NC STATE SEDIMENT, EROSION, & TURBIDITY CONTROL

Research Updates

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NC STATE UNIVERSITY

Outline

1. Team Introduction
2. Research Program Updates
3. Training Program Updates
4. Emerging Challenges + Future Directions

1 Our Team

Our interdisciplinary team combines applied research and Extension training on erosion, sediment, and turbidity control practices to improve water quality statewide.

Dr. Rich McLaughlin
Emeritus Professor

Dr. Erin Rivers
Asst. Professor

Dr. Josh Heitman
Professor

Adam Howard
Research Technician

Dr. Christina Kranz
Lecturer

Research Themes:
Rainfall, Hydraulics, and Sediment Transport

- Pressurized rainfall simulator
- Controlled droplet size, velocity, and distribution
- Quantifies soil detachment, transport, and deposition under repeatable conditions
- Runoff volume, turbidity, & TSS
- Side-by-side BMP testing under identical storm sequences

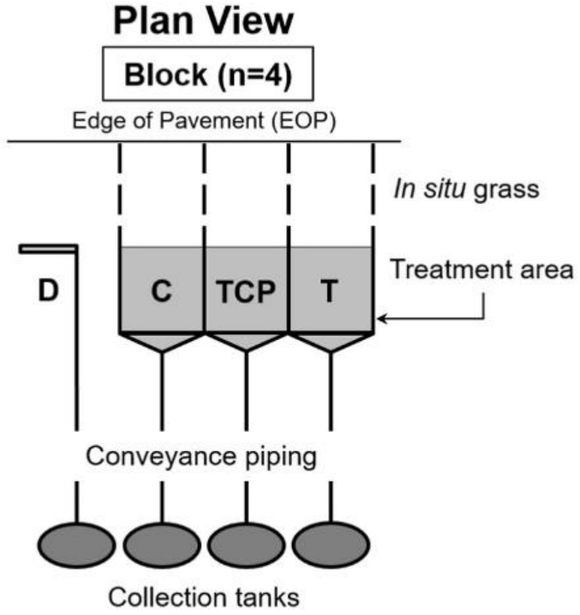
Research Themes:
Rainfall, Hydraulics, and Sediment Transport

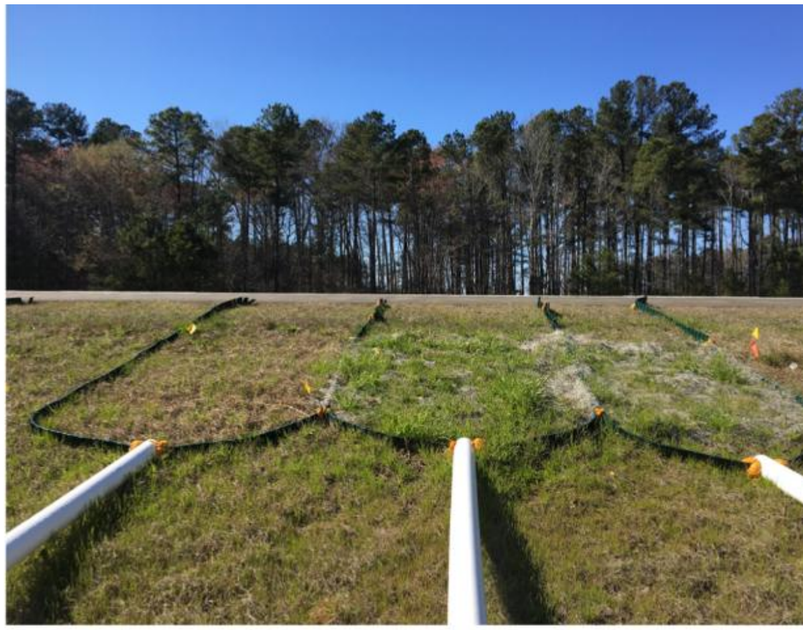
- Pressurized rainfall simulator (mobile)
- Controlled droplet size, velocity, and distribution
- Quantifies soil detachment, transport, and deposition under repeatable conditions
- Runoff volume, turbidity, & TSS
- Side-by-side BMP testing under identical storm sequences

