Why Soil Sample?

Information

★ Chemical way of estimating the nutrients available to the plant (i.e., a starting point for plant growth).

★ Nutritional Needs & Soil Chemistry
  ✔ Tool for making management decisions

★ Environmental Protection
  ✔ Phosphorus & Nitrate (NO₃⁻) – separate analysis
Why do we fertilize turf?

Basic Reasons

☆ Color
  ✓ We are in a quality business – it must look good

☆ Growth & Recovery
  ✓ Divots, wear and tear, surface interaction (play)
  ✓ Yields are not important

UGA Soil Test Report

Information

☆ County Extension Office
  ✓ Collect & submit
  ✓ Interpret & modifications

☆ Direct to Ag. Services Lab
  ✓ www.SoilTest123.com
  ✓ Sampling instructions
  ✓ Soil Test Kit

UGA Soil Test Report

Components

☆ Results
  ✓ Nutrients – P, K, Ca, Mg, & Zn
  ✓ Relative sufficiency
  ✓ pH – soil acidity

☆ Recommendations
  ✓ Guide
  ✓ Not instructions
Soil Test Report - Other

Other Information

☆ Nutrients

✓ Na, Fe, Mn, S, Cu, & B
✓ NO₃-N

☆ Soil Properties

✓ CEC, Base Saturation & Acidity
✓ EC & Soluble Salts
✓ OM

Soil Test - Example

Good Report or Bad

☆ pH

? High – especially for SA
✓ Ca & Mg indicators

☆ Phosphorus

✓ Over applied
✓ Not needed this season

Soil Test - Example

Good Report or Bad

☆ pH

? Low – need lime
✓ Ca & Mg - alright

☆ Phosphorus

✓ Not needed this season

☆ Potassium

✓ Needed
Purchasing a Fertilizer
Considerations

☆ Price
  ➔ Know what’s in it!

☆ Analysis or Grade
  ✓ % N, P₂O₅ & K₂O

☆ Type of Nitrogen
  ✓ Soluble / fast release
  ✓ Slow release

Analysis, Ratios, & Rates
What’s the Difference

☆ Analysis
  ✓ % N, P₂O₅ & K₂O
  ✓ 16-4-8

☆ Ratio
  ✓ relative amount of N, P & K fertilizer product
  ✓ Helps evaluate a fertilizer product for specific
    plant demands & soil characteristics
  ✓ 4:1:2

Analysis, Ratios & Rates
What’s the Difference

☆ Rate
  ✓ Amount of fertilizer applied over a given area
  ✓ 1 lb N / 1000 ft²
  ✓ More important than the fertilizer analysis or
    grade
Soil Acidity (pH)

pH
Two Tests
* pH
  ? Need
* Lime Buffer Capacity
  ✓ Adams-Evans Buffer
  ? How much

pH
Adjusting pH (5.5 to 6.5)
* Lime
  ✓ increase pH
* Sulfur & some Fertilizers
  ✓ lowers pH
  ✓ NH$_4^+$
  ✓ Urea
pH - Lime

- Slowly soluble
- Raise pH
- Pelletized & powdered
- Calcitic – calcium carbonate
  - calcium carbonate (CaCO₃)
- Dolomitic
  - calcium-magnesium carbonate (CaMg(CO₃)₂)

PH - Turfgrasses

Turfgrass Species

★ 5.0 to 5.5
  - Bahiagrass
★ 5.0 to 6.0
  - Centipedegrass

★ 5.5 to 6.5
- Bermudagrass
- Centipedegrass - establishment
- St. Augustinegrass
- Seashore Paspalum
- Tall Fescue
- Kentucky Bluegrass
★ 6.0 to 7.0 – Zoysiagrass
Nitrogen (N)

Role in the plant

- Synthesis of proteins & chlorophyll
  - DNA & RNA
  - Protein composes 85% of N in plants
- Needed for growth of all plant parts
- Mobile
  - from old to young growing regions
Nitrogen (N)

In Soil
- Increases – U.S.
  - From south to north
  - From east to west
  - Result of temperatures & soil water
- Surface has greatest N concentration
  - Aeration & microbial activity
  - Upper 3 to 10 inches

Timing N Fertilization

Warm-season Grasses
- Soil Temperatures
  - Active root growth & activity
  - 65° F
  - Consistently – multiple days
  - 4-inch depth
  - www.GeorgiaWeather.net
  - Combination products

Is now a good time to fertilize?
- Nitrogen
  - Let soil temps guide
- Phosphorus & Potassium
  - Soil test
  - Potassium (K) good carrier
    - preemergence herbicide
    - insecticide
Cultural Practices

Fertilization

✓ When - soil test
✓ What to use – Soil Test
✓ How Much - rarely exceed 1 lb N per 1000 ft²
✓ Application - uniform (2 directions)

Adverse Affects

High N Fertilization

☆ Succulence or Juiciness of Vegetation
  ✓ Increased proportion of water w/in cells
☆ Thinner cell walls
☆ Promotion of protein synthesis
  ✓ expense of carbohydrate synthesis & accumulation

