Soil Fertility Management for Soybean
Carl R. Crozier, V.G. James Center, Plymouth NC

Soil Fertility Basics
Deficiency Symptoms
Problem Diagnosis
Soil Info Resources
Soil Fertility Basics

- Requirement for individual elements.

- Deficiency - shortage of an individual element that limits yield or quality.

- Crops have characteristic nutrient contents and removal rates, proportional to crop yields.
Soybean Soil Fertility Basics

- Recommendations general soil test
  N, B, Fe not included in soil test
- Subsoil nutrients available to taproot crop?

- Historically more attention focused on other rotational crops
- Soil test calibration data
- Crop nutrient uptake/removal data
Soybean Soil Fertility Basics

- Recommendations general soil test
  N, B, Fe not included in soil test
- Subsoil nutrients available to taproot crop?
- Planter-placement?
  some risk of seed injury, so minimize amount if in furrow
- Micronutrients as needs documented
  Mn, Fe (usually pH related)
  Mo
  B – lower requirement & more sensitive to toxicity than cotton
Soil S index typically increases with depth:

Conetoe, Bertie Co., 2005
Loamy sand topsoil- 45
Loamy sand subsoil- 55
Sandy loam subsoil- 194
Soybean Soil Fertility Basics

- Soil test calibration NC most recent published research on K: mid-1990s on 15-inch rows under irrigation on a Goldsboro soil (one year) and Dothan soil (two years) using the variety Ransom (Heckman and Kamprath, 1994).

A yield response to applied K was found only in one site-year when the initial soil test level was 100 ppm ("estimated" K-I = 50) and a yield plateau was never attained under the highest fertilization (250 lb K2O/ac) with a yield of 78 bu / acre at this site.

Woodruff and Parks (1980) study, subsoil contributions of K to soybean yield were believed to be an important factor.
## Estimated Nutrient Uptake & Removal by Corn/Wheat/Soybean (lb/ac)

<table>
<thead>
<tr>
<th>Crop (yield)</th>
<th>Harvest</th>
<th>Total Uptake</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>P$_2$O$_5$</td>
</tr>
<tr>
<td>Corn (300 bu/ac)</td>
<td>224</td>
<td>106</td>
</tr>
<tr>
<td>Wheat (100 bu/ac)</td>
<td>125</td>
<td>50</td>
</tr>
<tr>
<td>Soybean (100 bu/ac)</td>
<td>376</td>
<td>80</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>725</strong></td>
<td><strong>236</strong></td>
</tr>
</tbody>
</table>

Consider rotational sequence & likely contribution from prior crop residues.
Nutrient Deficiency Image Collection
http://deficiencies.soil.ncsu.edu/

<table>
<thead>
<tr>
<th>Nutrient problem</th>
<th>Corn</th>
<th>Cotton</th>
<th>Soybean</th>
<th>Peanut</th>
<th>Rice</th>
<th>Tobacco</th>
<th>Wheat</th>
<th>other</th>
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<tbody>
<tr>
<td>Normal</td>
<td>F G</td>
<td>F</td>
<td>F</td>
<td>G</td>
<td>G</td>
<td>F</td>
<td>F</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>F G G</td>
<td>F G G</td>
<td>G</td>
<td>F G G</td>
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<td>F</td>
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<tr>
<td>P</td>
<td>F G G</td>
<td>F F G</td>
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</tr>
<tr>
<td>K</td>
<td>F G</td>
<td>G F G</td>
<td>G</td>
<td>G G G</td>
<td>G</td>
<td>G</td>
<td>F</td>
<td></td>
</tr>
<tr>
<td>S</td>
<td>F G</td>
<td>G G G</td>
<td>G</td>
<td>G G G</td>
<td>G</td>
<td>G</td>
<td>F</td>
<td></td>
</tr>
<tr>
<td>Mg (see low pH)</td>
<td>F</td>
<td>G G G</td>
<td>G</td>
<td>G G G</td>
<td>G</td>
<td>G</td>
<td>F</td>
<td>G</td>
</tr>
<tr>
<td>Cu</td>
<td>F G</td>
<td>G G G</td>
<td>G</td>
<td>G G G</td>
<td>G</td>
<td>G</td>
<td>F F</td>
<td>F</td>
</tr>
<tr>
<td>Mn (see high pH)</td>
<td>F G</td>
<td>G G G</td>
<td>G</td>
<td>G G G</td>
<td>G</td>
<td>G</td>
<td>F</td>
<td>F</td>
</tr>
<tr>
<td>Zn</td>
<td>F G G</td>
<td>F G G</td>
<td>G</td>
<td>G G G</td>
<td>G</td>
<td>G</td>
<td>F</td>
<td>G</td>
</tr>
<tr>
<td>Zn excess</td>
<td>G</td>
<td>G G G</td>
<td>G</td>
<td>G G G</td>
<td>G</td>
<td>G</td>
<td>F</td>
<td>G</td>
</tr>
<tr>
<td>B</td>
<td>G</td>
<td>G G G</td>
<td>G</td>
<td>G G G</td>
<td>G</td>
<td>G</td>
<td>F</td>
<td>G</td>
</tr>
<tr>
<td>B toxicity</td>
<td>F</td>
<td>F G G</td>
<td>G</td>
<td>G G G</td>
<td>G</td>
<td>G</td>
<td>F</td>
<td>G</td>
</tr>
<tr>
<td>Low pH</td>
<td>F F</td>
<td>F F F</td>
<td>F F F</td>
<td>F F F</td>
<td>F</td>
<td>F</td>
<td>F</td>
<td>F</td>
</tr>
<tr>
<td>High pH</td>
<td>F</td>
<td>F F F</td>
<td>F F F</td>
<td>F F F</td>
<td>F</td>
<td>F</td>
<td>F</td>
<td>F</td>
</tr>
</tbody>
</table>

