Understanding the Soil Test Report

Charlotte Glen, Horticulture Agent
NC State Extension
Chatham County Center
Soil Testing for Lawns and Gardens

- Learn about our Spring Soil Test Drive, March 20 – April 12, 2017
- Review Presentation: Soil Testing for Lawns and Gardens
- Review Presentation: Understanding the Soil Test Report

Healthy soil is the foundation of successful gardening. The first step to cultivating healthy soil is having your soil tested.

Collecting soil samples only takes a few minutes and has many benefits. It can help you save money in your lawn, garden and landscape, can result in healthier plants by telling you which nutrients are already in your soil, and can prevent over-fertilizing which could lead to nutrient runoff.
How Do I Find My Soil Test Report?

• Available online:  
  http://www.ncagr.gov/agronomi/pals

• Search by **last name** only!
• Can access reports ~ last 3 years
• Change date range:
What Soil Testing Can Tell You

- **Nutrients** your soil needs to support healthy growth

- If nutrient levels are **too high**

- **Soil pH**
  - Is your soil acidic (sour), or
  - Is it alkaline (sweet)

- **If lime is needed** & how much

Iron deficiency, likely caused by high pH
Predictive Home & Garden
Soil Report

Mehlich-3 Extraction

Sampled: 04/21/2015  
Received: 04/21/2015  
Completed: 04/30/2015  
Client: Charlotte Glen  
P.O. Box 279  
Pittsboro, NC 27312

Advisors:  
(Give names or organization)

Sampled County: Chatham

Agronomist's Comments:
This report provides Test Results and Recommendations for each sample submitted for testing. Look for Lime Recommendations and N-P-K Fertilizer Recommendations. If lime is needed, application at the indicated rate will raise soil pH to the optimal level for the plant you specified. Common target pH values are as follows: 5.0 for azalea, camellia, rhododencron and mt. laurel; 5.5 for centipedegrass; 6.0 for other lawn grasses, shrubbery, and; flowering plants; and 6.5 for vegetable gardens. N-P-K Recommendations are based on the nitrogen (N) needs of the plants being grown and the soil test results for phosphorus (P-I) and potassium (K-I); a 50 to 70 index for either is optimum. If the exact fertilizer cannot be found, find the closest match and adjust the rate accordingly. Refer to “Understanding the Soil Report” (last page of this report) for additional explanation and links to helpful information.

<table>
<thead>
<tr>
<th>Sample ID: RED</th>
<th>Lime History:</th>
<th>Test Results:</th>
<th>Lime Recommendations</th>
<th>N-P-K Fertilizer Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>pH = 5.0</td>
<td>75.0 lb per 1,000 sq ft</td>
<td>20 lbs per 1,000 sq ft 5-10-5</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td><strong>Optimum</strong></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>pH range</td>
<td>3.0 - 6.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Phosphorus Index (P-I)</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Potassium Index (K-I)</td>
<td>65</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Below Optimum</td>
<td>50%</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Optimum Above Optimum</td>
<td>70</td>
<td></td>
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Additional Test Results:

- %HMs: 0.04
- WV: 0.79
- CEC: 5.7
- Mn-1: 62
- Zn-1: 18
- Cu-1: 26
- S-1: 222

* If you cannot find the fertilizer recommended here, choose one from the same Group (A, B, C or D) listed on the last page of this report.

Note: This soil test does not measure nitrogen (N) levels. N fertilizer recommendations are based only on needs of the designated crop.

Reprogramming of the laboratory-information-management system that makes this report possible is being funded through a grant from the North Carolina Tobacco Trust Fund Commission.

Thank you for using agronomic services to manage nutrients and safeguard environmental quality.

