

THE EVERCHANGING TURF

- *a view from behind the radiator
and from bottom to top*



Tom Samples



ECOREGIONS

867 GLOBAL

TERRESTRIAL, FRESHWATER, MARINE

An Ecoregion:

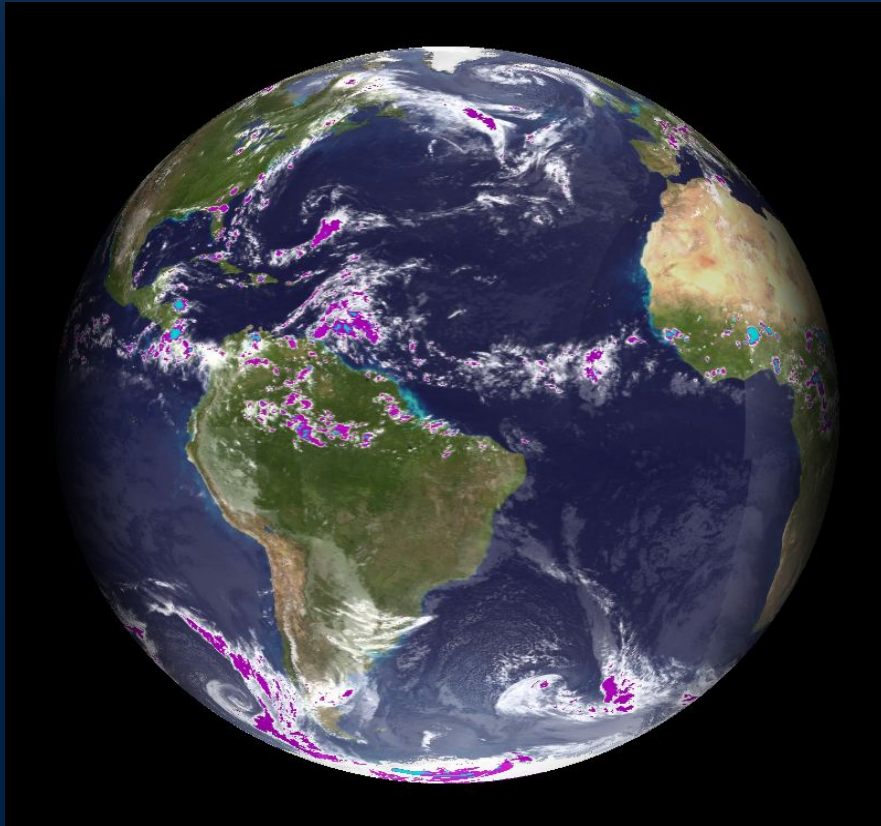
- is a "relatively large unit of land or water containing a characteristic set of natural communities that share a large majority of their species, dynamics, and environmental conditions"