F=field photo, G=greenhouse photo
N deficiency: typically lower leaf yellowing
deficiency: typically N lower, S upper leaves
P deficiency: typically stunting
K deficiency: typically lower leaf margin necrosis
Mg deficiency: typically lower leaves
low pH & Mg deficiency: typically lower leaves
Mn deficiency: typically interveinal chlorosis often upper leaves
Mn deficiency: typically interveinal chlorosis, often if high pH
B deficiency: typically terminal or pod development
Cu deficiency: typically apex
Systematic Approach to Problem Diagnosis

• Multiple Possibilities:
  – Crop genetics & seed source
  – Environment (weather)
  – Pests (& chemical tolerance)
  – Soil
    • physical properties (texture, wetness, compaction)
    • fertility/chemical property limitation

• Simplest explanation?

• Easy way to organize information?

• Crop Problem Diagnosis Worksheet
Problem Diagnosis Worksheet

- Field & contact Info
- Problem distribution pattern
- Symptoms
- Site characteristics
- Crop management details
- Weather notes
- Samples & lab info
Diagnosis: Samples & lab info
(5 commodity groups fund diagnosis support for ag agents)

- Soil (consider separate surface & subsoil)
  - No-till
    - Shallow surface issues, pH problems
    - Subsoil issues due to lack of mixing
  - Deep sands leaching issues
- Plant tissue
  - Avoid severely necrotic tissue
  - Read guidelines for plant part and growth stage
- Nematode
- Disease/insect
- Most convincing – sample “problem” and “normal” areas
Basic Info

• Collecting Samples
  – NCDA&CS Soil sampling basics
  – NCSU Soil Facts http://content.ces.ncsu.edu/careful-soil-sampling-the-key-to-reliable-soil-test-information

• Understanding the Soil Test Report
  – 1 page simplified handout
    http://www.ncagr.gov/agronomi/pdffiles/usoilA.pdf
More details

• Collecting Samples
  – NCSU Soil Facts Precision Soil Sampling
  http://content.ces.ncsu.edu/soil-sampling-for-precision-farming-systems

• Understanding the Soil Test Report
  – The entire “orange book”

• Soil Test Lab options
  – Methods (ask about options)
  – Units of reporting (conversions available in “orange book”)
  – Interpretation – different strategies – look at supporting data
Plant Tissue Analysis

NCDA&CS Agronomic Services Plant Tissue Analysis
http://www.ncagr.gov/agronomi/uyrplant.htm

Collection:
NCDA&CS Plant Tissue Analysis Guide

Interpretation:
Problem Diagnosis Support for Ag Agents

State commodity group support for lab fees: Corn, Cotton, Soybean, Tobacco, Small Grains (incl. rapeseed, sorghum)

Annual support as educational tool for Ag Agent training

NCSU PDIC- note “Ag Agent problem sample”

NCDA&CS (plant tissue, nematode)
– escrow account name “Crozier-diagnosis”
  (and email me: grower, county, crop # samples)
-ideal scenario is to sample both soil & plants from “poor” and “normal” areas

Use the service & thank your commodity board members!
Soil Information Resources

- County Soil Surveys
- Web Soil Survey
- SoilWeb app
Why Map & Classify Soils?

