Phosphorus Management in North Carolina

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The Face of North Carolina
Animal Agriculture in North Carolina

- 43 M Turkeys
  - $452 M
  - #1 US

- 9.6 M Swine
  - $1.7 B
  - #2 US

- 712 M Broilers
  - $1.7 B
  - #4 US
Livestock Production Distribution

NC Division of Water Quality
Animal Waste Management System
Registration Database – November 1998

- Cattle
- Horses
- Poultry (Liquid System)
- Swine
Crop Production and Physiographic Region

- Pasture / Hay
- Row Crop
Phosphorus and NC Soils
Nutrients and North Carolina Soils

Figure 2. Percent of Soils Testing Medium or Lower in P

North America 47%
NRCS New 590 Nutrient Management Standard & its Phosphorus Accounting Tool: a site specific assessment using a phosphorus index

North Carolina Phosphorus Loss Assessment Tool (PLAT)
Who Developed PLAT?

- **NCSU**
  - Steve Hodges
  - Robert Evans
  - Wendell Gilliam
  - John Havlin
  - Gene Kamprath
  - Deanna Osmond
  - John Parsons
  - Wayne Skaggs

- **NCDAC &S**
  - Richard Reich
  - David Hardy

- **USDA-NRCS**
  - Roger Hansard
  - Lane Price

- **DENR-Div. Soil & Water**
  - Carroll Pierce
P Lost Through Erosion

Total P Lost by Erosion =
Amount of Soil Eroded * Soil Test P
* Best Management Practices
P Lost Through Runoff

Total of P Lost Through Runoff = Amount of Runoff * Soil Test P
P Lost Through Leaching

Total of P Lost Through Leaching = Amount of Drainage * Soil Test P

OR

High Soil Test P in the Subsoil
P Lost Through Source

Total of P Lost Through Sources =
Source Characteristics * Application Method * Source Rate
Phosphorus Loss Assessment Rating

Rating = Erosion + Runoff + Leaching + Source

Very High = No more P application (except starter)
High = Crop removal levels of P
Medium = N-based nutrient management plan
Low = N-based nutrient management plan
Field Verification of PLAT

Phase I
- Selected counties
- Selected sampling
- Soil type, soil test P, and leaching
- Initial determination for the affect of the new NRCS 590 nutrient management standard

Phase II
- All counties
- Proportional sampling
- Random samples
- Determine number and type of producers affected by new NRCS 590 nutrient management standard
Field Verification of PLAT

Amy Johnson, PhD 2004

Phase I
Counties Sampled

- Wilkes
- Haywood
- Iredell
- Nash
- Washington
- Union
- Duplin
- Pitt
<table>
<thead>
<tr>
<th>Soil Type</th>
<th>Counties Sampled</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mountain clays</td>
<td>Haywood, Wilkes</td>
</tr>
<tr>
<td>Piedmont clays</td>
<td>Iredell, Union</td>
</tr>
<tr>
<td>Coastal Plain loams</td>
<td>Duplin, Nash, Pitt</td>
</tr>
<tr>
<td>Coastal Plain sands</td>
<td>Duplin, Pitt</td>
</tr>
<tr>
<td>Mineral-Organics</td>
<td>Washington</td>
</tr>
<tr>
<td>Organics</td>
<td>Washington</td>
</tr>
</tbody>
</table>
Counties & Fertilizer Source Sampled

Wilkes
Iredell
Nash
Haywood
Union
Duplin
Pitt
Washington
Methods

From each site:

• Sampled soil to 32 inch depth at 4 inch increments
• Analyzed soil samples for Mehlich-3 extractable P
• Collected data on topography, cropping system, drainage, cropping history, amount of P applied, et
M3P With Depth for Different Fertilizers

![Graph showing Mehlich-3 P (mg/kg) vs. Depth (in) for different fertilizers: inorganic, dairy, poultry, and swine.](image-url)
# Phase I Data

