Department of Soil Science
**VISION:** The Department of Soil Science will be an international leader in soil and related research. The excellence of the Department’s academic programs will attract outstanding undergraduate and graduate students. The Department will provide nationally recognized extension leadership in sustainable and productive use of soil and water resources and waste materials.

**MISSION:**

1. To develop knowledge of basic soil science and the interrelationships with plant nutrition and environmental quality;

2. to apply this knowledge to advance resource efficient and environmentally sound soil, plant, and environmental management technologies;

3. to improve the quality of life by providing research-based information and educational opportunities on the appropriate use and management of soil and water resources;

4. to prepare undergraduate students with an understanding of and ability to apply fundamental principles of soil science, agronomy, environment, and natural resource management; and

5. to prepare graduate students to conduct basic and applied research that will be used to solve problems and advance soil science.
Soil Science Staffing

<table>
<thead>
<tr>
<th>Current Personnel</th>
<th>Appropriated</th>
<th>Extramural</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tenure Track Faculty</td>
<td>22</td>
<td>-</td>
</tr>
<tr>
<td>EPA Professionals</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>USDA Scientist</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>Post-doctoral Scholars</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Visiting Scientists</td>
<td>-</td>
<td>2</td>
</tr>
<tr>
<td>SPA Technical Staff</td>
<td>6.4</td>
<td>5.6</td>
</tr>
<tr>
<td>SPA Administrative Staff</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>34.4</strong></td>
<td><strong>17.6</strong></td>
</tr>
</tbody>
</table>

**Faculty/EPA FTE**
- Research
- Academic
- Extension

Photo of Soil Science Staff

NC STATE UNIVERSITY
DEPARTMENT of SOIL SCIENCE

Agriculture & Life Sciences
Academics, Research, Extension
Departmental Facilities

Sediment and Erosion Control Research and Education Facility

Estates at Learning Point

GIS Education Laboratory

Soil Physical Properties Laboratory

Environmental and Agricultural Testing Lab

J. Edward Booth Field Learning Lab

On-site Wastewater Training Facilities

Williams Hall

Vernon G. James Center

Lake Wheeler Road Field Laboratory

Mountain Horticultural Crops Center
Research Strengths

Broad and Productive Research Programs

Multidisciplinary:
Chemistry,
Geology,
Biology,
Physics,
Engineering

Multiscale:
From atoms to planets

Since 2007, 240 publications in journals representing many fields
## Research Strengths
*Uniquely Equipped to Address Societal Needs*

<table>
<thead>
<tr>
<th>Soil Sci. Soc. Amer. Grand Challenges</th>
<th>CALS Strategic Goals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Human and ecosystem health</td>
<td>Improved health and well-being</td>
</tr>
<tr>
<td>Food and energy security</td>
<td>Safe and sustainable production of food/fiber</td>
</tr>
<tr>
<td>Climate change</td>
<td>Renewable and affordable energy</td>
</tr>
<tr>
<td>Waste treatment and water quality</td>
<td>Protecting our natural resources</td>
</tr>
<tr>
<td></td>
<td>Economic development</td>
</tr>
</tbody>
</table>
Human and Ecosystem Health

- Mitigating Arsenic in Drinking and Irrigation Water in Asia
- Bacterial Source Tracking of Antibiotic Resistance Genes
- Wetland Restoration and Delineation
- Impact of Agricultural Systems on Air Quality
- Distribution and Uptake of Potentially Toxic Metals
Food and Energy Security

- Assessing the Suitability of Biofuel Crops for North Carolina
- Soil Fertility and Precision Agriculture
- Nutrient Management and Crop Productivity
- Cover Crops Utilization in Organic Agriculture
Climate Change

- Improving Soil Management for Carbon Sequestration
- Measuring Water and Heat fluxes from Soils
- Reduction of Greenhouse Gas Emissions from Agricultural Systems
- Microbial Transformations of Nitrogen and Carbon in Soil
Waste Treatment and Water Quality

• Riparian Buffers for Controlling Nonpoint Source Pollution
• Land Application of Animal Waste
• Agronomic Utilization of Biosolids
• Erosion and Sediment Transport Control
• Chemistry of Coal Fly Ash
• On-Site Waste Water Treatment
Outreach Capabilities and Strengths

- Applied Research
- K-12 Education
- Professional Training
  - County agents
  - Nutrient management
  - On-site wastewater
  - Decentralized water reuse
  - Sediment and erosion control
  - Soil scientists
- Publications
- Public Education
  - Citizens
  - Community leaders
  - Farmers
- Information Support for State, Federal and International Programs
Outreach Capabilities and Strengths:

K-12 Outreach

- Books and Lesson Plans
- Envirothon
- Science House
- Museums
- School of Math and Science
- 4-H
- School Visits
- Boy Scouts
- Girl Scouts
- NSTA
Outreach Capabilities and Strengths

*Professional Development and Training*

- County-based programs
- Professional development
  - Lake Wheeler location
  - State-wide locations
  - On-line training
  - Financially sustainable for 15+ years

<table>
<thead>
<tr>
<th>Year</th>
<th>Nutrient Mgt</th>
<th>Sediment and Erosion Control</th>
<th>On-site Wastewater Mgt</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pub</td>
<td>Priv</td>
<td>Pub</td>
<td>Priv</td>
</tr>
<tr>
<td>2011</td>
<td>146</td>
<td>196</td>
<td>62</td>
<td>139</td>
</tr>
<tr>
<td>2012</td>
<td>56</td>
<td>50</td>
<td>112</td>
<td>1032</td>
</tr>
<tr>
<td>Total</td>
<td>202</td>
<td>246</td>
<td>174</td>
<td>1171</td>
</tr>
</tbody>
</table>
Outreach Capabilities and Strengths

Information for State and Federal Agencies

- NC Dept. Agriculture and Consumer Services
- NC Dept. Environment and Natural Resources
  - Animal Waste; Aquifer Protection; Water Quality
- NC Dept. Health and Human Services
  - On-site wastewater
- NC Dept. of Transportation
- USDA-Natural Resources Conservation Service
- US Environmental Protection Agency
Academic Instruction

- Quality (Student Evaluations)
  - 4.13 University
  - 4.25 CALS
  - 4.26 Soil Science
- Quantity – 831 SCH/FTE
  - #3 in College (177%)
- Courses (42)
  - Undergraduate (18)
  - Graduate (14)
  - DE (10)
- Undergraduate Students (26)
  - Plant and Soil Science (10)
  - Natural Resources (13)
  - Soil and Land Development (3)
- Graduate Students
  - Master of Science (16)
  - Master of Soil Science (12 with 8 DE)
  - Doctorate (11)
Academic Services

• # 3 in SCH/FTE in College
• GEP and cross-disciplinary
  – SSC 185 Land and Life
  – SSC 200 Intro to Soil Science
  – SSC 442 Environmental Biogeochemistry
  – SSC 428 Service Learning
• Certificate Programs
  – Soil Science (DE)
  – Geographic Information Systems
• Graduate Course Enrollment
  – 54% Soil Science
  – 46% Other Majors
    • 26% Crop Sci., BAE, Forestry
    • 14% Horticulture, Nat. Res., MEAS
    • 6% Other
Activities

• Research
  – Undergraduates
  – High School Students

• Agronomy Club

• Soil Judging

• Resource Conservation Workshop

• Envirothon Workshop

• A.P.E.S. Teacher Workshop
Employment

**Types of jobs**

- Technician
- Private Sector Consultant
- Entrepreneur
- USDA-NRCS
  - Field
  - Administration
- USDA-ARS
- Regulatory
- Academic
- Research
- NGOs

**Where they go (recent grads)**

- PhD
  - 80% in Post-docs and Faculty
  - In US and International
- MS
  - 30% with Industry
  - 23% with Government
  - 15% continue to PhD
- BS
  - 25% to Graduate School
  - 42% Private sector
  - 23% Technicians
  - 15% with Government
Core International Activities

An International Leader with Global Impact

Since 2007:

⭐️ 7 Faculty with Activities in 21 countries (R, T, or E)
⭐️ 11 Visiting Students and Scientists from 8 countries
⭐️ Graduate Students from 11 Countries
Departmental Partners
Since 2008, over $16 million in competitive funding
Opportunities for Vision and Growth

- Soils are an integral part of all agricultural production systems in North Carolina.
- The Department has a long history of interdisciplinary cooperation providing basic and applied information on soil science and management for optimum productivity with minimal impact on environmental degradation.
- The Department has a progressive research and education program in non-agricultural use of soils.
- Because of the department's breadth of programs and national and international reputation, outstanding undergraduate and graduate students can be recruited to maintain program excellence.
- The Department maintains state-of-the-art chemical, physical, and biological analytical instrumentation, as well as computer technologies to facilitate research and education programs.
Important Challenges Ahead

- Changing model (CALS and NCSU)
- Competitive grant arena
- Declining state support
- “Turf” competition