Adverse Affects

High N Fertilization

☆ Susceptibility to pests
  ✓ diseases – Brown Patch, SDS, etc.
  ✓ insects – sap suckers
  ✓ thin cell walls
☆ Susceptibility to environmental stresses
  ✓ drought
### Available Sources of N

Plants use inorganic N

- **Nitrate (NO$_3^-$)**
  - easily leached

- **Ammonium (NH$_4^+$)**
  - converted to NO$_3^-$ in soil – *nitrification*
  - Nitrification – rapid in warm, aerated soils
  - lowers soil pH

### Origins of N

**Organic**

- **Natural Organics**
  - thatch / crop residue
  - sewage sludge
  - poultry feather meal
  - bone meal blood
  - manure

### Organic N

**Benefits**

- low turf burn potential
- uniform N release
- little effect on soil pH
- low leaching losses
Organic N
Suggested Benefits
✓ may enhance plant metabolism & disease resistance
✓ contain sulfur, iron, & trace elements

Organic N
Disadvantages
× low N content
  ★ 1 to 8%
  ★ $\$ per pound of nutrient

× low N release cool weather
  ★ microbe dependent
  ★ temperature mediated

Organic N
Disadvantages (cont.)
× objectionable odor
× salts, heavy metals, weed seeds
× increased insect populations
  × black turfgrass ataenius
Origins of N

Synthetic Organics

* water soluble
* urea $\rightarrow$ NH$_4^+$
  ✓ rapid release
* urea formaldehyde
  ✓ slowly soluble
* isobutylidene diurea (IBDU)
  ✓ temp dependent

Origins of N

Inorganic

* Synthetic Inorganics
  ✓ ammonium nitrate
  ✓ ammonium sulfate
  ✓ calcium nitrate
  ✓ potassium nitrate
  ✓ nitrate of soda

Phosphorus (P)
**Fertilization**

Phosphorous (P\(_2\)O\(_5\))
- Reported in oxide form
- 43% P
- Slowly soluble
- Super Phosphate (0-18-0)
- Triple Super (0-45-0)
- Promotes Rooting
- Till into soil

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**Phosphorus Fertility**

Phosphorus (P)
- Granular P ferts. are 90 to 100% water-soluble
- Dissolve rapidly in moist soil
- Hydrolysis of water-soluble P increase when temps. increased from 41° F to 95° F
- At field capacity, 50 – 80% water-soluble P will move out of granular in 24 hours; 20 – 50% at 2 – 4% soil moisture.

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**Phosphorus (P)**

Role in the plant
- Nucleic acids & nuclei of plant cells
  - DNA & RNA
- Energy
  - ATP – adenosine triphosphate
  - Other P containing components
- Location – growing points / tips
**Phosphorus (P)**

**Forms & Sources**
- Absorbed by plants
  - Phosphate - $\text{H}_2\text{PO}_4^- \text{ & HPO}_4^{2-}$
- Sources
  - Natural - superphosphate
  - Organic – e.g. bone meal
  - Chemical – ammoniated phosphate

**Phosphorus (P)**

**Considerations**
- Relatively immobile in soils
- Effect on soil pH
  - Ammoniated phosphates lower soil pH
  - Superphosphate (SP) & triple SP increase soil pH
- Environmental hazards
  - Water quality – algal bloom
  - Soil test for need

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**Proper Fertilizer Usage**

**Common Sense**
- Proper rate
- Application (sidewalks)
- Calibration
- Timing
Potassium (K)

Fertilization
Potassium (K₂O)
- 83% K
- “Health” element
- Promotes Rooting
- Stress preconditioning
- Till into soil
- N:K (2:1)
- Part of last application (1:1)

Potassium (K)
Role in the plant
- Maintaining plant’s water status
  - cellular turgor pressure
  - opening & closing of stomata
  - osmotic pressure for water to enter roots
- Enzyme activation
  - associate with >60 enzymes
Potassium (K)

Mobility

☆ Soil
  ✓ readily leached
  ✓ commonly low to deficient in Georgia soils

☆ Plant
  ✓ translocated to young meristematic tissue
  ✓ interveinal yellowing of older leaves
  ☺ root entrance competition with K⁺, Ca⁺² & Mg⁺²

Potassium (K)

Forms & Sources

☆ Absorbed by plants
  ✓ Ion form – K⁺
  ✓ From the soil solution

☆ Sources
  ✓ Muriate of potash – potassium chloride (KCl)
    ✓ 1° K-containing fertilizer
  ✓ Sulfate of potash – potassium sulfate (K₂SO₄)
  ✓ Saltpeter – potassium nitrate (KNO₃)

Turfgrass Management App

For Sale Application

☆ iTunes – iPhone & iPod Touch

☆ BlackBerry

www.GeorgiaTurf.com
Important Dates in 2010

- UGA Turfgrass Field Day – August 4
- Turfgrass Institute – Dec. 8 & 9
- For other local programs contact your CEA

Thank You

Visit
www.Georgiaturf.com