

Dare to be first.



A Field Study of Biochar Amended Soils: Water Retention, Infiltration, and Nutrient Removal from Stormwater Runoff

Joseph Brown¹, Sriya Panta¹, Seyyed Ali Akbar Nakhli¹, Yudi Yan¹,
Charles Hegberg², Larry Trout³, Paul T. Imhoff¹

¹Department of Civil and Environmental Engineering, University of Delaware, Newark, DE

²reGENESIS Consulting Services, LLC, 3408 Smoketown Road, Spring Grove, PA

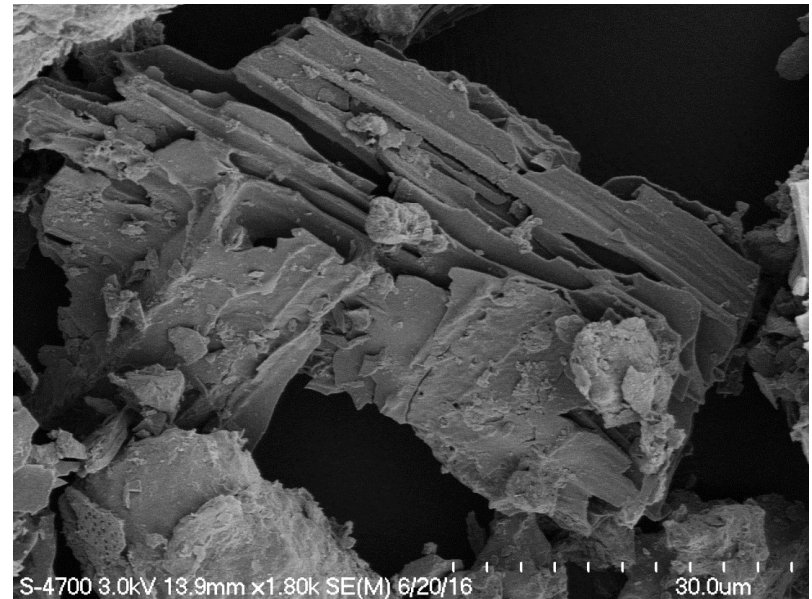
³RK&K Delaware, 110 S. Poplar Street, Wilmington, DE

What is Biochar?

- Produced from the pyrolysis of wood or waste biomass

Pinewood Biochar @ 550°C

- Important properties
 - High surface area
 - High porosity
 - Significant cation exchange capacity
 - High adsorption capacity
 - Stable carbon structure



Biochar Particle – 4% Biochar/Soil Mix – Biochar Filter Strip

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Research Hypotheses:



Bulk Density



Compaction



Porosity



Infiltration



Water Retention

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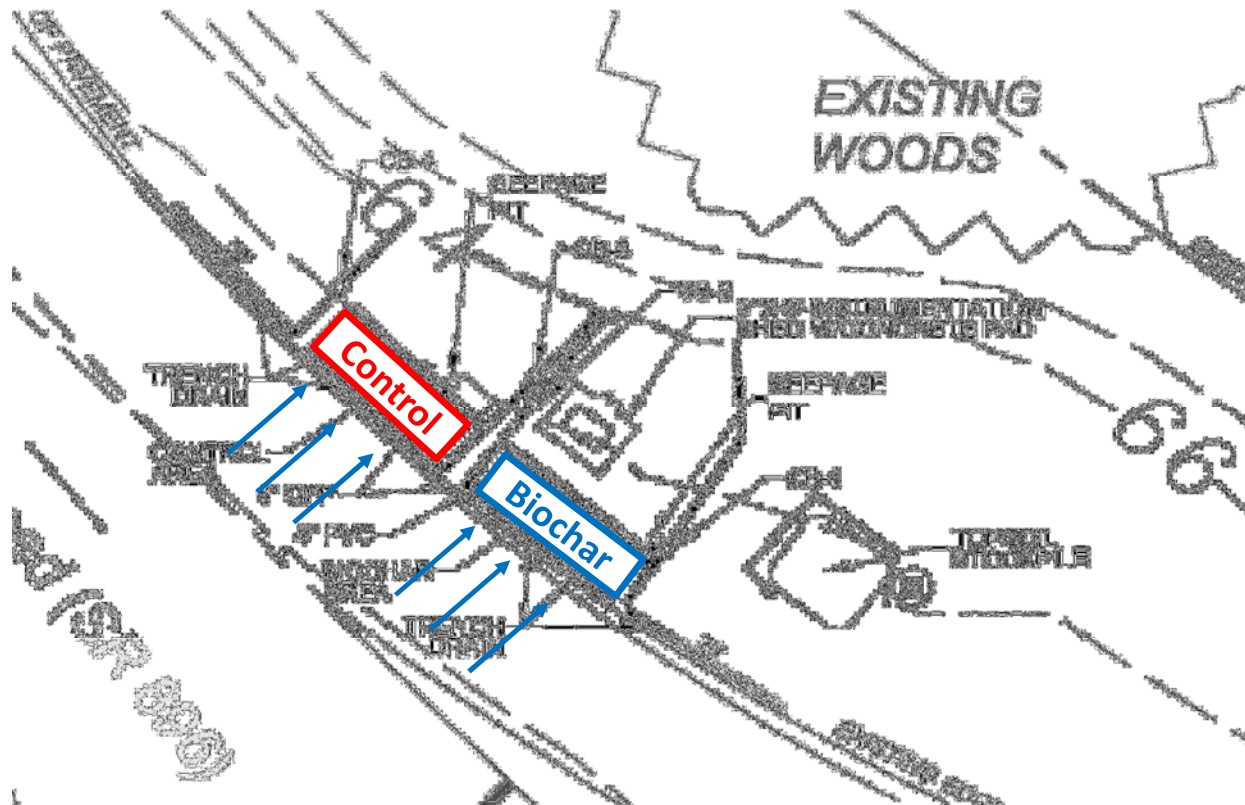
Project Site: Rt 896 & Bethel Church Road Middletown, De