Olson & Dinerstein 1998, 2002; The Nature Conservatory 1997





SATELLITE



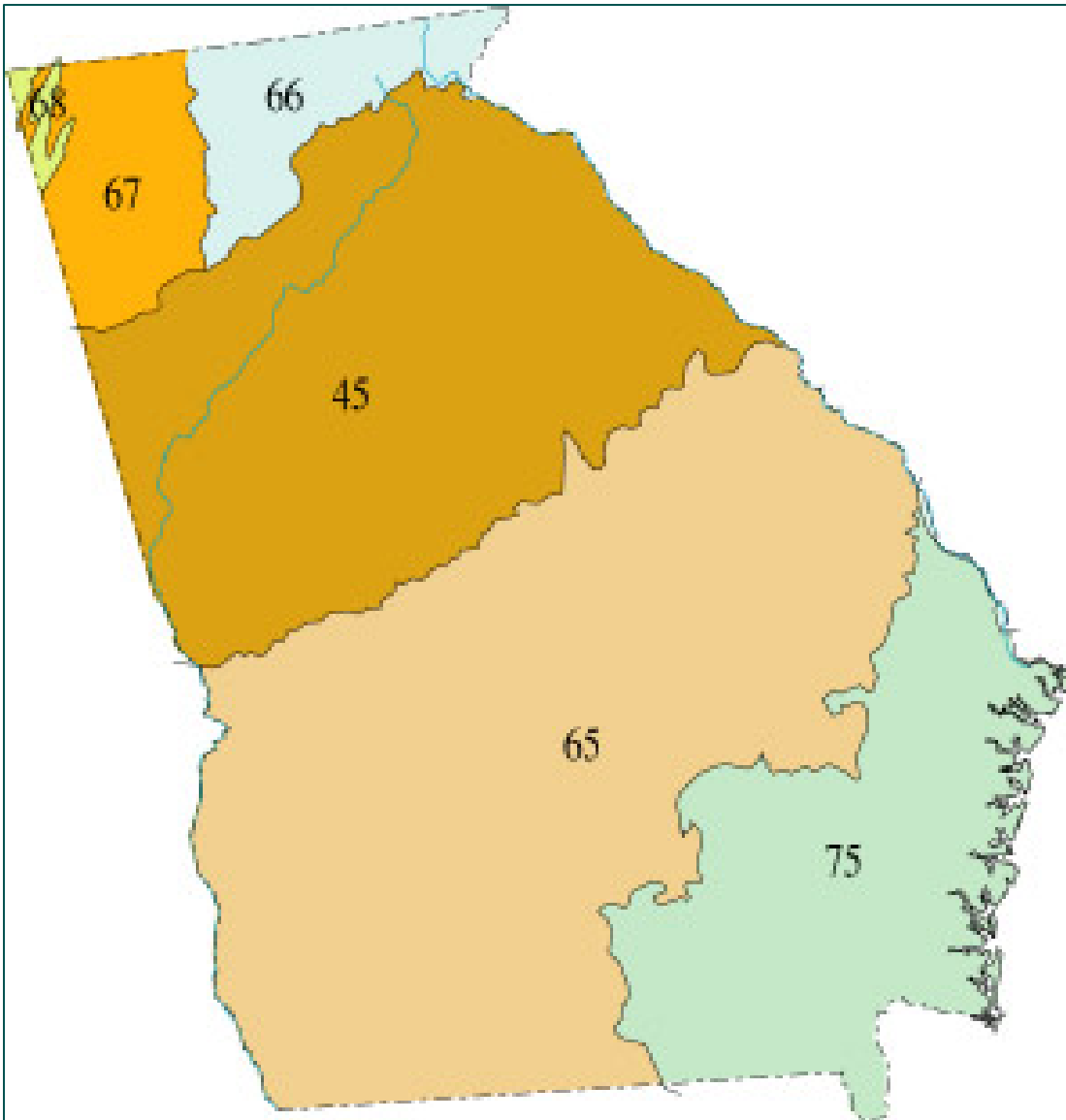
http://sos.noaa.gov/images/fullsize/atmosphere/colorenhancedIRsatblue_marble.jpg



http://upload.wikimedia.org/wikipedia/commons/8/8d/GPS_Satellite_NASA_art-iif.jpg