- Identify differences & predict behavior with land use
- Estimate productivity
- Understand most likely problems with use
- Delineate soil spatial areas
<table>
<thead>
<tr>
<th>Series</th>
<th>Scale</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1925 (Northampton Co.)</td>
<td>1:63,000</td>
<td>USDA Bureau of Chemistry &amp; Soils</td>
</tr>
<tr>
<td></td>
<td>(1”=1 mile)</td>
<td></td>
</tr>
<tr>
<td>1957 (Pasquotank Co.)</td>
<td>1:20,000</td>
<td>USDA SCS</td>
</tr>
<tr>
<td></td>
<td>(3.125”=1 mile)</td>
<td></td>
</tr>
<tr>
<td>1974 (Pitt Co.)</td>
<td>1:15,840</td>
<td>USDA SCS, Modern Soil Taxonomy</td>
</tr>
<tr>
<td></td>
<td>(4”=1 mile)</td>
<td></td>
</tr>
<tr>
<td>1994 (Northampton Co.)</td>
<td>1:24,000</td>
<td>USDA SCS</td>
</tr>
<tr>
<td></td>
<td>(2 5/8”=1 mile)</td>
<td></td>
</tr>
<tr>
<td>1995 (Beaufort Co.)</td>
<td>1:24,000</td>
<td>USDA NRCS</td>
</tr>
<tr>
<td></td>
<td>(2 5/8”=1 mile)</td>
<td></td>
</tr>
</tbody>
</table>
Soil Parent Material / Topographic Variability
Information in Soil Surveys

- Soil names (map units)
- Distribution & acreage
- Drainage class
- Landscapes
- Profile layers
- Textural class, color
- Permeability, moisture holding capacity
- Erosion hazards (water or wind)
- Suitability / limitations to use
- Physical & Chemical Properties
Soil names / distribution / acreage

• Soil map unit name
  – Can indicate slope, erosion
  – Smallest mapped unit? (1-3 ac)

• Soil taxonomic name
  – Technical, but generalized features (o.m., drainage, layer thickness)

• Distribution
  – Landscape position, likely inclusions

• Acreage
Soil Survey Interpretation

• Soil map units are delineated & precisely defined
• Soils on the landscape are natural objects with a characteristic variability
• Spatial resolution limits the ability to describe variability
• Sufficient information for resource plan development
• Onsite investigation needed to plan intensive uses in small areas
Access to Soil Surveys

- Hard copies
- Web Soil Survey

http://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm
Welcome to Web Soil Survey (WSS)

Web Soil Survey (WSS) provides soil data and information produced by the National Cooperative Soil Survey. It is operated by the USDA Natural Resources Conservation Service (NRCS) and provides access to the largest natural resource information system in the world. NRCS has soil maps and data available online for more than 95 percent of the nation’s counties and anticipates having 100 percent in the near future. The site is updated and maintained online as the single authoritative source of soil survey information.

Soil surveys can be used for general farm, local, and wider area planning. Onsite investigation is needed in some cases, such as soil quality assessments and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center or your NRCS State Soil Scientist.

Four Basic Steps

1. Define the Soil Survey Area
2. Identify the Soil Survey Method
3. Select the Web Soil Survey Tool
4. Access the Soil Survey Data

I Want To...
- Start Web Soil Survey (WSS)
- Know the requirements for running Web Soil Survey — will Web Soil Survey work in my web browser?
- Know the Web Soil Survey hours of operation
- Find what areas of the U.S. have soil data
- Find information by topic
- Know how to hyperlink from other documents to Web Soil Survey
- Know the SSURGO data structure

