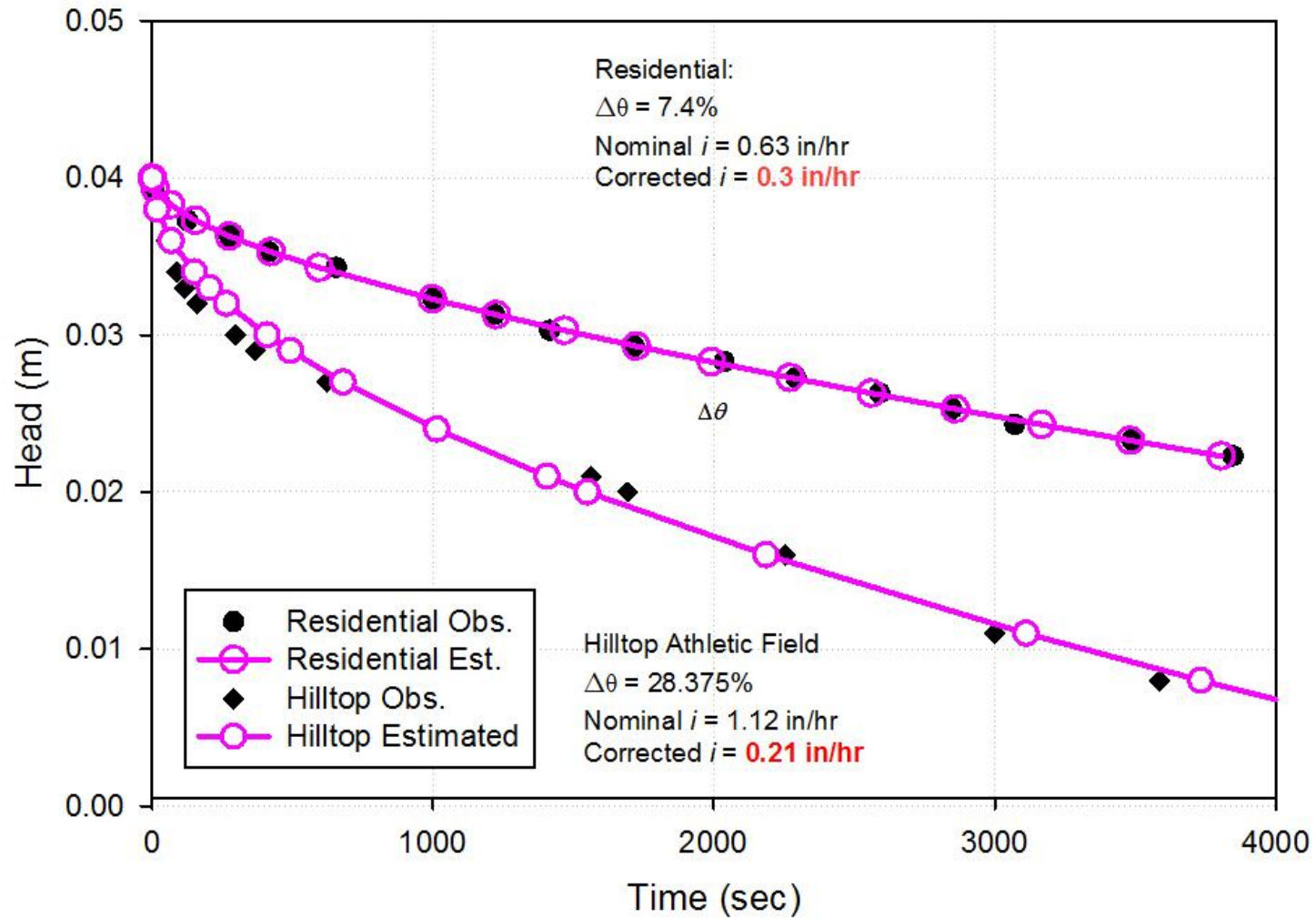








## Single Ring Falling Head Infiltration Test






# Bay-Wise Landscaping

- Tools for Compaction Assessment
- Prototype for Maintenance and Inspection Protocols


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## Home


Welcome to the Bay-Wise Landscaping soil compaction web site  
A UMBC - University of Maryland Extension partnership



Humic rootzone above compacted clay



Bay-Wise Yards and Landscapes avoid or mitigate soil compaction to maintain infiltration



Measuring Infiltration with a single ring falling head infiltrometer

Center for Urban Environmental Research and Education (CUERE)  
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<https://sites.google.com/a/umbc.edu/umbc-bay-wise-landscaping-soil-compaction/home>



# Suburban Subsoiling Summary

Manage Pervious Landscape for Hydrologic Function

Superior Sustainable Landscaping Practice

Deeper rooted healthier drought resistant turf

LCA – Payback 9-45 months

Challenges:

Underground utilities

Re-compaction & Maintenance

Equipment

Mobilization Costs

Leaching Potential

Specifications

Enormous Potential to Restore Hydrologic Function of Pervious  
Landscape



# Conclusion

- Decoupled form and hydrologic function in urban/suburban landscapes
- Have to look below the surface
- Suburban Subsoiling with technically and commercially sustainable technologies can restore hydrologic function of the *pervious* landscape
- Urban Soil Husbandry supports active management of services from sustainable landscapes



Thanks!

Questions?