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Filter Strip Design



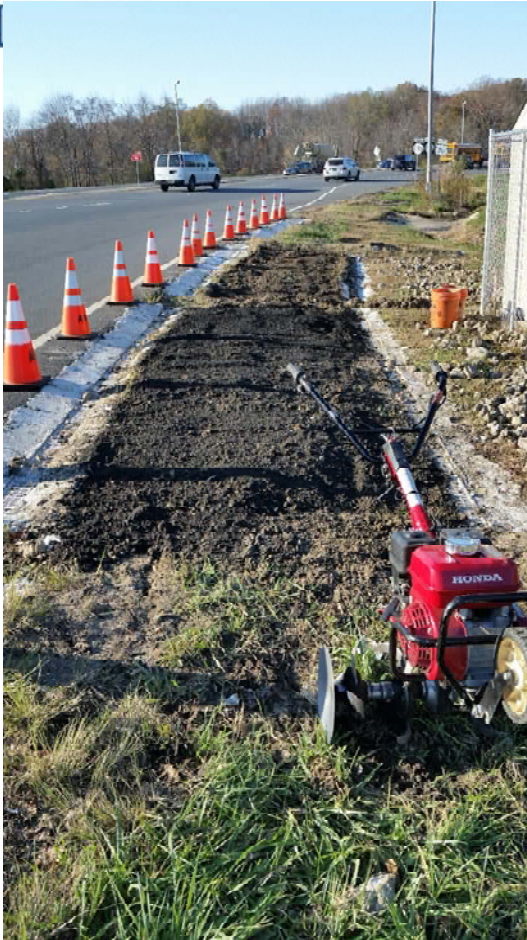
Test Equipment:

- Soil Moisture sensors
- Water potential & temperature sensors
- Automated water samplers
- Ultrasonic flow sensors
- Rain gauge

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Biochar Amendment

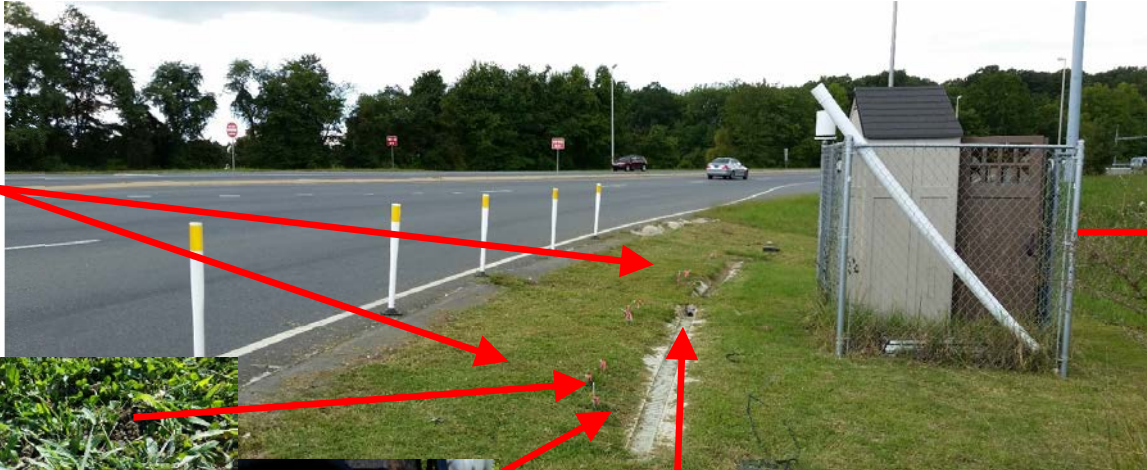
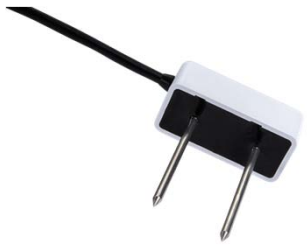