- Images
- Global Position

LEVEL III ECOREGIONS



75 Southern Coastal Plain

68 Southwestern Appalachians

67 Ridge & Valley

66 Blue Ridge

65 Southeastern Plains

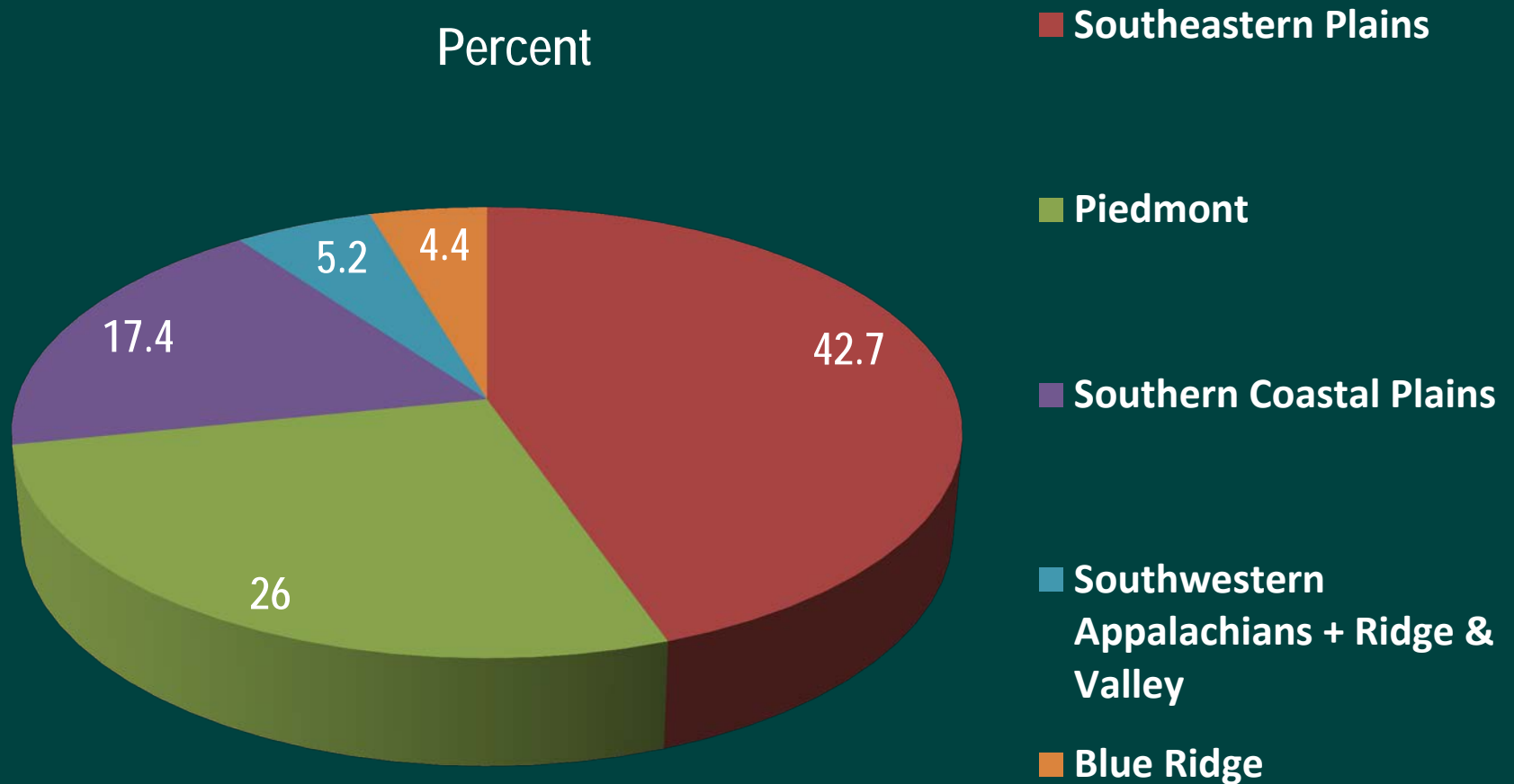
45 Piedmont

Total Area = 59,441 sq. mi.

http://www.netstate.com/states/geography/ga_geography.htm

LEVEL III ECOREGIONS

Percent



STATE FLAG



STATE BIRD

Brown Thrasher

Toxostoma rufum



https://bigdogsbirdblog.files.wordpress.com/2010/03/male_brown_thrasher.jpg



STATE FLOWER

Cherokee Rose

Rosa laevigata



<http://media-cache-ec0.pinimg.com/736x/24/69/2a/24692a15519cb862edf0c61dbe80dba1.jpg>

STATE TREE

Southern Live Oak

Quercus virginiana



http://media.cmgdigital.com/shared/lt/lt_cache/thumbnail/960/img/photos/2012/08/11/d0/8c/032412Wild_1_1339716a.JPG



STATE SOIL

Tifton

Surface layer:

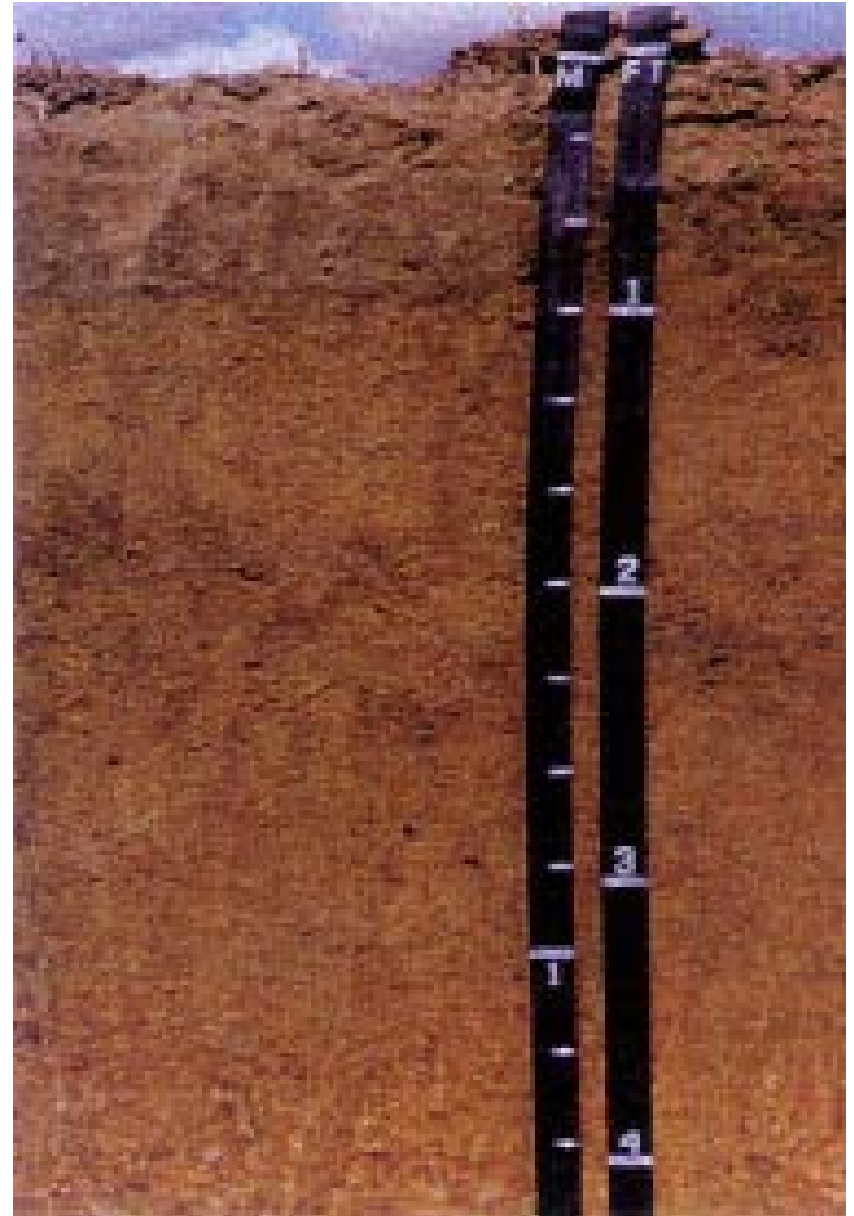
Dark grayish brown loamy sand

Subsoil :