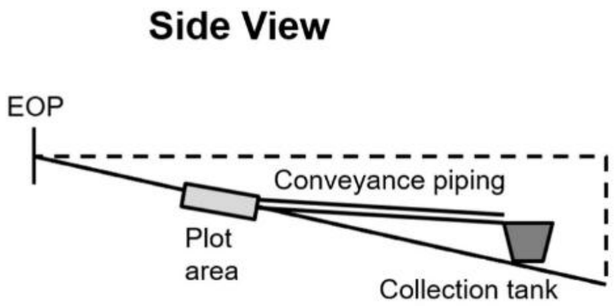
Research Themes:

Slope Stabilization and Surface Cover Performance

- Evaluate soil improvements (e.g. tillage, compost)
- Vegetation type (grass mixes, wildflower)
- Laboratory experiments and field plots
- Runoff reduction, turbidity, TSS, nutrients, metals
- Side-by-side testing under field conditions







Research Themes:
Turbidity Treatment & Reduction

- Test PAM and hybrid polymer dosing for rapid turbidity reduction
- Baffle and skimmer basin configurations to promote plug flow
- Measure settling velocity improvements and time-to-clear metric
- Generate practical dosing guidance for field crews and inspectors

2 Research Program Updates

Diamond grinding slurry management and reuse

Effectiveness of compost application methods

Diamond Grinding Slurry Wastewater: Effects on Soil and Vegetation

Dr. Josh Heitman

Dr. Christina Kranz

Adam Howard

Graduate Student: James Harris

Study Objectives:

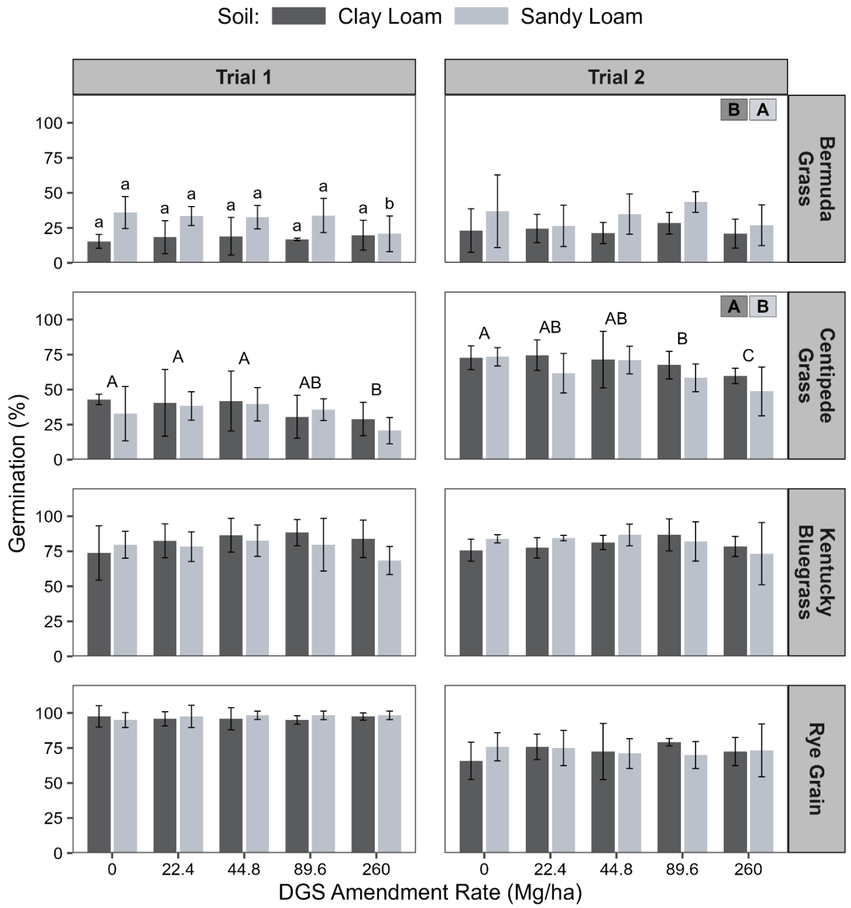
- Determine the effects of DGS wastewater composition on soil effluent (soil column experiment)
- Conduct a greenhouse trial to determine the feasibility of growing vegetation and changes to soil properties following irrigation with DGS wastewater

Diamond Grinding Slurry Wastewater: Effects on Soil and Vegetation

Background:

- By-product of concrete road grinding operations; mixture of water and fine particles of concrete
- Environmental challenges: High pH, potential impacts on soil and water quality
- Road infrastructure expansion increases DGS production
- Need for sustainable and environmentally sound disposal and reuse strategies