Announcements/Events
- Web Soil Survey 3.2 has been released! View description of new features and fixes.
- Web Soil Survey Release History
- Sign up for e-mail updates via GovDelivery
Web Soil Survey
“Quick Navigation” NC, Washington Co.
Tidewater Res Sta area
Create Area of Interest (AOI) Polygon
Tidewater Res Sta, Washington Co.
Soil Map Tab
Tidewater Res Sta, Washington Co.
Soil Map, TRS O Block
Soil Science Dept, College of Agriculture & Life Sciences

TRS Soil Map
Corn Productivity Ratings

Vegetative Productivity
- Crop Productivity Index
- Forest Productivity (Cubic Feet per Acre per Year)
- Forest Productivity (Tree Site Index)
- Iowa Corn Suitability Rating CSR2 (IA)
- Range Production (Favorable Year)
- Range Production (Normal Year)
- Range Production (Unfavorable Year)
- Yields of Irrigated Crops (Component)
- Yields of Irrigated Crops (Map Unit)

Yields of Non-Irrigated Crops (Component)

Tables — Yields of Non-Irrigated Crops (Component): Corn (Bu) — Summary By Map Unit

<table>
<thead>
<tr>
<th>Map unit symbol</th>
<th>Map unit name</th>
<th>Rating</th>
<th>Acres in AOI</th>
<th>Percent of AOI</th>
</tr>
</thead>
<tbody>
<tr>
<td>At</td>
<td>Augusta fine sandy loam</td>
<td>103.12</td>
<td>9.6</td>
<td>0.8%</td>
</tr>
<tr>
<td>Ba</td>
<td>Belhaven muck, 0 to 2 percent slopes, rarely flooded</td>
<td>120.60</td>
<td>10.9</td>
<td>0.9%</td>
</tr>
<tr>
<td>Cf</td>
<td>Cape Fear loam, 0 to 2 percent slopes, rarely flooded</td>
<td>132.70</td>
<td>349.2</td>
<td>29.2%</td>
</tr>
<tr>
<td>Ds</td>
<td>Dragston loamy fine sand</td>
<td>64.50</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Me</td>
<td>Muckalee loam</td>
<td>109.24</td>
<td>621.7</td>
<td>52.1%</td>
</tr>
<tr>
<td>Pt</td>
<td>Portsmouth fine sandy loam</td>
<td>105.78</td>
<td>144.2</td>
<td>12.1%</td>
</tr>
<tr>
<td>Ro</td>
<td>Roanoke loam</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Total area of interest: 1,104.1 acres
Soil Science Dept, College of Agriculture & Life Sciences

Shopping Cart – Free Custom Soil Resource Report
Custom Soil Resource Report for
Washington County, North Carolina

Tidewater Research Station
Contents

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Washington County, North Carolina..............................12
  At—Augusta fine sandy loam..............................12
  Ba—Belhaven muck, 0 to 2 percent slopes, rarely flooded......13
  Cf—Cape Fear loam, 0 to 2 percent slopes, rarely flooded....15
  Ds—Dragston loamy fine sand..............................16
  Me—Muckalee loam..........................................18
  Pt—Portsmouth fine sandy loam...........................19
  Ro—Roanoke loam..........................................21
References..................................................................23
TRS Soil Map
(scale 1:37,400 if printed on 8.5 x 11” sheet)
Map Unit Legend

<table>
<thead>
<tr>
<th>Map Unit Symbol</th>
<th>Map Unit Name</th>
<th>Acres in AOI</th>
<th>Percent of AOI</th>
</tr>
</thead>
<tbody>
<tr>
<td>At</td>
<td>Augusta fine sandy loam</td>
<td>9.6</td>
<td>0.8%</td>
</tr>
<tr>
<td>Ba</td>
<td>Belhaven muck, 0 to 2 percent slopes, rarely flooded</td>
<td>10.9</td>
<td>0.9%</td>
</tr>
<tr>
<td>Cf</td>
<td>Cape Fear loam, 0 to 2 percent slopes, rarely flooded</td>
<td>349.2</td>
<td>29.2%</td>
</tr>
<tr>
<td>Ds</td>
<td>Dragston loamy fine sand</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Me</td>
<td>Muckalee loam</td>
<td>58.5</td>
<td>4.9%</td>
</tr>
<tr>
<td>Pt</td>
<td>Portsmouth fine sandy loam</td>
<td>621.7</td>
<td>52.1%</td>
</tr>
<tr>
<td>Ro</td>
<td>Roanoke loam</td>
<td>144.2</td>
<td>12.1%</td>
</tr>
<tr>
<td><strong>Totals for Area of Interest</strong></td>
<td></td>
<td><strong>1,194.1</strong></td>
<td><strong>100.0%</strong></td>
</tr>
</tbody>
</table>

