Why Does NCDOT Conduct Research?

- Science-based decisions
- Foundation for informing policy development
- Optimize limited resources
- Better environmental outcomes
- Compliance
NCDOT Research & Development Unit

Oversees transportation-related research that investigates materials, operations, planning, traffic and safety, structures, human environments, and natural environments.

- Research and Development Manager: Neil Mastin, PE
- Research Engineer: Planning, Environment and Transit: John Kirby
Annual Research Cycle

1. Research Idea
2. University Develops Pre-proposals
3. Exec. Committee Final Approval
4. Committee Recommends Full Proposal
5. Selected Pre-proposal => Full Proposal
6. Research Project Authorized
7. Exec. Committee Final Approval
8. Committee Recommends Full Proposal
9. University Develops Pre-proposals
10. Research Idea
Typical Stormwater Research Project

- Typ. Length: 2-3+ years
- Typ. Funding: $200-300K
- Researchers: UNC-system universities or USGS, SCO
- Research used to update NCDOT guidance manuals
Types of Stormwater Research Projects

Post-Construction (permanent measures)
- ~18 years of research under the NPDES program
- Runoff characterization
- BMP performance characterization
- Manufactured device evaluation
- Vegetation management

Construction (temporary measures)
- 30+ years of research
- Erosion and sediment control
- Vegetation management
Just How Much Post-Construction Research?

- 71 sites monitored across NC
- 2,751 storm events
- 33,579 event mean concentrations
- 162 different analytes
Research Topics

- Swale
- Bioswales
- Check dams
- Linear wetlands
- Coastal infiltration systems
- Bioretention
- Level spreaders
- Roadside filter strips
- Biofiltration conveyance
- Wash pads
Research Topics

- Pollutant load characterization:
  - Nutrients
  - Metals
  - Bacteria
  - Gross solids
  - Particle size distribution
- Soil improvement to promote infiltration
- Pathogen reduction
- Spray liner pipe rehab technologies
Research Topics

- Permeable friction course
- Dry detention basins
- Carbon sequestration by SCMs
- Soil/GW contamination
- Bridge deck runoff characterization
- Borrow pits
- Numerous erosion control and vegetation management topics

60+ research projects since 1999
Active Post-Construction Research Areas
Soil Improvement Using Tillage and Amendments to Increase Infiltration
Swale and Bioswale Design Optimization
A Peek Into Next Year’s Ideas…

- Outlet/outfall discharge analysis
- Optimizing filtration media specifications for specific pollutants
- Optimizing the soil improvement BMP with compost additions
Research Gone Amuck
Construction Research
Example Research Projects

- Evaluation of polyacrylamides (PAM) for both erosion and turbidity control for construction sites.
- Multi-Sensor Precipitation Estimates (MPE)
  - New project: Identifying High-Risk Areas During Precipitation Events Support of NCDOT Stormwater Quality Monitoring
Active Research Projects
by Dr. Rich McLaughlin at NCSU as part of NCDOT’s Construction Program:

• Performance Standards for Straw Mulch Binding Agents
• Evaluation of Flocculants: Optimizing Characteristics and Screening Methods
• Comparing Low-Cost Methods to Stabilize Temporary Diversions and Ditches
• Erosion, Sediment, and Turbidity Control and Monitoring Research to Meet Water Quality Goals
Performance Standards for Straw Mulch Binding Agents

Wind and water erosion concerns with tackifiers
How well do tackifiers perform?
Wind tunnel built for testing tackifers
Evaluation of Flocculants

- Collected 22 different soil samples from across NC
- Evaluated current flocculants available and their effectiveness
Comparing Low-Cost Methods to Stabilize Temporary Diversions and Ditches
Field Lab Work

NCDOT Project Work
Erosion, Sediment, and Turbidity Control and Monitoring Research to Meet Water Quality Goals

Test new methods to dose flocculants
Test potential toxicity of chemical flocculation treatment to freshwater mussels

No evidence of toxicity
Vegetation Management Research

- Pollinator Study
- Stormwater Infiltration and Pollinator Habitat Zones along Highways
Selection, Installation and Evaluation of Zoysiagrass

- >1,000 miles of median rail
- Use chemical and mechanical weed control management
- Zoysiagrasses are thick sod-producing turfgrass that once established have minimal weed invasion.
  - Unfortunately, some existing zoysiagrass cultivars can be slow to establish unless they are sodded to cover all existing exposed soil.
- This research will allow NCDOT to select the best germplasm for long-term maintenance of NC roadsides.
How Can I Access This Research?

1. Go to Google and search for "ncdot research".
2. Look for the top search result:
   - Research and Development - Connect NCDOT
   - This link provides information about the Research and Development Unit, which oversees transportation-related research.
3. Explore other links:
   - NCDOT Research Projects - Connect NCDOT
   - List of All NCDOT Research Projects - Connect NCDOT
   - These links provide more detailed information about specific research projects funded by NCDOT.
NCDOT's Research Website

Click on View Research Projects

Filter by researcher

Filter by topic
NCDOT's STORMDATA Database

- Schema based on FHWA/USGS Highway Runoff Database
- Will allow users to query research data, find trends, test correlations, etc.
- Integrates with the QAPP in that data quality will be recorded in the database
Thanks, especially to NCDOT’s Stormwater Researchers!