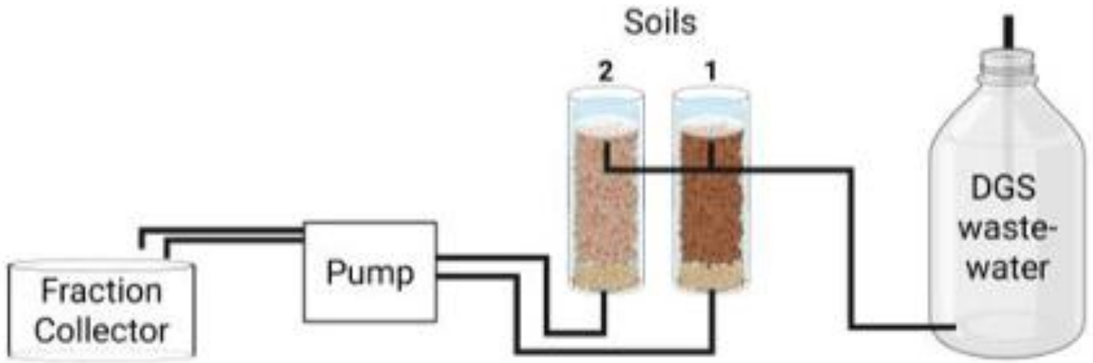
Diamond Grinding Slurry Wastewater: Effects on Soil and Vegetation



Previous Work:

- Polyacrylamide additions can improve the separation of solids and wastewater
- Diamond grinding slurry solids can be applied to soil as a liming agent with limited effects on grass germination

Diamond Grinding Slurry Wastewater: Effects on Soil and Vegetation



Soil column setup

Preliminary Results:

- High pH of DGS wastewater
- Composition & chemistry varied by project (old vs. new pavement)
- DGS wastewater buffered acidic Piedmont soils

Comparing Effectiveness of Compost Surface Blanket and Incorporation for Post-Construction Soils

Dr. Josh Heitman

Dr. Christina Kranz

Adam Howard

Graduate Student: Gboyega Adebayo

Study Objectives:

Compare the impact of compost (blanket vs. incorporation) on:

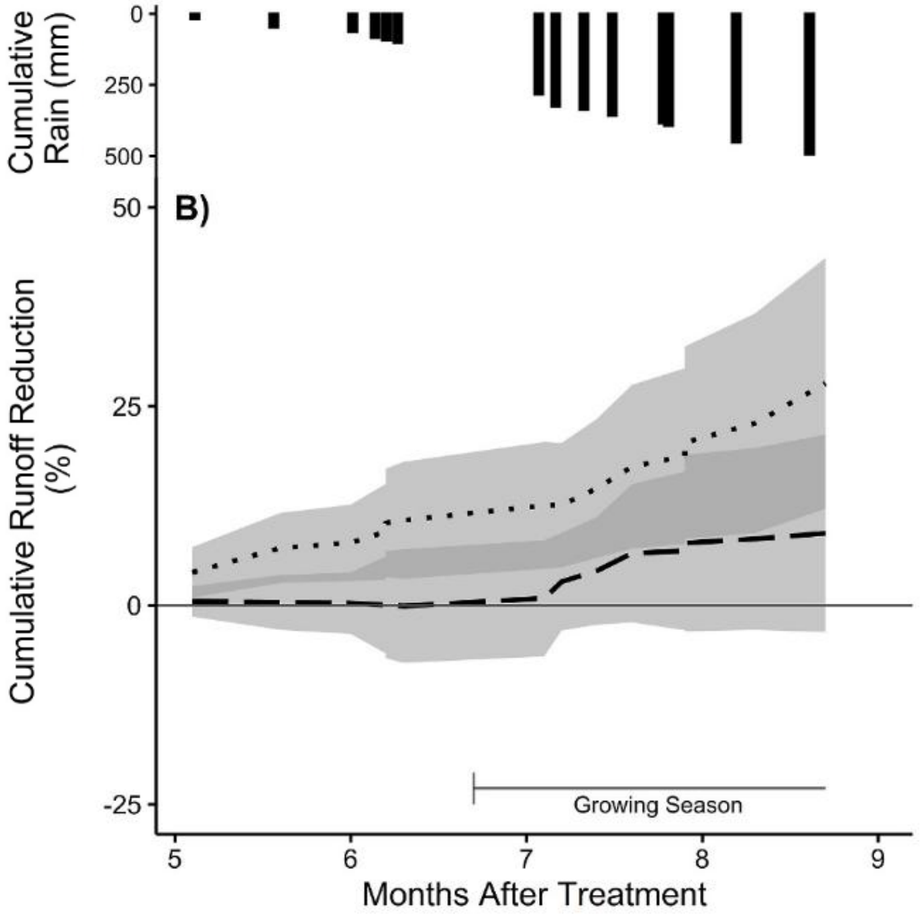
- Stormwater runoff quantity & quality (volume, sediments, N, P)
- Vegetation establishment (cover & biomass)
- Soil properties (bulk density, infiltration, penetration resistance, moisture content)