- Steve Trox
### Soil Test Report

- **Sample ID** – what you entered
- **Crop 1** – what you plan to grow

#### Lime Recommendations
- **Optimum pH range**: 6.2 - 6.7
- **Lime Recommendations**: 75.0 lb per 1,000 sq ft

#### N-P-K Fertilizer Recommendations
- **Phosphorus Index (P-I)**: 1
- **Potassium Index (K-I)**: 65
- **Fertilizer Recommendations**: 20 lbs per 1,000 sq ft 5-10-5

#### Additional Test Results:
- **HM%**: 0.04 g/cm³
- **WV**: 0.79 meq/100 cm³
- **CEC**: 5.7
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### pH

- **Actual pH (number)**
- **Also shows where your pH is in comparison to target range - based on soil type and what you intend to grow**

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**Lime History:**

**Sample ID:** RED

**Crop 1-Crop 2:** Vegetable garden

**Test Results:**

- **pH = 5.0**

**Optimum pH range:**

- 3.0
- 6.2
- 6.7
- 8.0

**Lime Recommendations:**

- 75.0 lb per 1,000 sq ft

**N-P-K Fertilizer Recommendations:**

- 20 lbs per 1,000 sq ft 5-10-5

**Additional Test Results:**

- **HM%:** 0.04 g/cm³
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- **CEC:** 5.7
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- **S:** 222

**Phosphorus Index (P-I):** 1

**Potassium Index (K-I):** 65

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Logarithmic Scale:

More Acidic

0  5  6  7  8  9  14

Neutral

More Alkaline

x 10

x 100

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Lime Recommendation

- If pH is low for crop you intent to grow, lime will be recommended
- Rate is in pounds per 1000 square feet
- For dolomitic or agricultural/garden lime
Changing Soil pH

Based on soil test results

Lime lifts!

Sulfur suppresses!

Ideal Range 5.5 – 6.5

Lime increases pH

Sulfur lowers pH

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Should You Alter pH?

If low, YES!

• Lime raises pH
• Only add lime if recommended
• Add agricultural or dolomitic lime
• Till lime into the soil before planting – takes 6 months to fully react
Should You Alter pH?

If high, maybe

• Sulfur lowers pH
• Apply only amount recommended by report
• Till into soil – takes 2-3 months to react
• Consider adding if pH over 7.5 and plants show symptoms of micronutrient deficiency
Micronutrient Deficiency

Zinc

Magnesium

Iron

**Epsom Salts** = Magnesium sulfate, lowers pH and provides Mg and S, two nutrients that are often deficient at higher pH – apply no more than 2-3 times a season
### Phosphorus & Potassium Index

- Both are essential plant nutrients
- Between 50 and 70 is ideal
  - Shown as actual number and bar graph
- If less than 50 will recommend fertilizer
- **Notice:** There is no Nitrogen index
  - Too volatile to measure
Fertilizer Recommendation

- Given in pounds per 1000 square feet
- Based on index numbers and crop intend to grow
- Nitrogen recommendation based on anticipated crop needs
- Can use natural (organic) or synthetic fertilizers to supply

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Note: This soil test does not measure nitrogen (N) levels. N fertilizer recommendations are based only on needs of the designated crop.
What the numbers mean:

Number in the analysis represent % of:

N  ↑  Nitrogen
    New growth

P  ↑  Phosphorus
    Roots, Flowers and Fruits

K  ↑  Potassium/Potash
    Flavor and Hardiness

This knowledge allows you to “decode” fertilizers!
Nitrogen 10-5-15

- Promotes green, leafy growth
- **Most limiting nutrient**
  - Most common deficiency
- **Easily leaches from soil** – Can pollute surface and groundwater
  - **Not enough?** Stunted growth, yellow leaves – older leaves first
Nitrogen

Too much:
• Burns plants
• Can increases pest problems
• Reduces vegetable yields
  • Especially in beans, tomatoes, cucumbers, squash, peppers
Phosphorous 10-5-15

- Promotes root growth, flower, fruit and seed production
- **Held tightly by soil – leaching rare**
- Causes pollution when soil **erodes**, P attached to soil particles
- **Needs to be incorporated before planting**
- Frequently fertilized soils often have too much

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Phosphorous

Not Enough?