Upper- Strong brown fine sandy loam

Middle- Yellowish brown sandy clay loam

Lower- Strong brown sandy clay



http://urbanext.illinois.edu/soil/st_soils/PDF/GA_SOIL.PDF



SOIL CLASSIFICATION

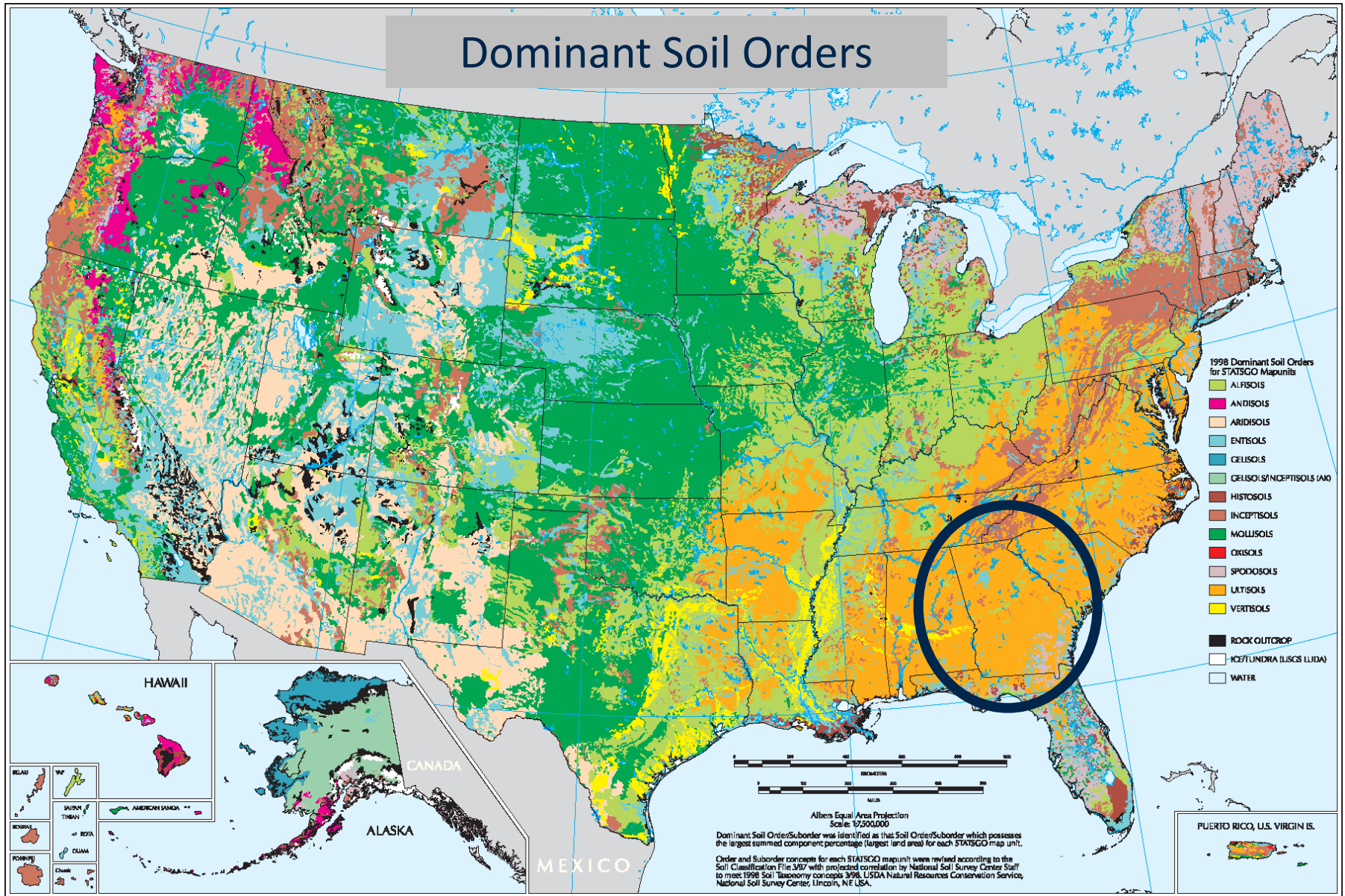


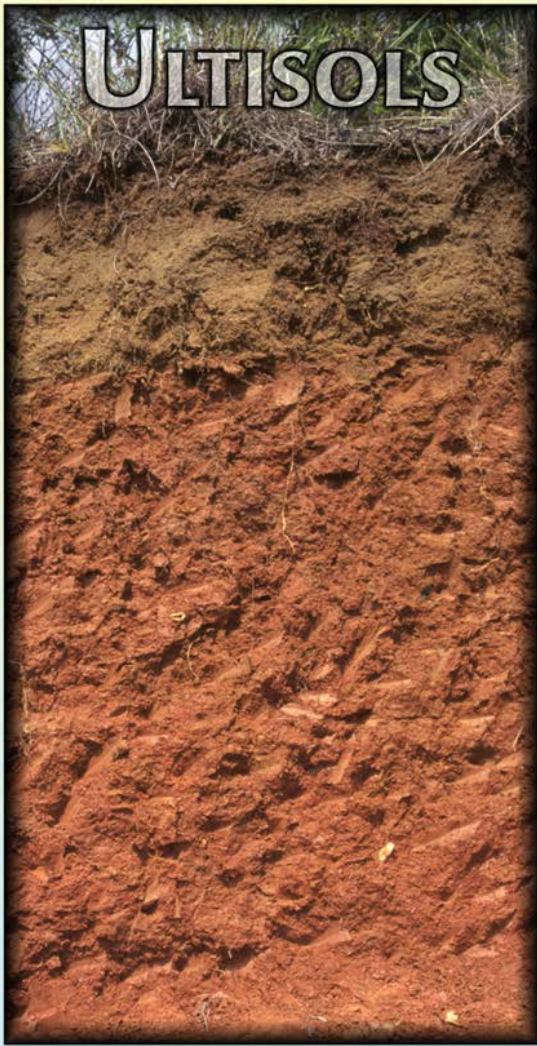
USDA SOIL CLASSIFICATION

- Order
 - Suborder
 - Great Group
 - Subgroup
 - Family
 - Series



Dominant Soil Orders





Ultisols are soils in humid areas. They formed from fairly intense weathering and leaching processes that result in a clay-enriched subsoil dominated by minerals, such as quartz, kaolinite, and iron oxides.