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic
Portsmouth fine sandy loam map unit

Map Unit Setting
National map unit symbol: 3wxv
Elevation: 0 to 30 feet
Mean annual precipitation: 42 to 58 inches
Mean annual air temperature: 61 to 64 degrees F
Frost-free period: 190 to 270 days
Farmland classification: Prime farmland if drained

Map Unit Composition
Portsmouth, drained, and similar soils: 75 percent
Portsmouth, undrained, and similar soils: 10 percent
Minor components: 7 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Portsmouth, Drained
Setting
Landform: Depressions on marine terraces, flats on marine terraces
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy fluviomarine deposits over sandy fluviomarine deposits

Typical profile
Ap - 0 to 12 inches: fine sandy loam
Eg - 12 to 19 inches: fine sandy loam
Btg - 19 to 35 inches: sandy clay loam
BCg - 35 to 38 inches: sandy loam
2G - 38 to 80 inches: loamy sand

Properties and qualities
Slope: 0 to 2 percent
Depth to restrictive feature: 30 to 40 inches to strongly contrasting textural

Soil Science Dept, College of Agriculture & Life Sciences
Soil Web Apps: UC Davis & USDA-NRCS
https://casoilresource.lawr.ucdavis.edu/soilweb-apps/
(link on this website, not from App store)
Soil Web Smartphone or PC App

- Smartphone touch “target” icon or “Get My Location” (old version)
  - Touch series name (profile characteristics)
- PC “Menu” – “Zoom to Location” or find on map
- Accuracy specified (30m default on smartphone)
- Map Unit (& components)
- Distances to map unit boundary
- Each component soil
Soil Information Link

- Soil Taxonomy
- Land Classification
- Erodibility / Drainage / Parent Material
- Geomorphology (landscape)
- Typical vegetation
- Profile graphic data
  - (organic matter, clay, sand, pH, CEC, etc.)
Tidewater Res Sta, Washington Co.
Soil Science Dept, College of Agriculture & Life Sciences

TRS, N & O Blocks

<table>
<thead>
<tr>
<th>Map Unit Name</th>
<th>Composition</th>
<th>Symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>Portsmouth fine sandy loam</td>
<td>75% - Portsmouth</td>
<td>Pt</td>
</tr>
<tr>
<td></td>
<td>10% - Portsmouth</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4% - Cape lookout</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3% - Portsmouth</td>
<td></td>
</tr>
</tbody>
</table>

Map Unit Data

[Image of a map showing soil units and locations]
TRS O Block
Map Unit – Muckalee loam
Soil Science Dept, College of Agriculture & Life Sciences

TRS O Block
Map Unit- Portsmouth fine sandy loam
Documenting yield losses, 2003 Corn

Depending on weather, can have substantial yield impact

YieldVol (bu/ac)
- 150 to 165 (11)
- 135 to 150 (126)
- 120 to 135 (788)
- 105 to 120 (499)
- 90 to 105 (136)
- 75 to 90 (88)
- 60 to 75 (150)
- 45 to 60 (872)
- 30 to 45 (668)
- 15 to 30 (143)
- 0 to 15 (245)
Map Unit Composition
Map units consist of 1 or more soil types, commonly referred to as "components".

<table>
<thead>
<tr>
<th>Component Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil Type 1 Muckalee</td>
</tr>
</tbody>
</table>

Note: links to horizon data marked with an * are approximate.

Map Unit Data
Cartographic information about this map unit.

Map Unit Name: Muckalee loam
Map Unit Type: Consociation
Map Unit Symbol: Me
Map Unit Area: acres (2445 ac. total in survey area)

Map Unit Aggregated Data
Generalized soils information within this map unit.