Comparing Effectiveness of Compost Surface Blanket and Incorporation for Post-Construction Soils

Background:

- Post-construction soils are compacted, nutrient-poor, low-organic matter, and highly erosion-prone
- Runoff from disturbed soils increases sediment transport, nutrient loss, and vegetation failure
- Compost offers a sustainable soil amendment with demonstrated erosion and stormwater benefits
- Application method likely influences short-term stabilization and long-term soil improvement

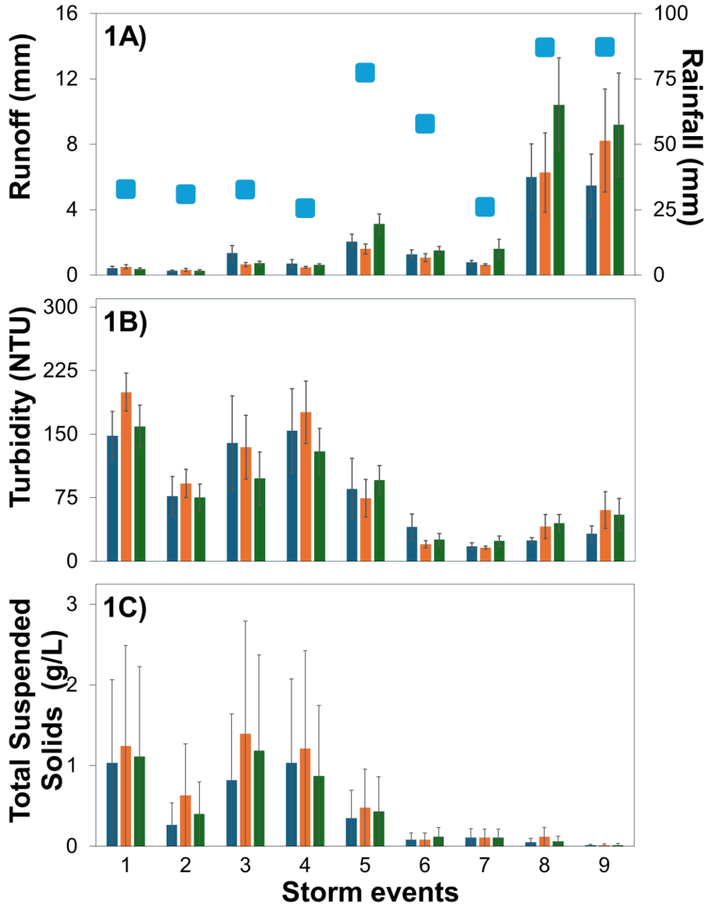
Comparing Effectiveness of Compost Surface Blanket and Incorporation



Previous Work:

- Compost (+tillage) reduces bulk density, improves infiltration, and increases stormwater interception
- Limited assessment of incorporation method on performance

Comparing Effectiveness of Compost Surface Blanket and Incorporation



Preliminary Results:

- Runoff: decreased with compost, with blanket application most effective during high-intensity storms
- Sediment (Turbidity & TSS): peaked in early storms, especially under incorporation, but declined sharply as vegetation cover developed.

2 Training Program Updates

Diamond grinding slurry management and reuse

Effectiveness of compost application methods

❷ Training Program Updates

Sediment and Erosion Control Research and Education Facility (SECREF)