<table>
<thead>
<tr>
<th>Category (PLAT Index)</th>
<th>Very High</th>
<th>High</th>
<th>Medium</th>
<th>Low</th>
</tr>
</thead>
<tbody>
<tr>
<td>P Loss</td>
<td>&gt; 100</td>
<td>51-100</td>
<td>26-50</td>
<td>0-25</td>
</tr>
<tr>
<td>% in Category</td>
<td>8</td>
<td>11</td>
<td>19</td>
<td>62</td>
</tr>
</tbody>
</table>
# Phase I Data By Phosphorus Type

<table>
<thead>
<tr>
<th>PLAT Rating</th>
<th>Dairy</th>
<th>Poultry</th>
<th>Swine</th>
<th>Fertilizer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very High</td>
<td>11</td>
<td>15</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>High</td>
<td>22</td>
<td>19</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>Medium</td>
<td>33</td>
<td>27</td>
<td>13</td>
<td>12</td>
</tr>
<tr>
<td>Low</td>
<td>34</td>
<td>39</td>
<td>75</td>
<td>88</td>
</tr>
</tbody>
</table>
Field Verification of PLAT

Phase II
# Phase II PLAT Sampling Project

<table>
<thead>
<tr>
<th>County</th>
<th>Pasture /Hay</th>
<th>Crops</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pamlico</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>Union</td>
<td>9</td>
<td>23</td>
</tr>
<tr>
<td>Johnston</td>
<td>16</td>
<td>13</td>
</tr>
<tr>
<td>Clay</td>
<td>10</td>
<td>1</td>
</tr>
</tbody>
</table>
## County Sample Numbers for PLAT Phase II Sampling

<table>
<thead>
<tr>
<th>Number of Samples</th>
<th>Number of Counties</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-9</td>
<td>8</td>
</tr>
<tr>
<td>10-19</td>
<td>44</td>
</tr>
<tr>
<td>20-29</td>
<td>42</td>
</tr>
<tr>
<td>≥ 30</td>
<td>6</td>
</tr>
</tbody>
</table>
## Crop Distribution in Phase II

<table>
<thead>
<tr>
<th>Type of Crop</th>
<th>Number of Fields</th>
</tr>
</thead>
<tbody>
<tr>
<td>Row Crop</td>
<td>545</td>
</tr>
<tr>
<td>Pasture</td>
<td>371</td>
</tr>
<tr>
<td>Hay</td>
<td>473</td>
</tr>
</tbody>
</table>
Example of Soil Test P Data for Phase II

- Duplin County: 23 samples
  - 21 samples very high
  - 2 samples high
- Madison County: 15 samples
  - 4 samples very high
  - 3 samples high
  - 3 samples medium
  - 5 samples low
## P Soil Test Data for Phase II

<table>
<thead>
<tr>
<th>County</th>
<th>Soil series</th>
<th>P-Index (surface)</th>
<th>P-Index (sub)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Union</td>
<td>Cid channery silt loam</td>
<td>1593.6</td>
<td>7.08</td>
</tr>
<tr>
<td>Duplin</td>
<td>Autryville</td>
<td>135.2</td>
<td>185.8</td>
</tr>
<tr>
<td>Hyde</td>
<td>Scuppernong muck</td>
<td>25.1</td>
<td>27.08</td>
</tr>
<tr>
<td>Yadkin</td>
<td>Buncombe sand</td>
<td>212</td>
<td>178.7</td>
</tr>
</tbody>
</table>
## Phase II PLAT Results

<table>
<thead>
<tr>
<th>TYPE</th>
<th>LOW</th>
<th>MEDIUM</th>
<th>HIGH</th>
<th>VERY HIGH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poultry</td>
<td>60</td>
<td>16</td>
<td>18</td>
<td>6</td>
</tr>
<tr>
<td>Dairy</td>
<td>60</td>
<td>15</td>
<td>20</td>
<td>5</td>
</tr>
<tr>
<td>Swine</td>
<td>49</td>
<td>19</td>
<td>22</td>
<td>10</td>
</tr>
<tr>
<td>Inorganic</td>
<td>86</td>
<td>10</td>
<td>3</td>
<td>1</td>
</tr>
</tbody>
</table>
A HUGE THANKS TO ALL EXTENSION AGENTS, NRCS AND DISTRICT FOLKS, AS WELL AS PRODUCERS WHO HELPED WITH THE SAMPLING