Ultisols are typically acid soils in which most nutrients are concentrated in the upper few inches. They have a moderately low capacity to retain additions of lime and fertilizer.

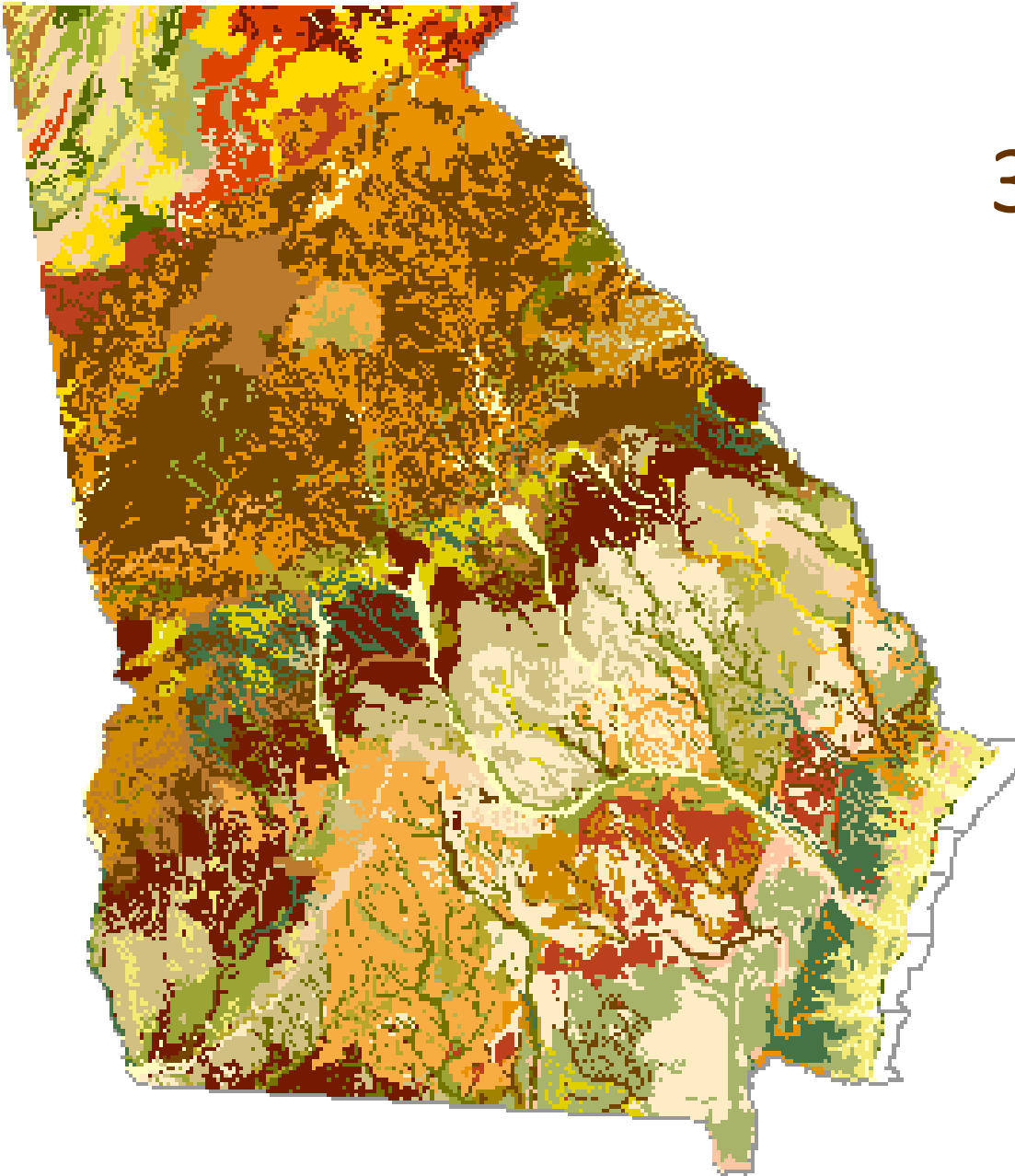
**ULTISOLS MAKE UP ABOUT 8% OF THE WORLD'S
ICE-FREE LAND SURFACE.**

ULTISOLS

- Soils in humid areas formed from fairly intense weathering and leaching processes that result in a clay-enriched subsoil with quartz, kaolinite clay and iron oxides
- Soils are usually acidic and most nutrients are concentrated in the upper few inches
- Soils have a medium-low capacity to retain both lime and fertilizers



