

An aerial photograph of a rural landscape. In the foreground, a multi-lane road curves through a field. To the right, there is a cluster of buildings, including a large barn and several smaller structures. The background is dominated by a dense forest of trees with autumn foliage in shades of green, yellow, and orange. A semi-transparent red rectangular box is overlaid on the center of the image, containing white text.

CAN SOIL AMENDMENTS REDUCE ROADSIDE RUNOFF?

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Presentation Outline

TOPICS FOR TODAY

- Managing urban runoff for erosion and sediment control
- Effects of tillage and compost amendments in roadside soils
 - Plot design and establishment
 - Changes in soil physical properties
 - Storm separation
 - Runoff volumes and water quality
- Implications and remaining questions



An aerial photograph of a suburban neighborhood. The scene is dominated by green trees, some with autumn-colored leaves. A multi-lane road runs horizontally across the middle of the frame. Several houses with various roof colors (blue, grey, brown) are scattered throughout the landscape. The overall atmosphere is bright and clear.

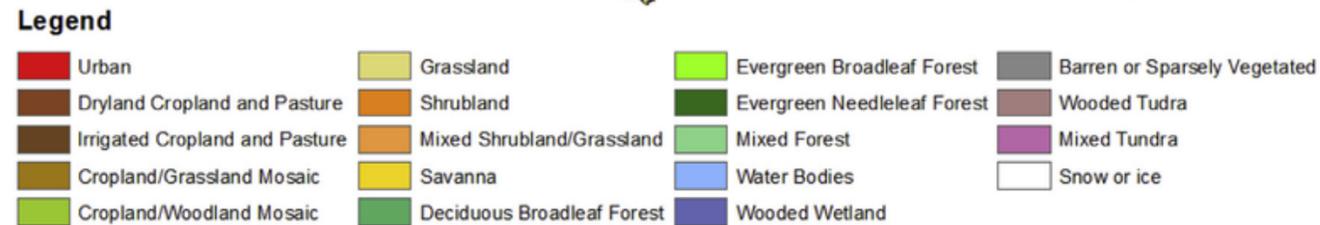
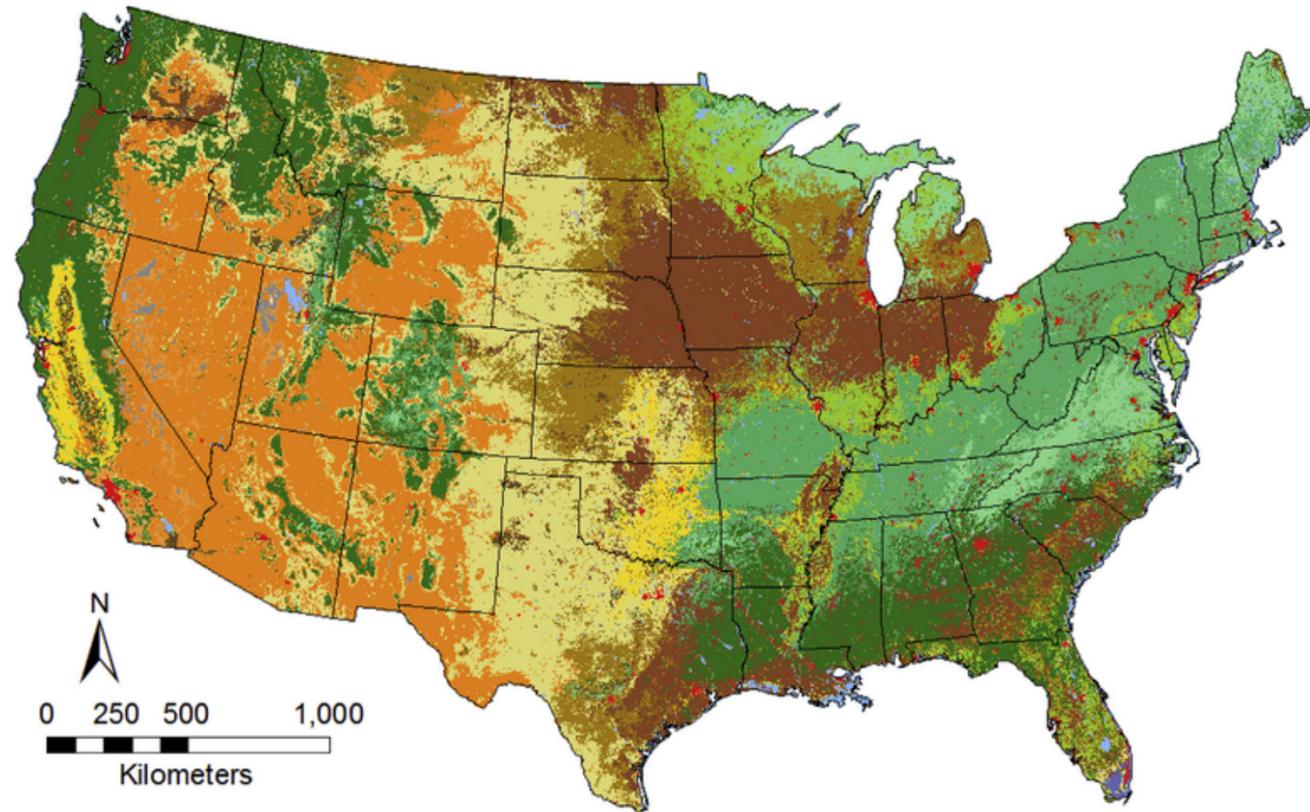
URBAN WATER QUALITY CHALLENGES

"Stormwater runoff from the built environment remains one of the great challenges of modern water pollution control"