SECREF

SECREF

Trainings

NC STATE UNIVERSITY

College of Agriculture and Life Sciences →

Department of Crop and Soil Sciences

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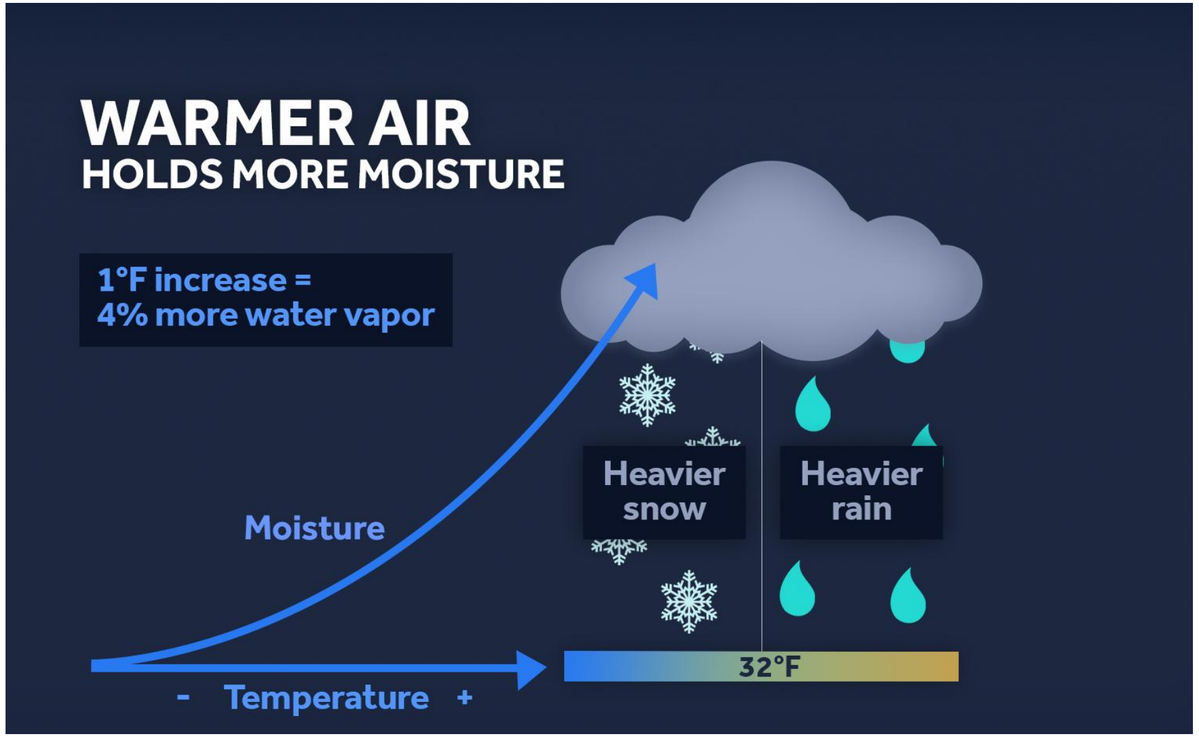
Erosion, Sediment and Turbidity Control

Training and Workshops

Water Challenges are Changing

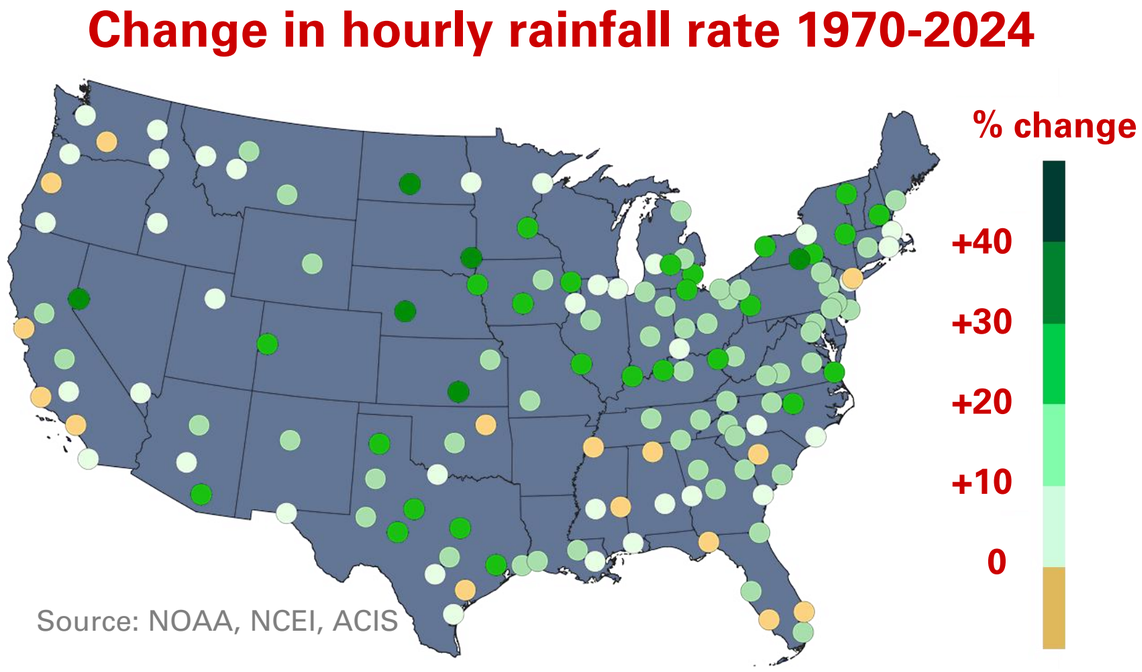
- More high-intensity storms, longer dry spells