Control Strip



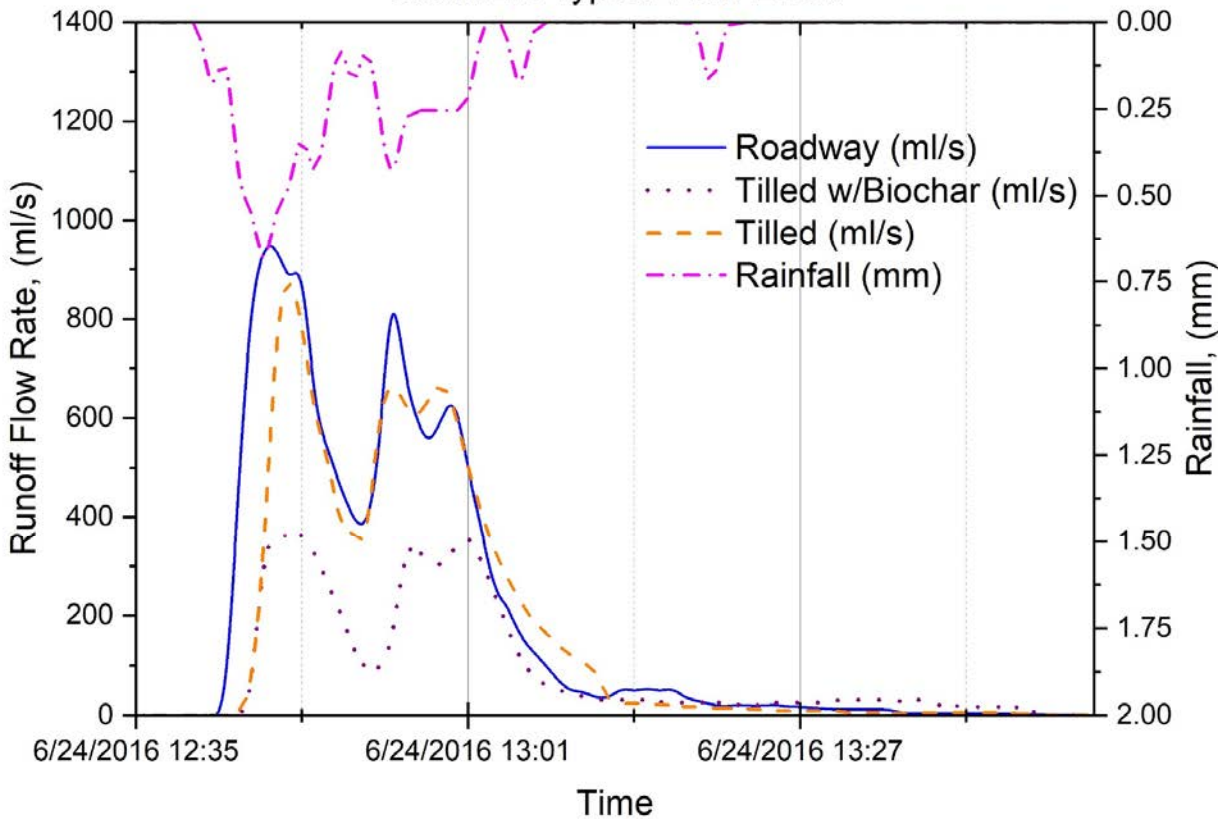
4% Biochar Strip

Experimental Methods – Roadside Filter Strips



Preliminary Results – Runoff Profile Hydrograph (Typical Rain Event)

Storm 27: Typical Rain Event



Results for 123 Rain Events

- Average Peak Stormwater Runoff Rate Reduction:

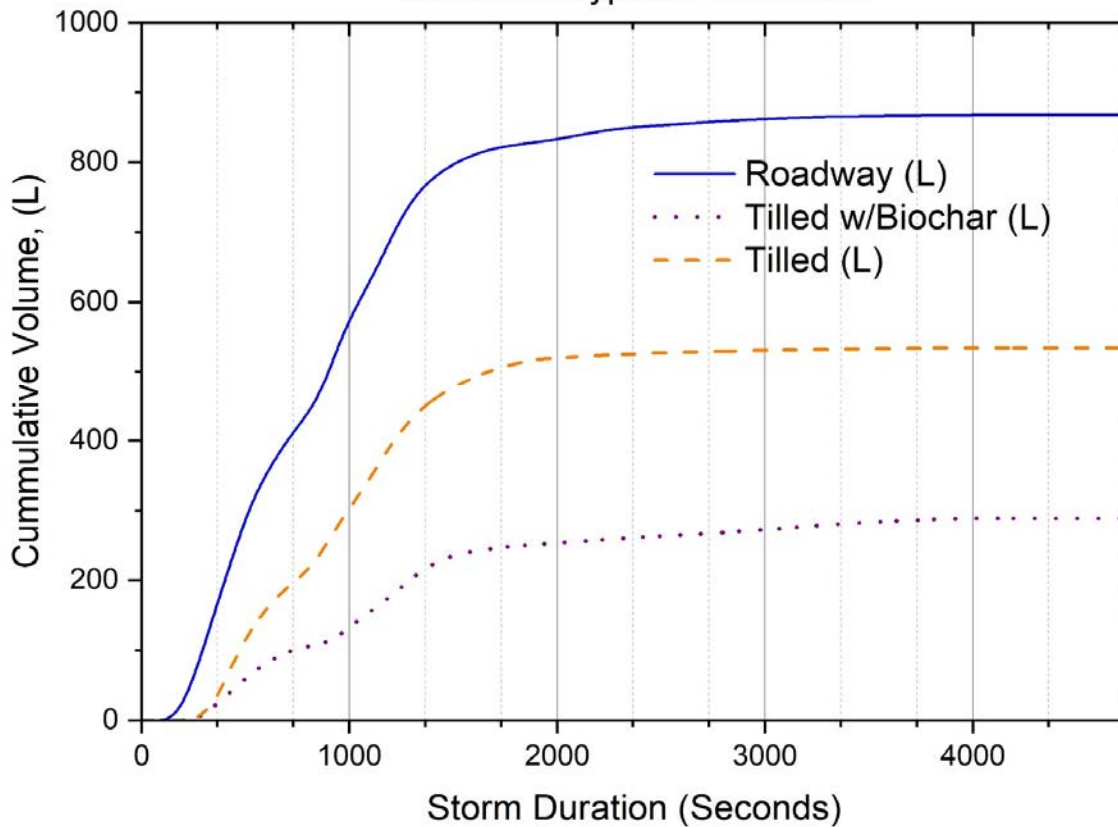
Tilled = 56%

Tilled w/Biochar = 80%

Biochar Reduction = 56%

Preliminary Results – Cumulative Volume (Typical Rain Event)

Storm 27: Typical Rain Event



Results for 123 Rain Events

- Average Cumulative Stormwater Runoff Volume Reduction:

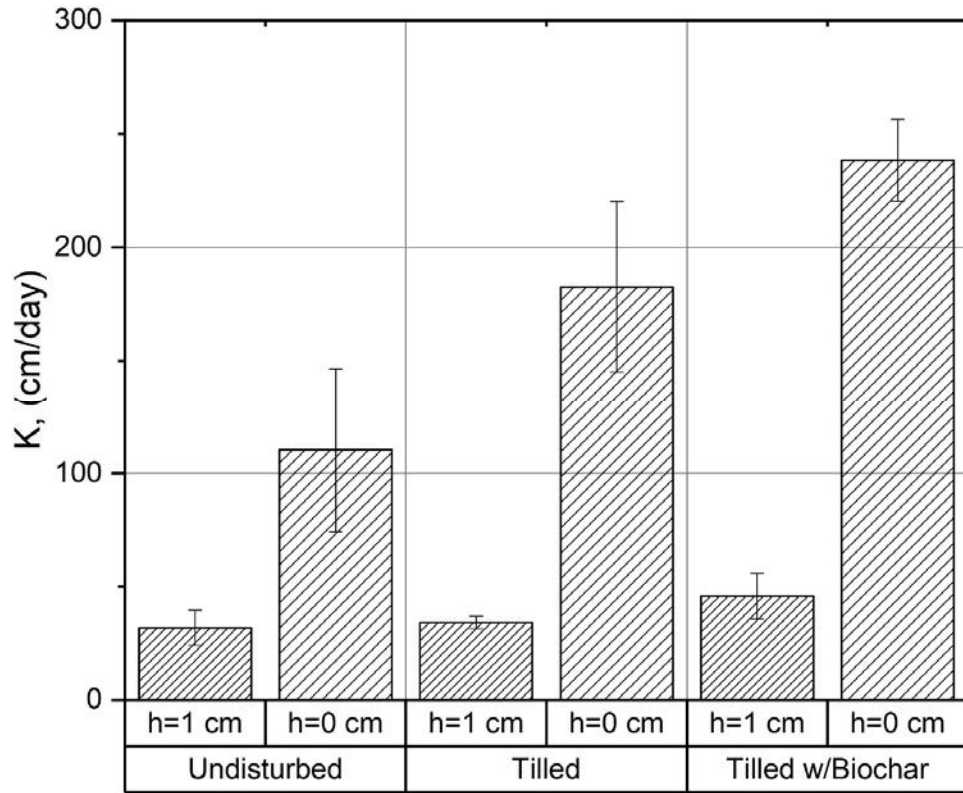
Tilled = 61%

Tilled w/Biochar = 85%

Biochar Reduction = 69%

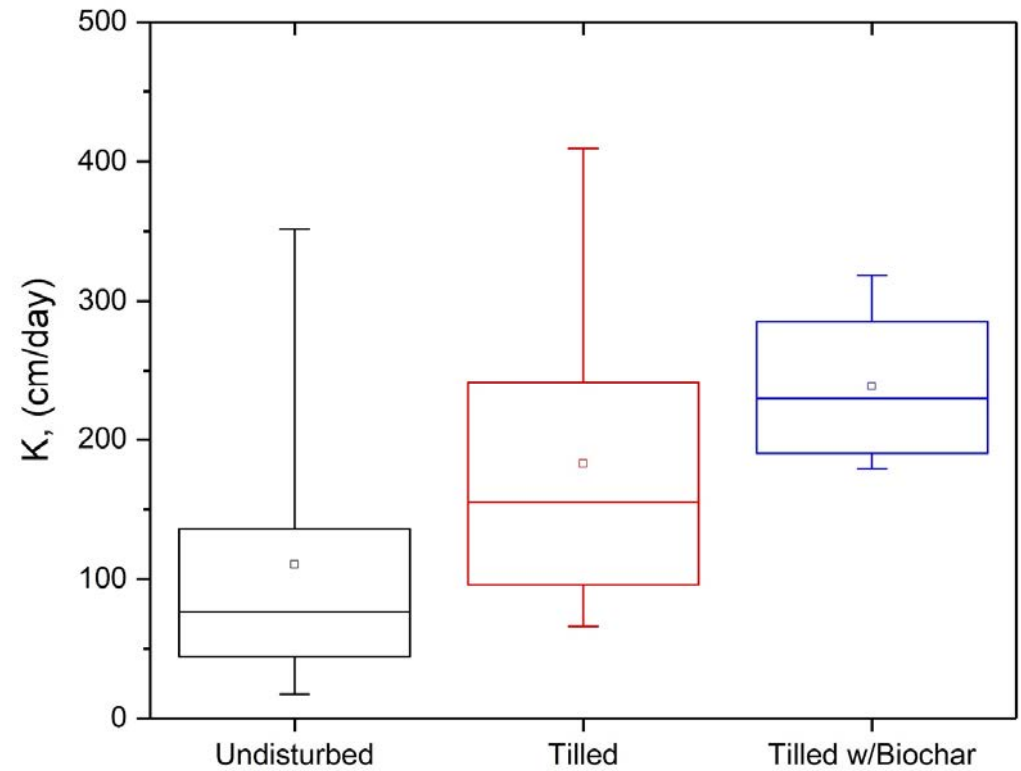