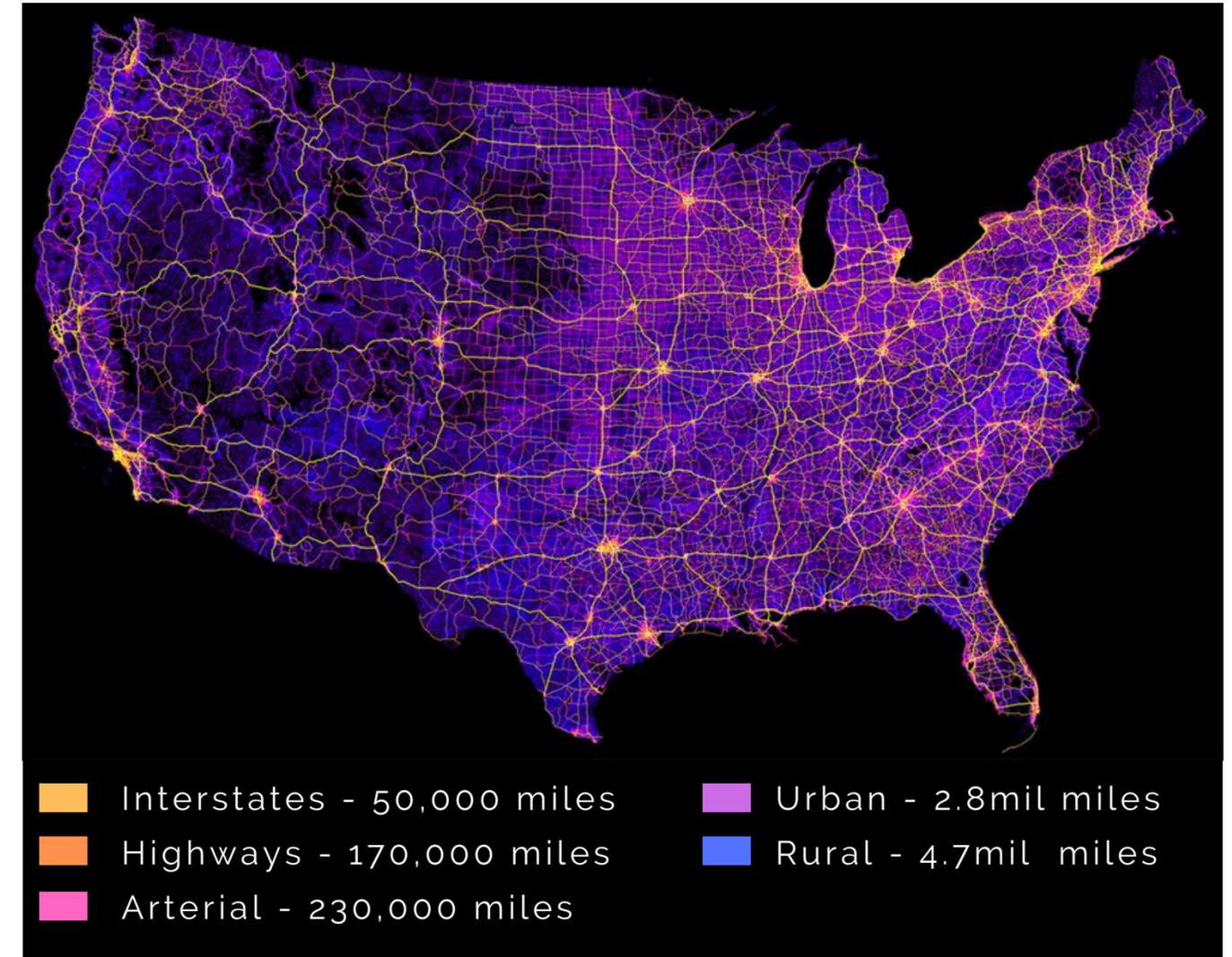
NATIONAL RESEARCH COUNCIL

US LAND COVER

3.5% CITIES



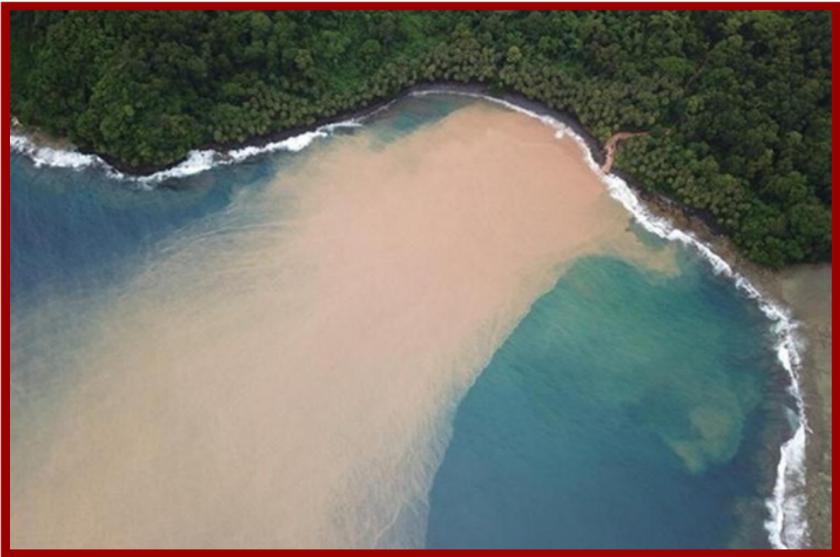
1% ROADS



STORMWATER RUNOFF → SURFACE WATER IMPAIRMENT

Impervious surfaces + Disturbed pervious areas

Quantity + Quality



NCDOT

BEST MANAGEMENT PRACTICES



CONSTRUCTION

Temporary

Erosion & Sediment Controls:

- Silt fence
- Gravel construction entrance
- Sediment basin
- Fiber rolls



POST-CONSTRUCTION

Permanent

End-of-Pipe:

- Detention basins
- Bioretention
- Wetlands
- Soil improvements

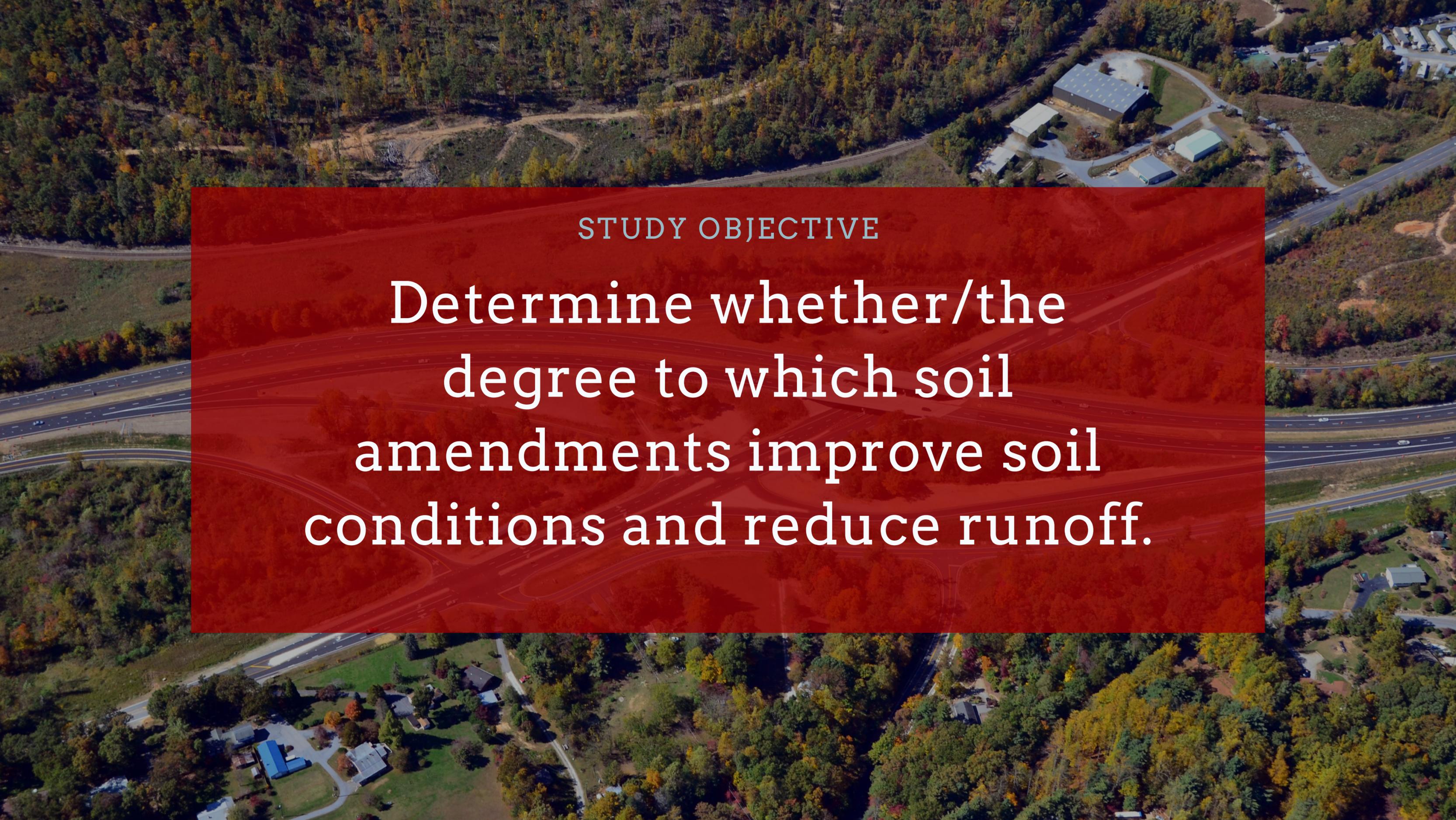


NON-STRUCTURAL

Source Controls, Pollution

Prevention:

- Fertilizer management
- Impervious area reduction
- Training

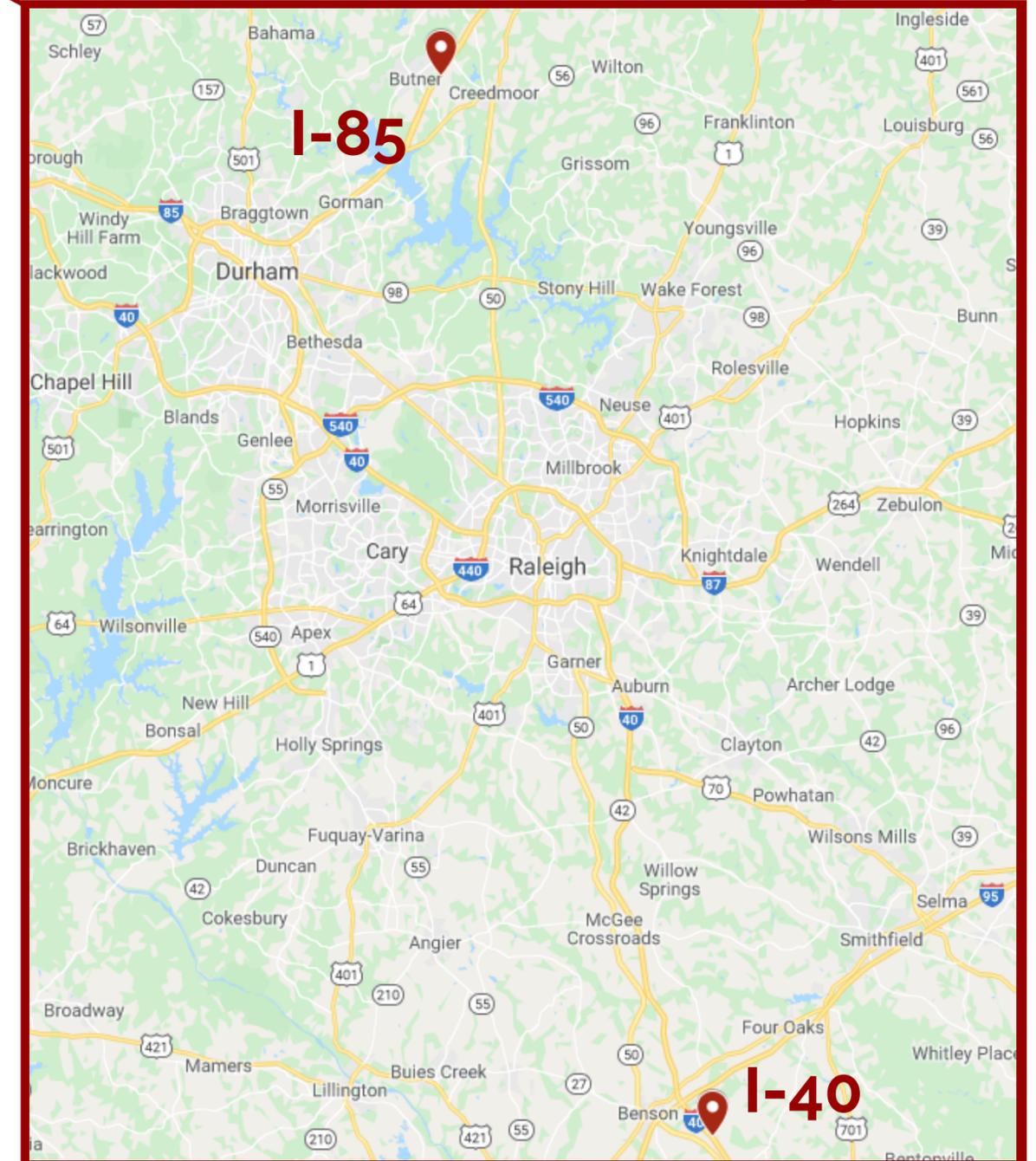
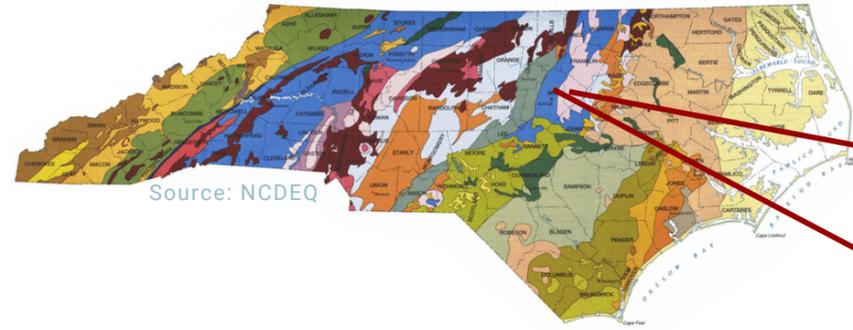
An aerial photograph of a rural landscape. A multi-lane road runs horizontally across the middle. To the right, there is a cluster of buildings, including a large barn and several smaller structures. The surrounding area is filled with trees, some showing autumn colors. A semi-transparent red rectangle is overlaid on the center of the image, containing text.

STUDY OBJECTIVE

Determine whether/the
degree to which soil
amendments improve soil
conditions and reduce runoff.