- Reduced growth
- Plants dark green
- Purple or reddish color to older leaves

Not taken up well in cold or wet soils

- Deficiency symptoms in winter usually due to cold weather rather than lack of nutrient in soil
Potassium 10-5-15

- Increases drought tolerance, disease resistance and improves winter hardiness
- Improves flavor in melons and tomatoes
- Sometimes called potash
- Visible deficiency symptoms rarely seen though levels often low
Nutrient Sources

**Synthetic**
- Manmade
- More predictable, higher analysis
- More likely to leach, burn

**Natural**
- Often low analysis, slow to release
- Condition the soil – feed microbes
- Typically more expensive
- Do not release well in cold weather
Compost vs. Fertilizer

- **Compost** = Improves soil, supports microbes, adds some nutrients but often not enough; N not immediately available
  - Typical analysis: 2-1-1
- **Fertilizers** = more concentrated source of nutrients. Added in much smaller amounts.
  - Typical analysis:
    - Organic: 5-3-3
    - Synthetic: 14-14-14
Slow Release Fertilizers

• **Time release fertilizers** (e.g. Osmocote) = slowly release nutrients over 2-6 months

• **Organic fertilizers** naturally slow release – nutrients not readily available in cold weather; feed microbes
Fertilizers

- Liquid fertilizers (Miracle Grow, Compost tea) = fast food, quick boost but no sustained feeding
- Good for plants growing in potting soil in containers
- Not recommended for garden/landscape except to help seedlings establish OR if need quick fix (nitrogen deficiency)
Fertilizers

10-10-10 and other granular fertilizers
• Dissolve in water – excess leaches
• Apply only small amounts at a time, reapply as needed – easy to over do it!

Specialty fertilizers
• Fertilizer spikes – not good! Need to spread fertilizer across root zone, not concentrate
• Rose, Tomato, etc.. Fertilizer – just a marketing ploy
Can’t Find The Recommended Analysis?

1. Find something with similar ratio, for example, 5-10-5 is a 1:2:1 fertilizer and adjust rate accordingly.

2. Use a complete fertilizer but always base application rate on Nitrogen – eg., if you have 5-3-3 (Plant-tone), apply at same rate recommended for 5-10-5.

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If need N only

- Blood meal is the most common natural N source
- Dried Blood is 12% nitrogen, 12-0-0

To determine how much is needed per 1000 sq. ft. to supply 1 lb of nitrogen, divide %N into 100:
100/12 = 8.3 lbs per 1000 sq. ft.
If need additional Phosphorous

• **Bone Meal**
  – Natural
  – 0-10-0
  – 10% P

• **Triple Super Phosphate**
  – Synthetic
  – 0-45-0
  – 45% P
If need additional Potassium

• **Muriate of Potash**, 0-0-60, not organic
• **Wood ashes** – K levels vary from 3 to 7%
  – Also raises soil pH!
• **Greensand**, 0-1-5
When to Fertilize

- **Vegetables** – at planting time and again 3-6 weeks later if needed
- **Annuals** – at planting time; may need additional N by mid-summer
- **Fruit trees, grapes, berries** – typically early spring
- **Trees, shrubs, perennials** – spring IF NEEDED
- **Fescue Lawns** – Fall and early Spring
- **Bermuda/Zoysia**: Summer
**Additional Information**

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**HM%** - humic matter, not total organic matter

**W/V** – Weight/Volume, over 1.5 sandy; under 0.5 organic

**Mn, Zn, Cu, S indices** – ideal range 50-70

Zn and Cu often high, want under 2000
Cation Exchange Capacity (CEC)

- Measure of soil’s capacity to hold nutrients
- Increases as organic matter, pH, and clay content increase
- Sandy soils lower, eg. 2.0
- Organic/Clay soils higher, eg. 25

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Organic matter increases CEC

NC State Extension
What the Report Doesn’t Tell You

• Drainage issues
• Soil compaction

Both affect root health and plant growth – Must correct these problems before lime or fertilizer can help

• Add organic matter
Questions?

There is an Extension center in every NC County!

Chatham County Center
http://chatham.ces.ncsu.edu
919-542-8202