Preliminary Results – Infiltration

Hydraulic Conductivity



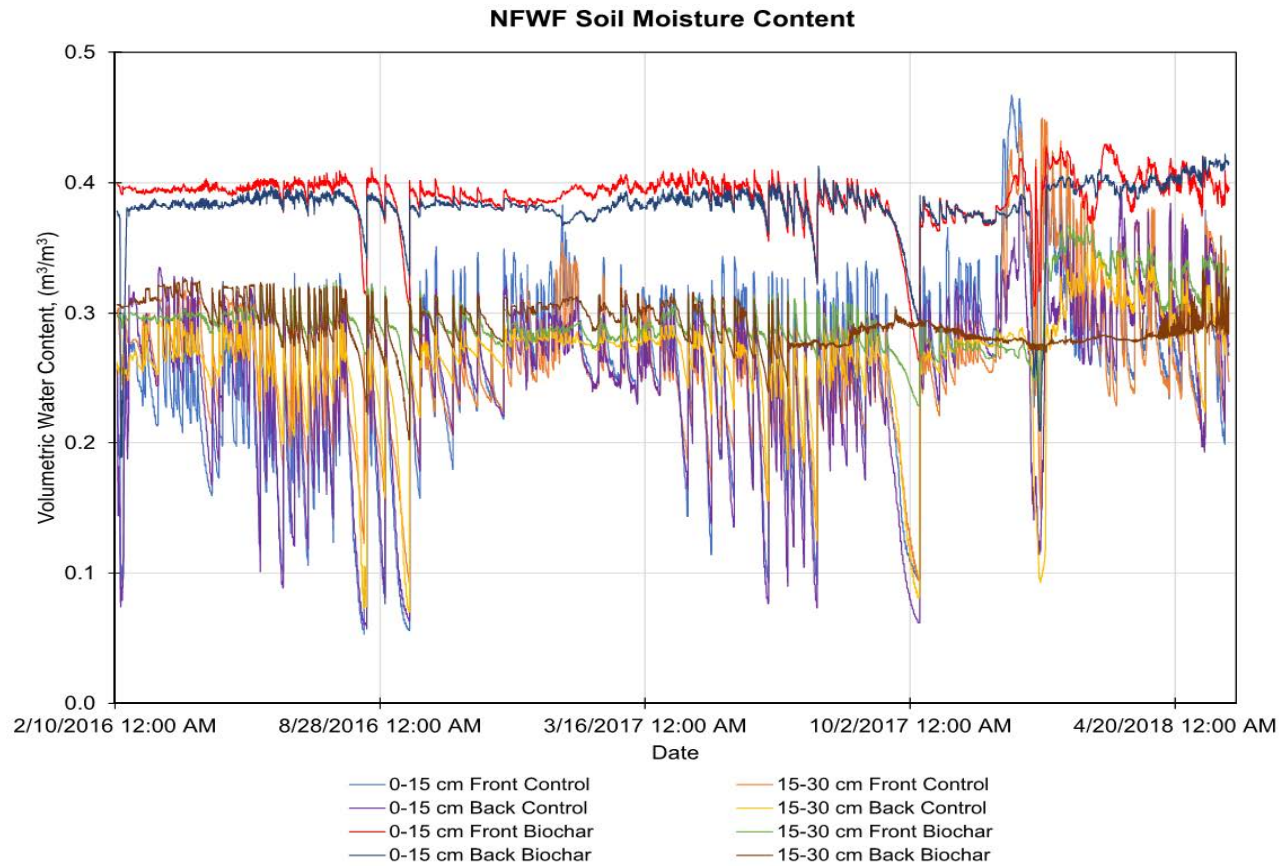
Seyyed Ali Akbar Nakhli

Saturated Hydraulic Conductivity