EXPERIMENTAL PLOTS

Site Design

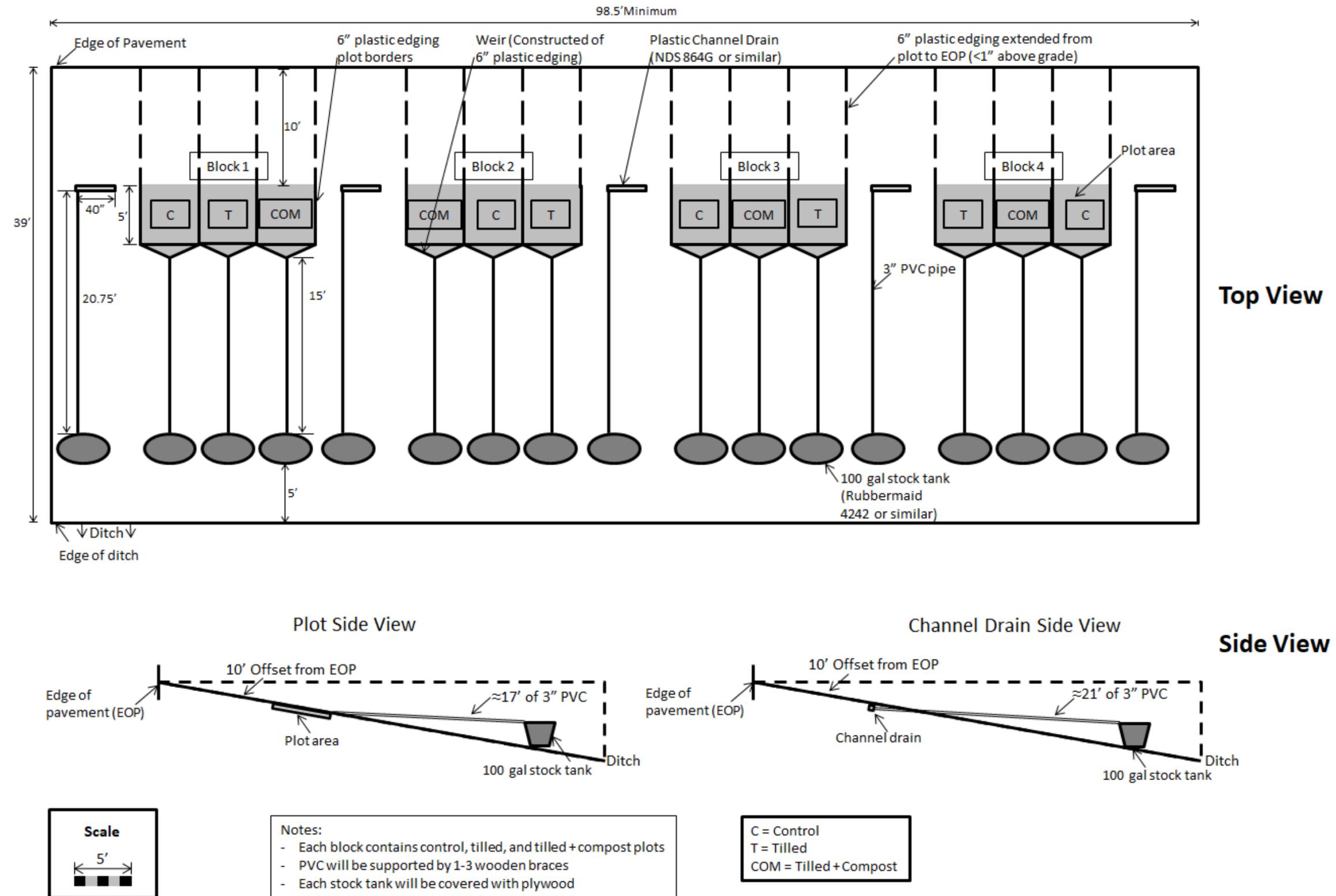


- LOCATIONS: I-40 & I-85
- RANDOMIZED COMPLETE BLOCK PLOT DESIGN
 - CONTROL
 - TILLAGE
 - TILLAGE + COMPOST
- STORM COLLECTION
 - RAIN GAUGE
 - RUNOFF VOLUME
 - WATER QUALITY

EXPERIMENTAL PLOTS

Site Design

- LOCATIONS: I-40 & I-85
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EXPERIMENTAL PLOTS

Site Design

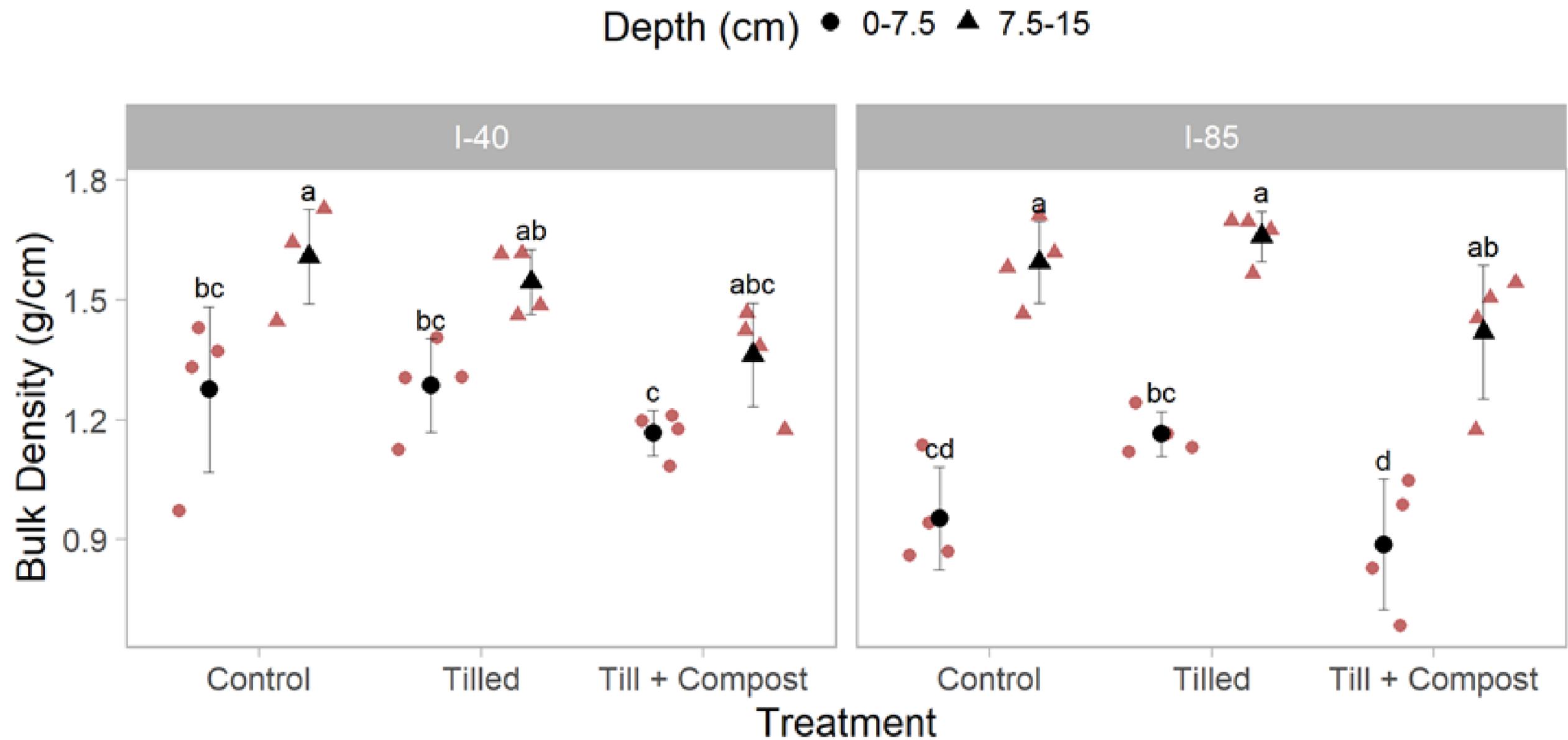
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RESULTS:

Soil physical properties

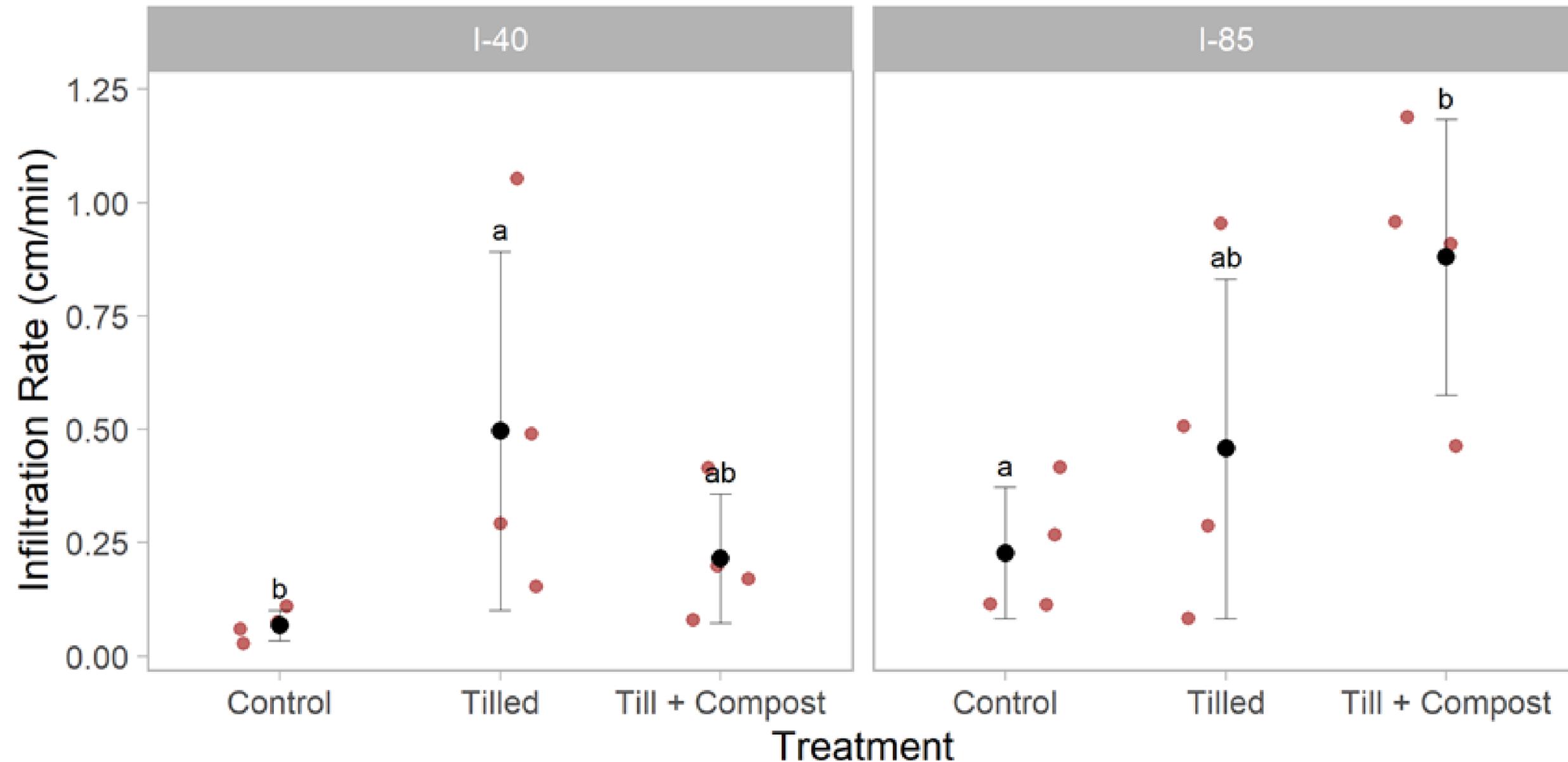
BULK DENSITY



RESULTS:

Soil physical properties

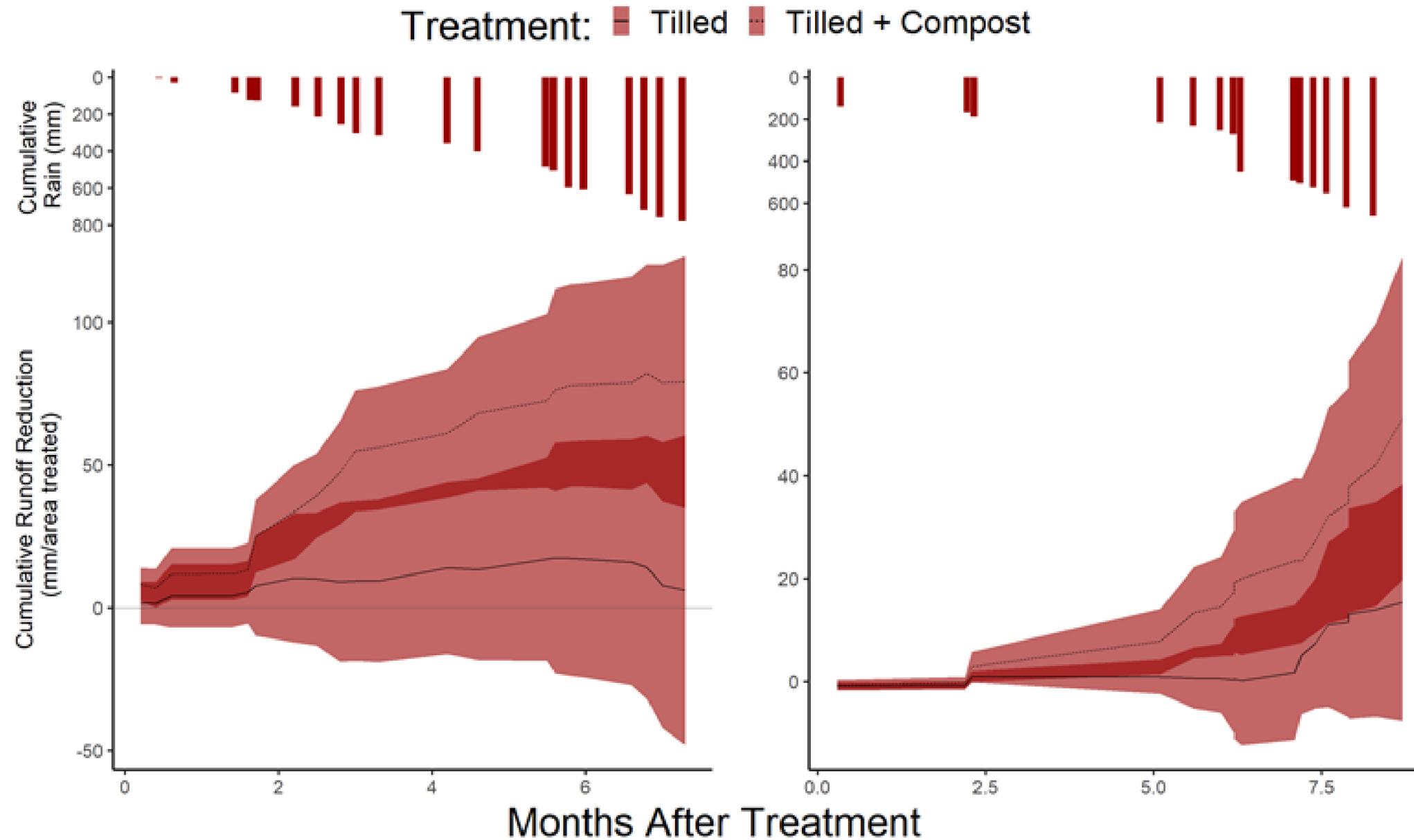
INFILTRATION RATES



RESULTS:

Soil physical properties

RUNOFF REDUCTION

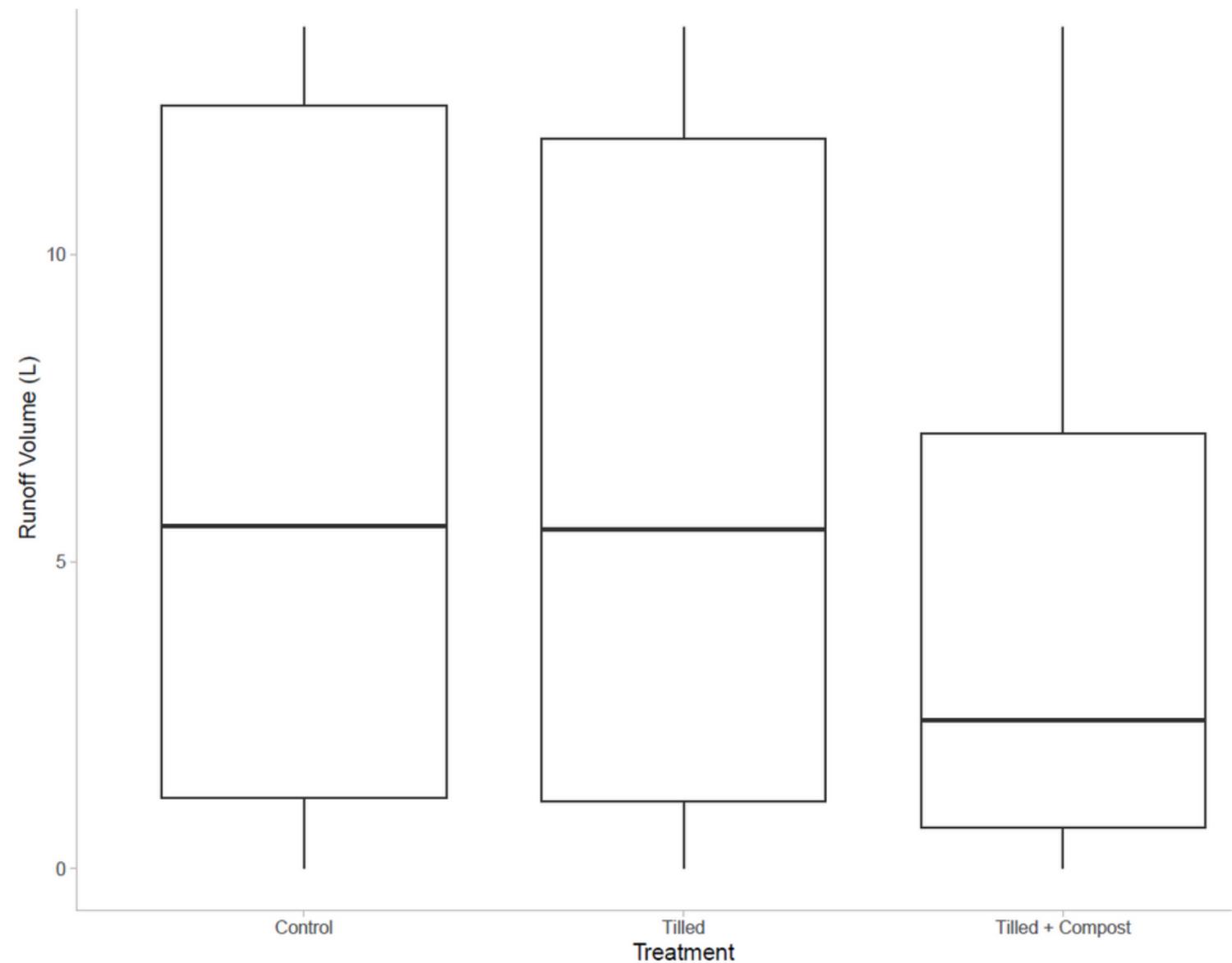


RESULTS:

Soil physical properties

RUNOFF REDUCTION

ACROSS ALL STORMS, NO
DIFFERENCE BETWEEN
TREATMENTS



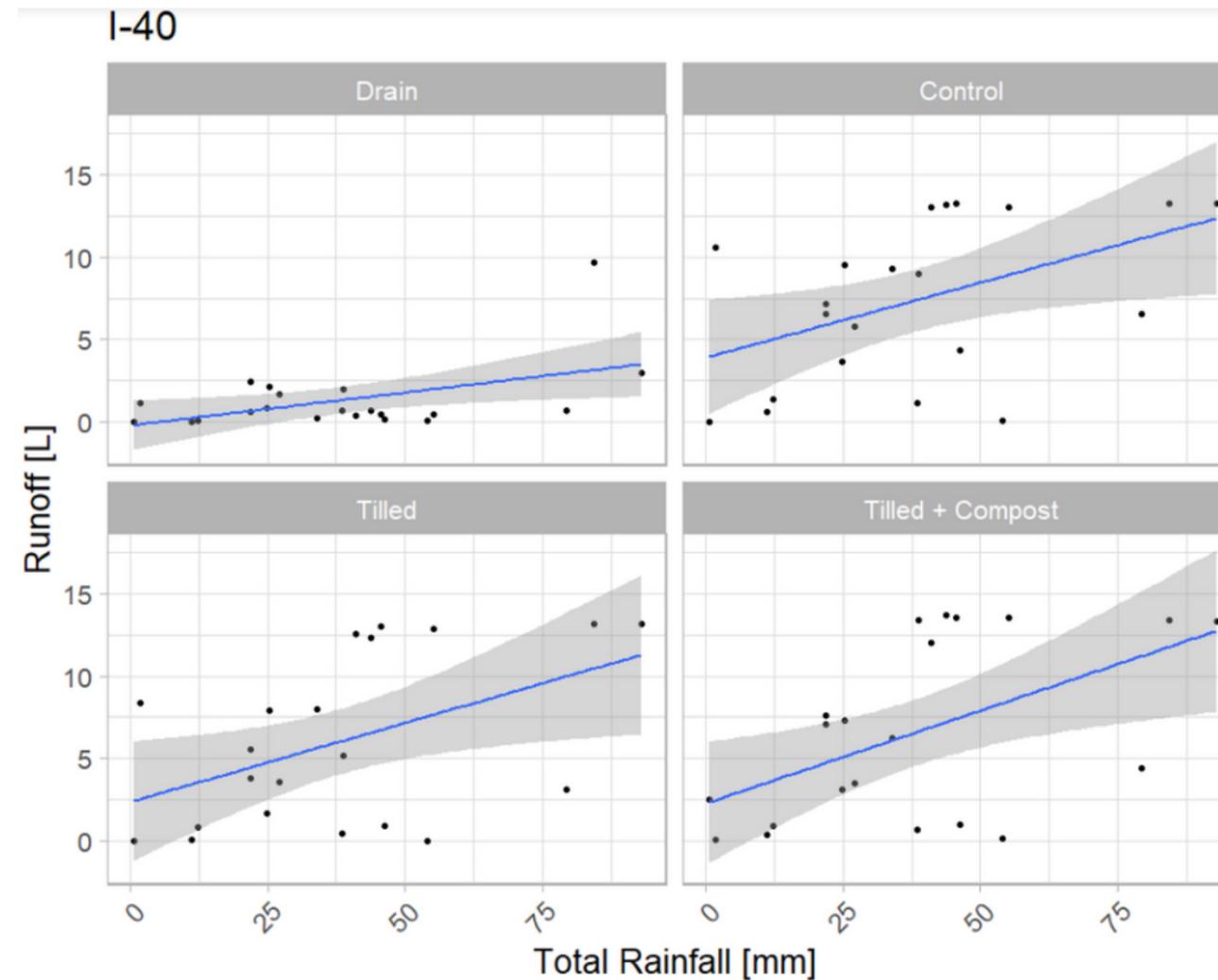
RESULTS:

Soil physical properties

RUNOFF REDUCTION

RUNOFF PROPORTIONAL TO
TOTAL RAINFALL

HIGH VARIABILITY IN
STORM SIZES

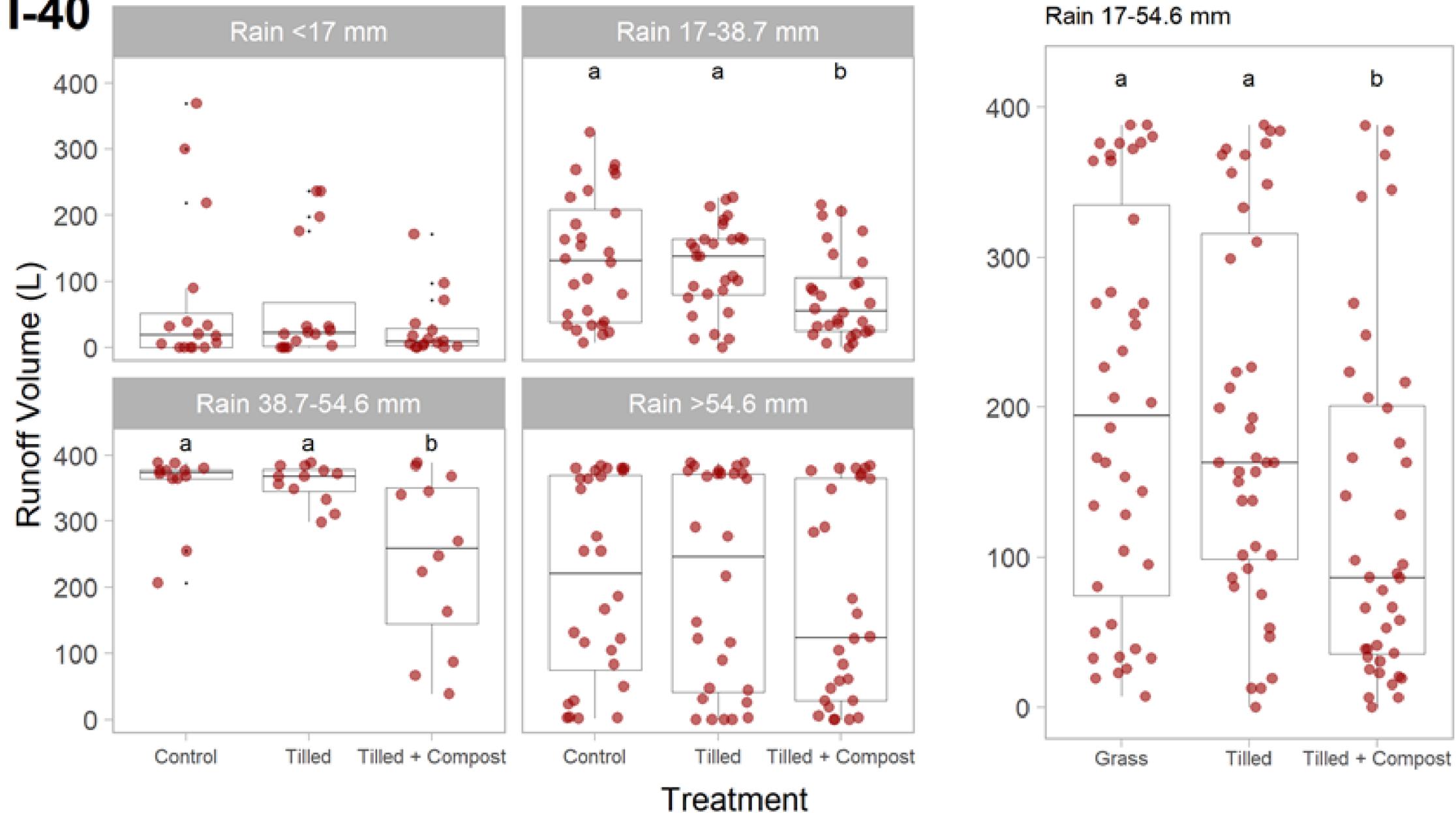


RESULTS:

Soil physical properties

RUNOFF REDUCTION

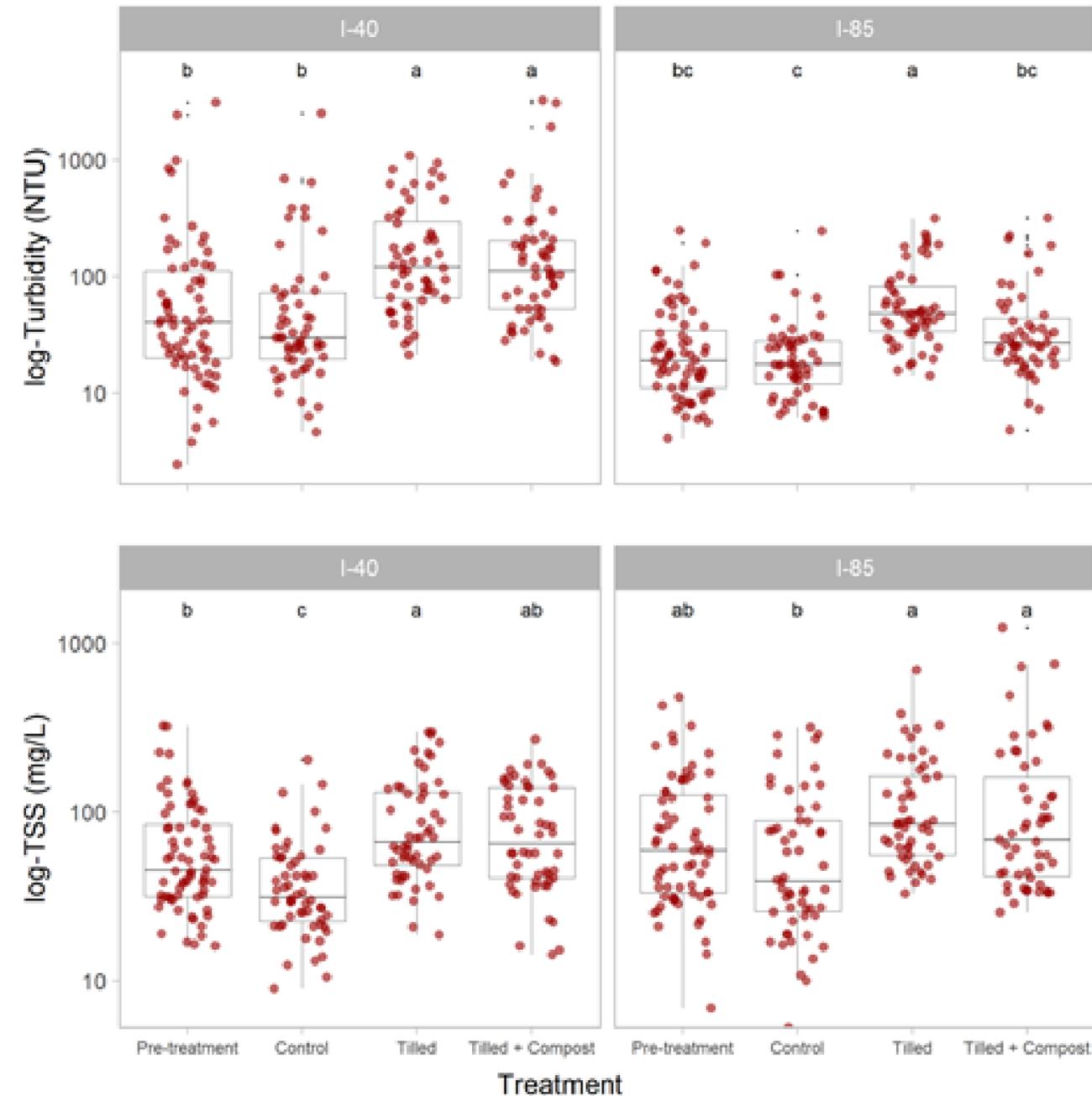
I-40



RESULTS:

Soil physical properties

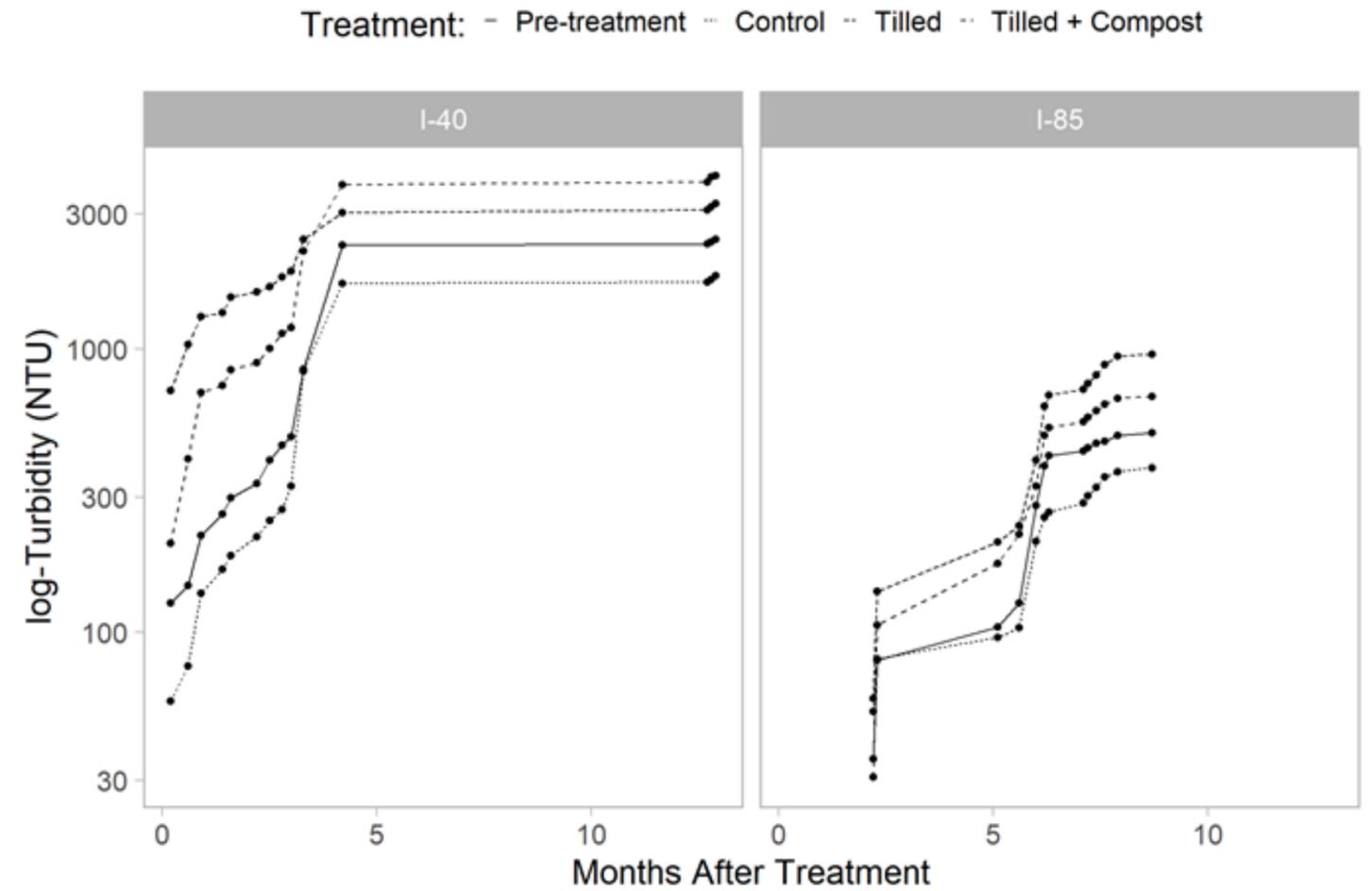
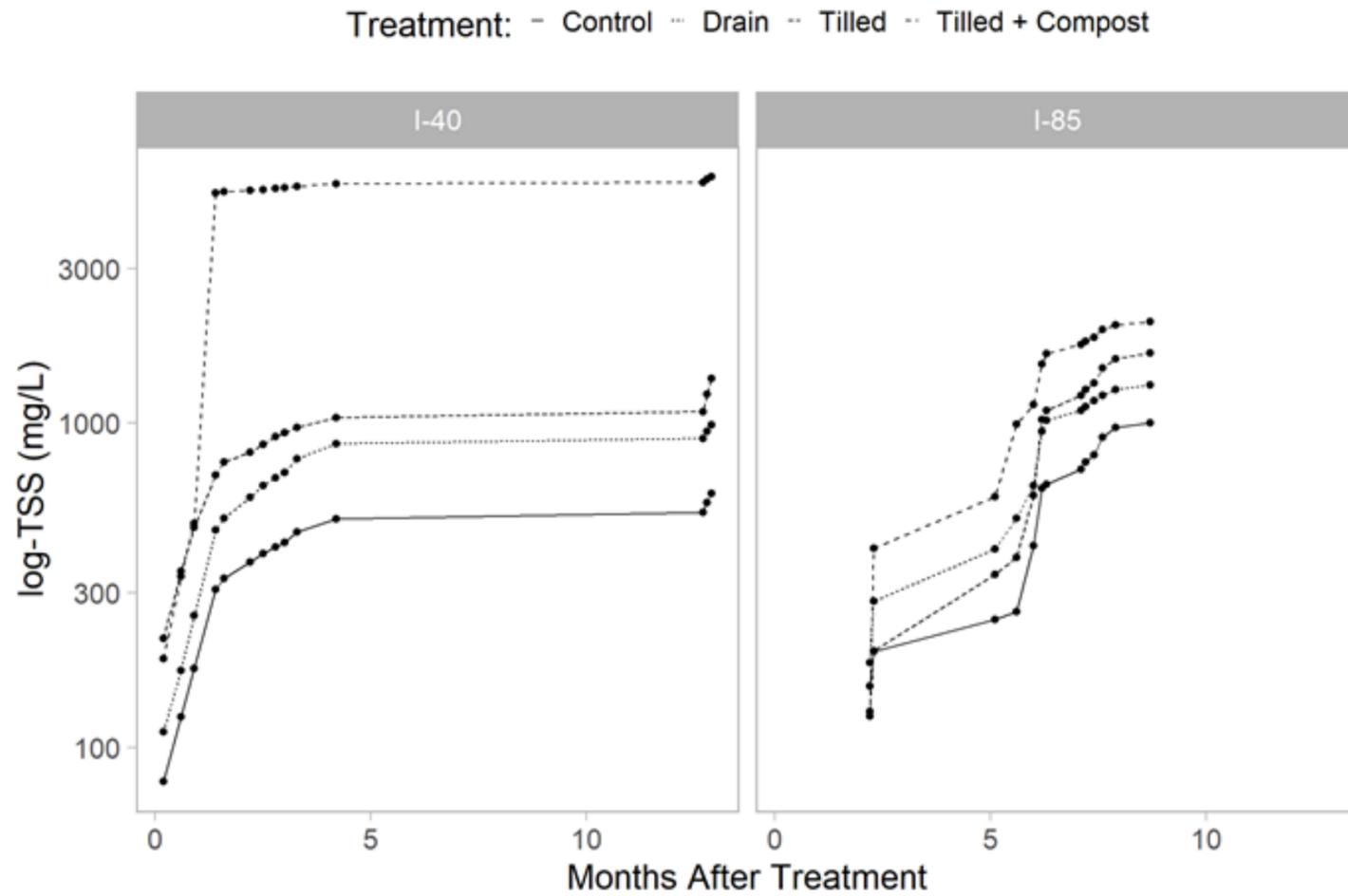
WATER QUALITY - SEDIMENTS



RESULTS:

Soil physical properties

WATER QUALITY - SEDIMENTS



Preliminary Findings

SOIL PHYSICAL PROPERTIES

Soil amendments did not change bulk density
Infiltration rates higher in Tillage and Tillage + Compost

RUNOFF REDUCTION

Tillage + Compost reduced significantly more runoff compared to Tillage alone

STORM SIZE

Effect of treatments emerged at intermediate rainfall depths

WATER QUALITY

Tillage and Tillage + Compost increased suspended sediments in runoff
Effect may level off over time

Remaining Questions

NUTRIENTS/METALS

What are the effects on other water quality parameters?

LONG TERM EFFECTS

How will soil amendments function over time?

OPTIMUM COMPOST AMENDMENT RATE

What is the ideal rate of compost application for water quality benefits? Cost-benefits?

OTHER OPTIONS

What are other soil amendment/stabilization options?

Biochar?
Wildflowers?



Questions?

North Carolina Erosion and Sediment Control Design Workshop
December 3, 2019



Please remember to Complete the End of Workshop Evaluation
(separate from the PDH sponser evaluation)

bit.ly/Raleigh2019-ESC-Eval