<table>
<thead>
<tr>
<th>Farmland Class:</th>
<th>Not prime farmland</th>
</tr>
</thead>
<tbody>
<tr>
<td>Available Water Storage (0-100cm):</td>
<td>11.02 cm</td>
</tr>
<tr>
<td>Max Flood Freq:</td>
<td>Frequent</td>
</tr>
<tr>
<td>Drainage Class (Dominant Condition):</td>
<td>Poorly drained</td>
</tr>
<tr>
<td>Drainage Class (Wettest Component):</td>
<td>Poorly drained</td>
</tr>
<tr>
<td>Hydric Conditions:</td>
<td>85</td>
</tr>
<tr>
<td>[Annual] Min. Water Table Depth:</td>
<td>15 cm</td>
</tr>
<tr>
<td>[April-June] Min. Water Table Depth:</td>
<td>23 cm</td>
</tr>
<tr>
<td>Min Bedrock Depth:</td>
<td>n/a</td>
</tr>
</tbody>
</table>

Associated Point Data
Links to any NSSL point data within this map unit.
### Soil Taxonomy

- **Order:** Ultisols
- **Suborder:** Aquults  
  [Map of Suborders]
- **Greatgroup:** Umbrargults
- **Subgroup:** Typic Umbrargults
- **Family:** Fine-loamy over sandy or sandy-skeletal, mixed, semiarid, thermic Typic Umbrargults
- **Soil Series:** Portsmouth  
  (Link to OSD)  
  (Soil Series Explorer)

### Land Classification

- **Storie Index**
- **Land Capability Class** [non-irrigated] 3-w
- **Land Capability Class** [irrigated] -
- **Ecological Site Description**  
  n/a
- **Forage Suitability Group**  
  n/a

### Soil Suitability Ratings

- **Waste Related**
- **Urban/Recreational**
- **Wildlife**
- **Engineering**
- **Irrigation**
- **Runoff**

### Hydraulic and Erosion Ratings

- **Wind Erodibility Group**
- **Wind Erodibility Index**
- **T Erosion Factor**
- **Runoff**
- **Drainage**
- **Hydric Rating**  
  [Hydrologic Group]
- **Parent Material:**  
  loamy fluviatile deposits over sandy fluviatile deposits
- **Total Plant Available Water (cm):** 17.99

### Geomorphology

- **Landform**  
  depressions
- **Landform**  
  marine terraces
- **Landform**  
  flats
- **Landscape**  
  coastal plains

### Plants
Soil Science Dept, College of Agriculture & Life Sciences

### Geomorphology
- **Landform**: depressions
- **Landform**: marine terraces
- **Landform**: flats
- **Landscape**: coastal plains

### Plants
<table>
<thead>
<tr>
<th>Symbol</th>
<th>Scientific Name</th>
<th>Common Name</th>
<th>Range Prod.</th>
</tr>
</thead>
<tbody>
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</tbody>
</table>

### Agricultural Properties
- **Organic Matter (%)**
- **Percent Clay**
- **Percent Sand**
- **K_{sat} (mm/hr)**
- **pH (1:1 H_2O)**
- **K_{factor}**

### Geologic Properties
- **EC (dS/m)**
- **SAR**
- **CaCO_3 (%)**
- **Gypsum (%)**
- **CEC at pH 7 (cmol +/kg soil)**
- **Linear Extensibility (%)**

### Agriculture
- **AGR - Pesticide Loss Potential-Leaching**: Very limited [1 - 1]
- **AGR - Pesticide Loss Potential-Soil Surface Runoff**: Very limited [1 - 1]

### Irrigation
- **WMS - Excavated Ponds (Aquifer-fed)**: Very limited [1 - 1]
- **WMS - Embankments, Dikes, and Levees**: Very limited [1 - 1]
- **WMS - Irrigation, Surface (level)**: Very limited [1 - 1]
- **WMS - Irrigation, Surface (graded)**: Very limited [1 - 1]
- **WMS - Irrigation, Micro (above ground)**: Very limited [1 - 1]
- **WMS - Irrigation, Micro (subsurface drip)**: Very limited [1 - 1]
Alternative soil mapping: “Veris” soil electrical conductivity. Ground-trothing needed: similar high conductivity values with high CEC organic soils & low CEC mineral soils with saltwater intrusion (Carteret Co., Open Grounds Farm, Inc.)

Block 53
1-3” layer
2/98
GIS: topo data

www.ncfloodmaps.com

elev (ft)

Wash. Co. (99 near 32)

*Assist in land re-leveling decisions

*$200-400/ac estimated