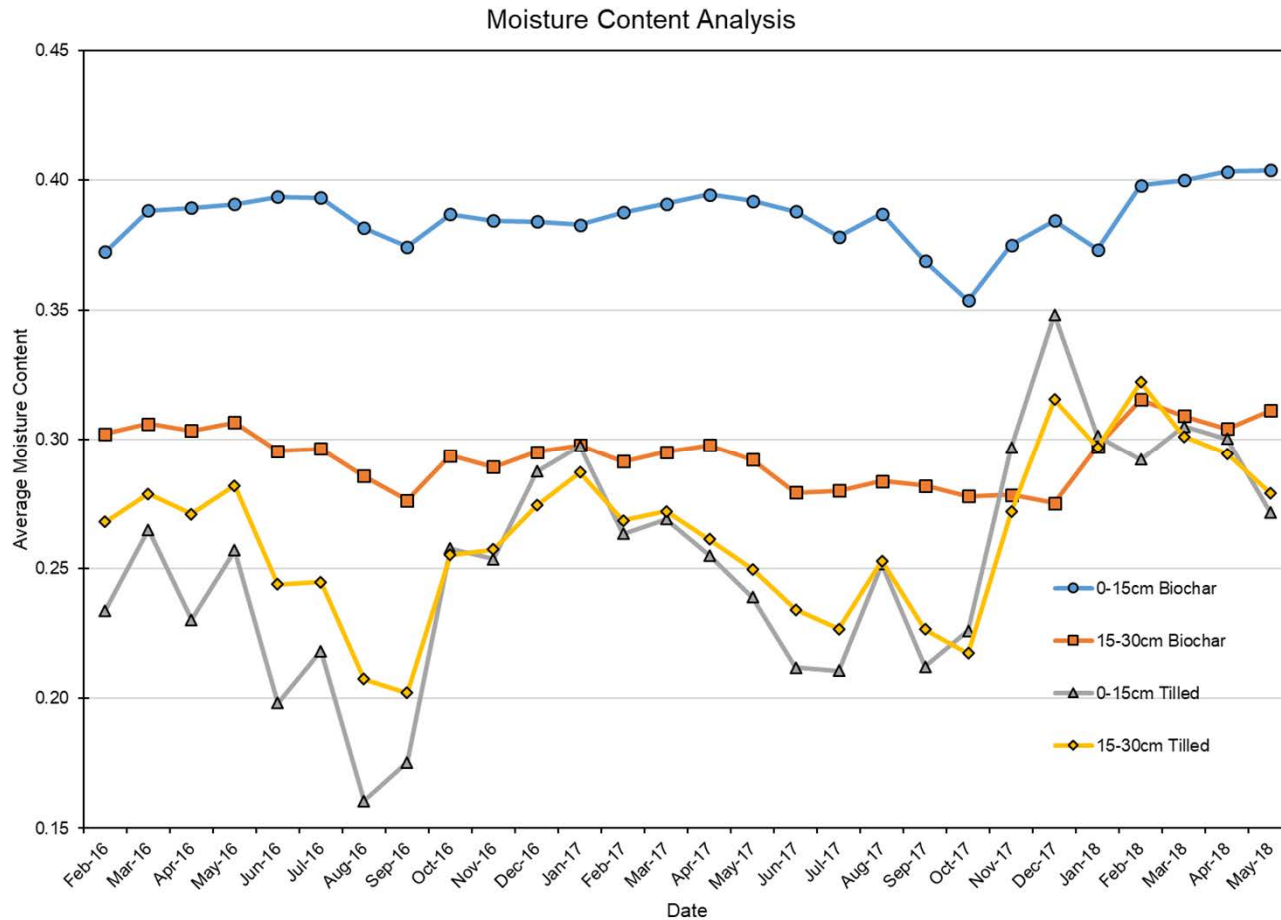


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Preliminary Results – Soil Moisture Content