Source: Climate Central

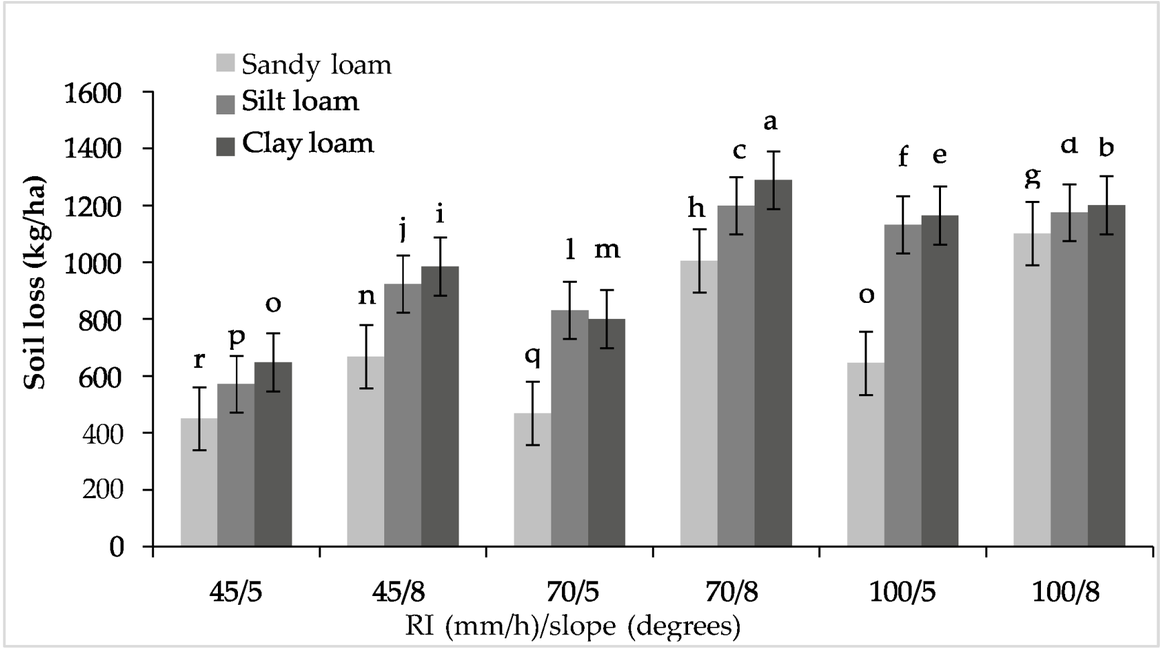
Water Challenges are Changing

- More high-intensity storms, longer dry spells



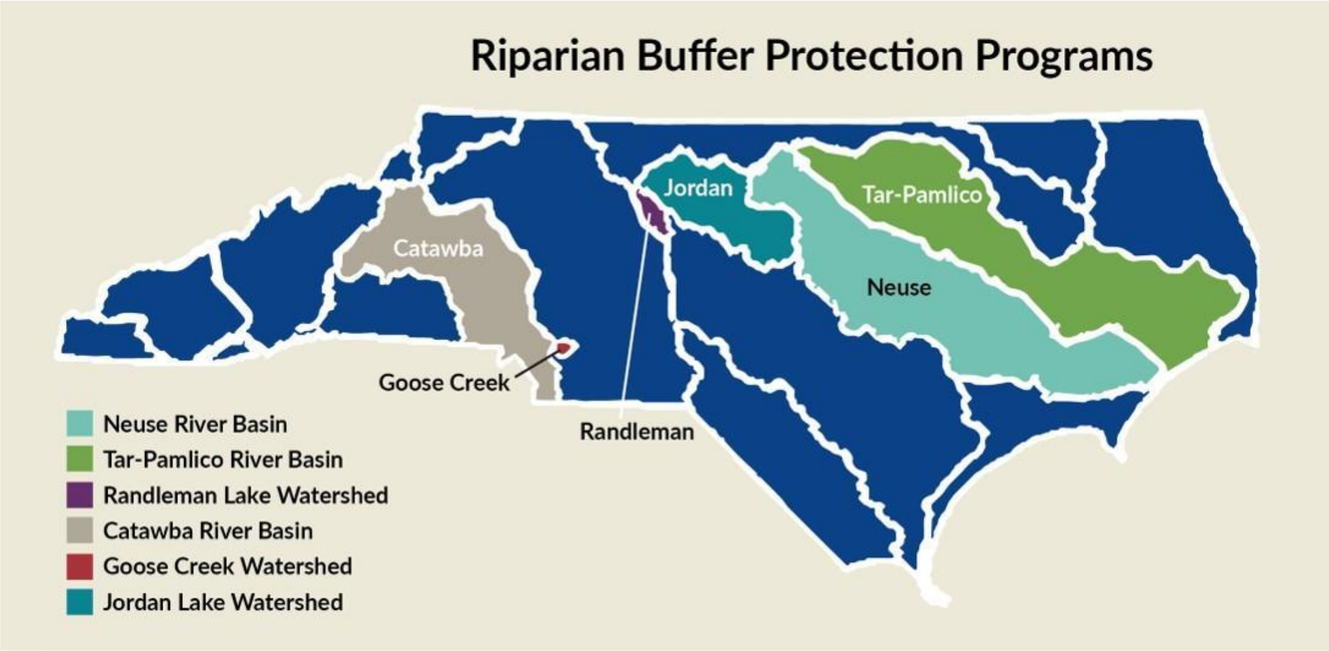
Water Challenges are Changing

- More high-intensity storms, longer dry spells
- Increases in nutrient and sediment delivery