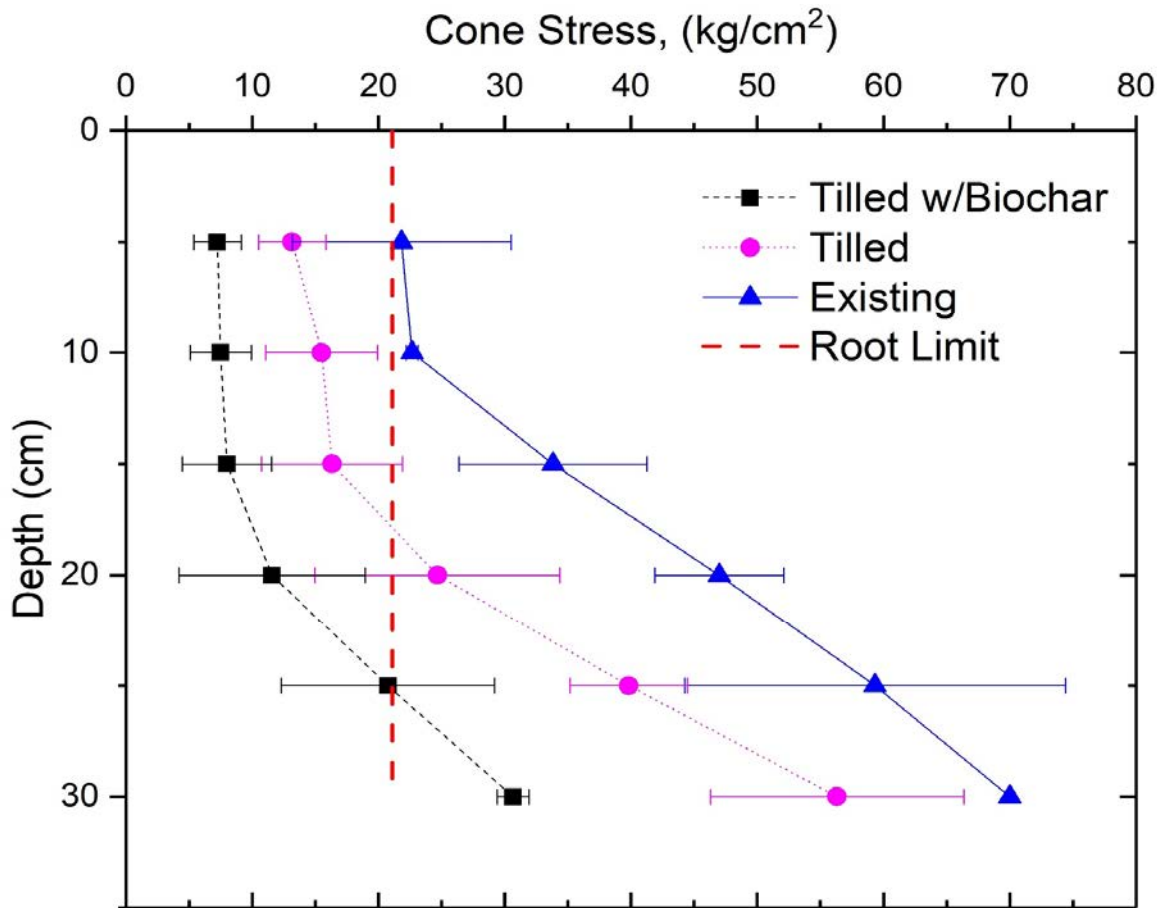


Preliminary Results – Soil Moisture Content



- 0-15cm Depth: 57% Increase
- 15-30cm Depth: 13% Increase

Preliminary Results – Compaction



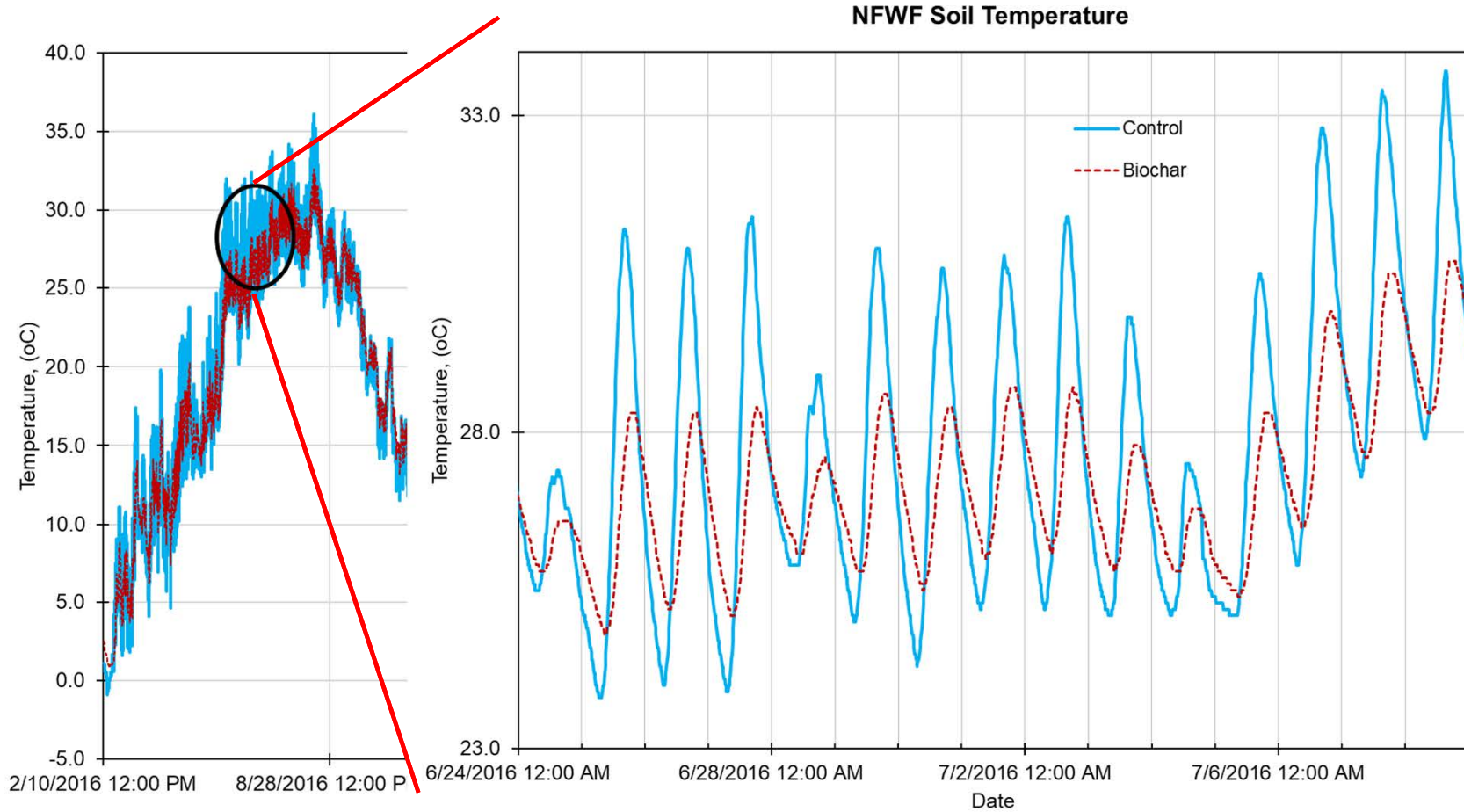
Dry Bulk Density:

Undisturbed: 1.63 g/cm³

Control: 1.46 g/cm³

Biochar: 1.22 g/cm³

Preliminary Results – Soil Moisture Content



Questions?

Dissecting Microscopic Imagery



Existing Soil



Existing Soil with 4% Biochar

Thank You

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