Water Challenges are Changing

- More high-intensity storms, longer dry spells
- Increases in nutrient and sediment delivery
- Regulatory changes/pressure in Neuse, Tar-Pam, Cape Fear Basins

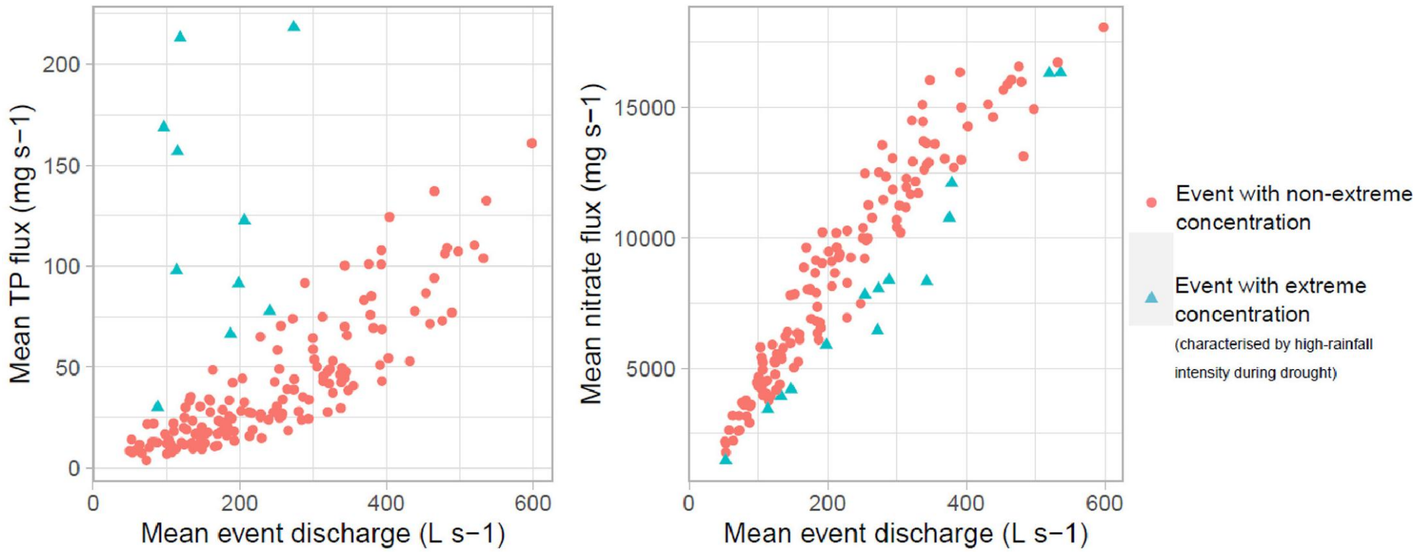


NCDEQ: Areas where riparian buffer rules are applied in North Carolina.

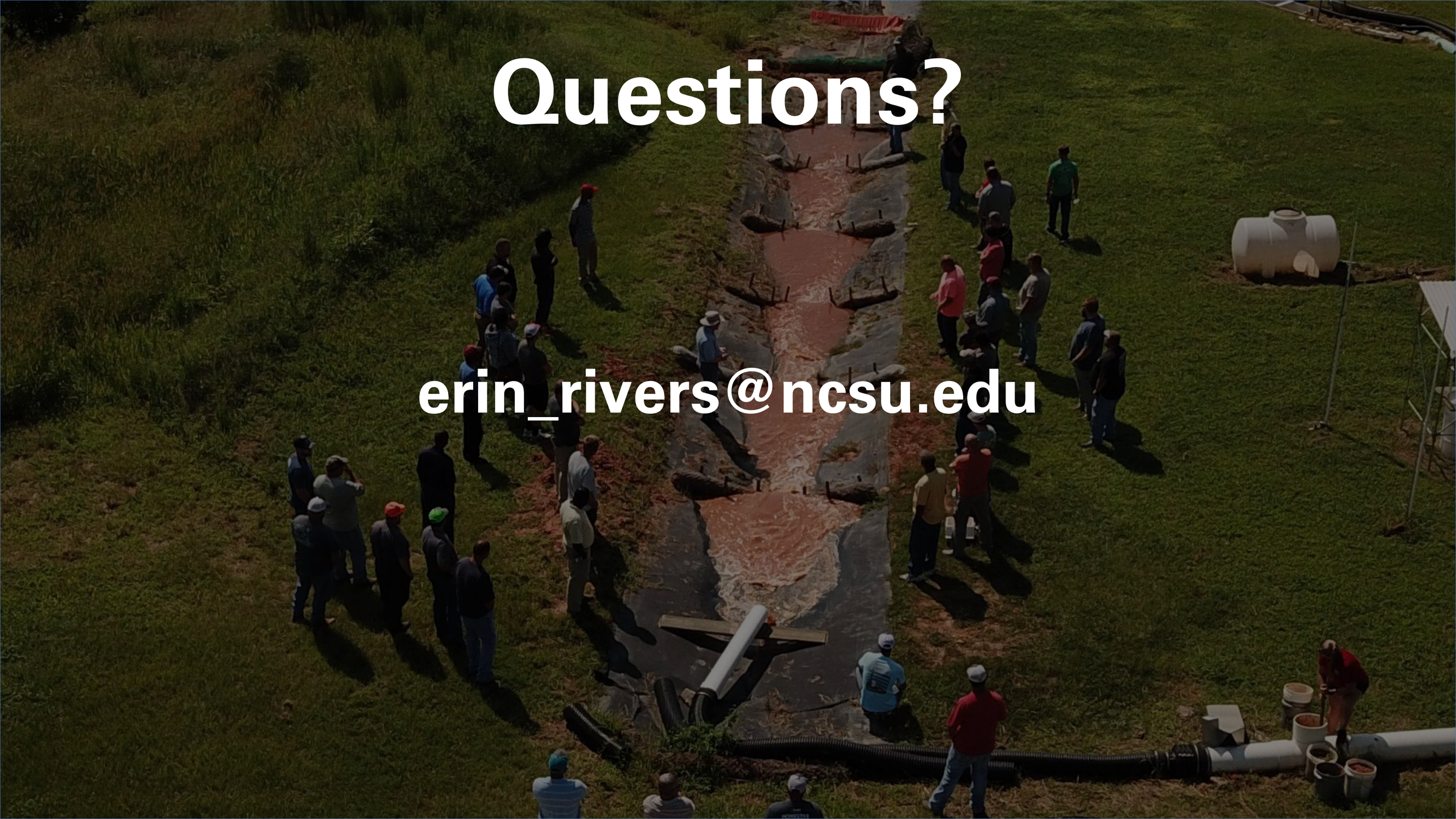
Storm-Driven Nutrient Loss

- 60–80% of annual N export from a few storm events
- High leaching and runoff risk with increasing development

High intensity rainfall triggers nutrient export



Dupas et al. 2025 High-intensity rainfall following drought triggers extreme nutrient concentrations in a small agricultural catchment



Questions?

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