372 Soil Series

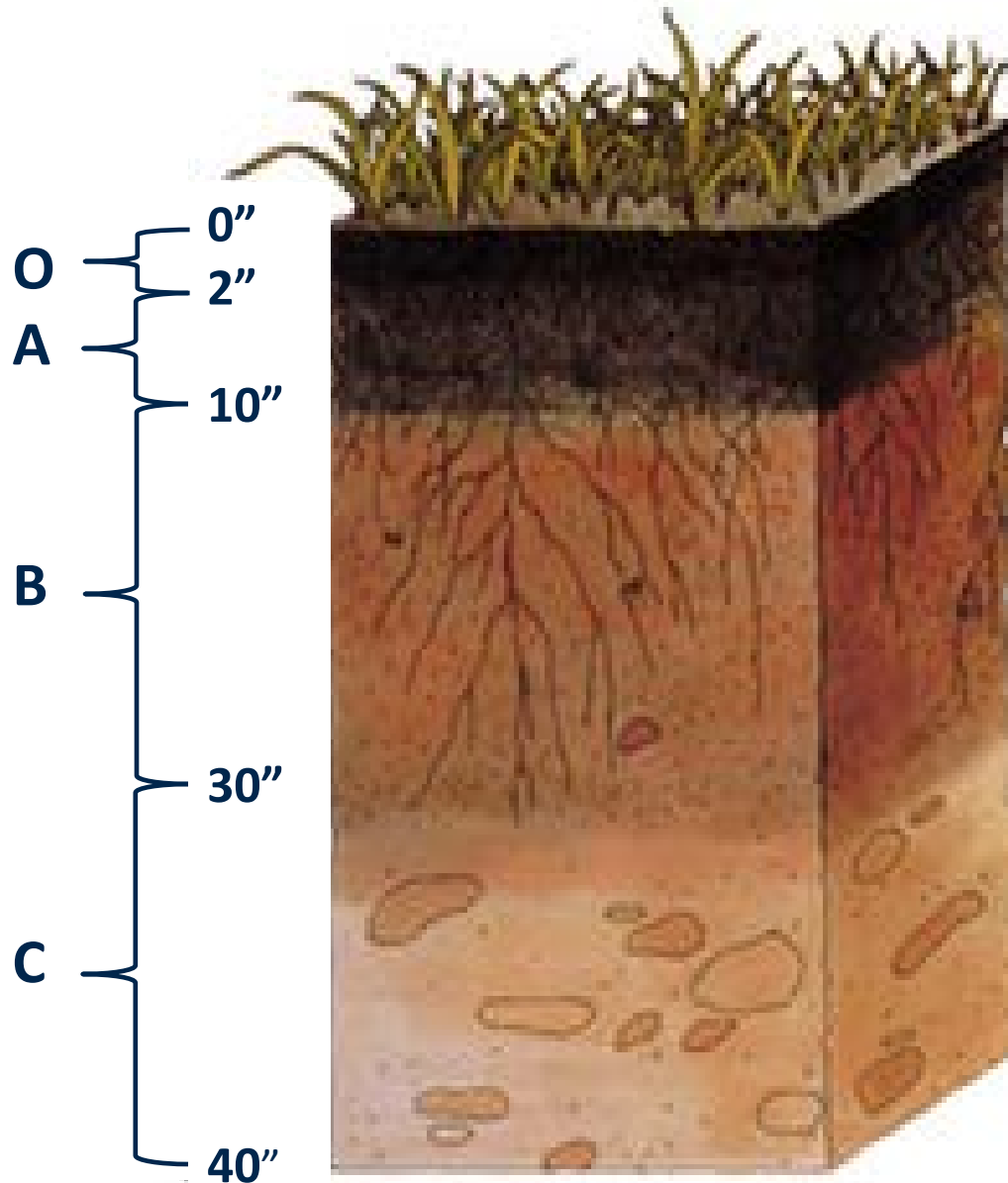


SOIL HORIZONS



SOIL HORIZON

A layer generally parallel to the soil surface, with physical characteristics different from those layers above and below



SOIL ORGANIC MATTER



SOIL TEMPERATURE REGIMES

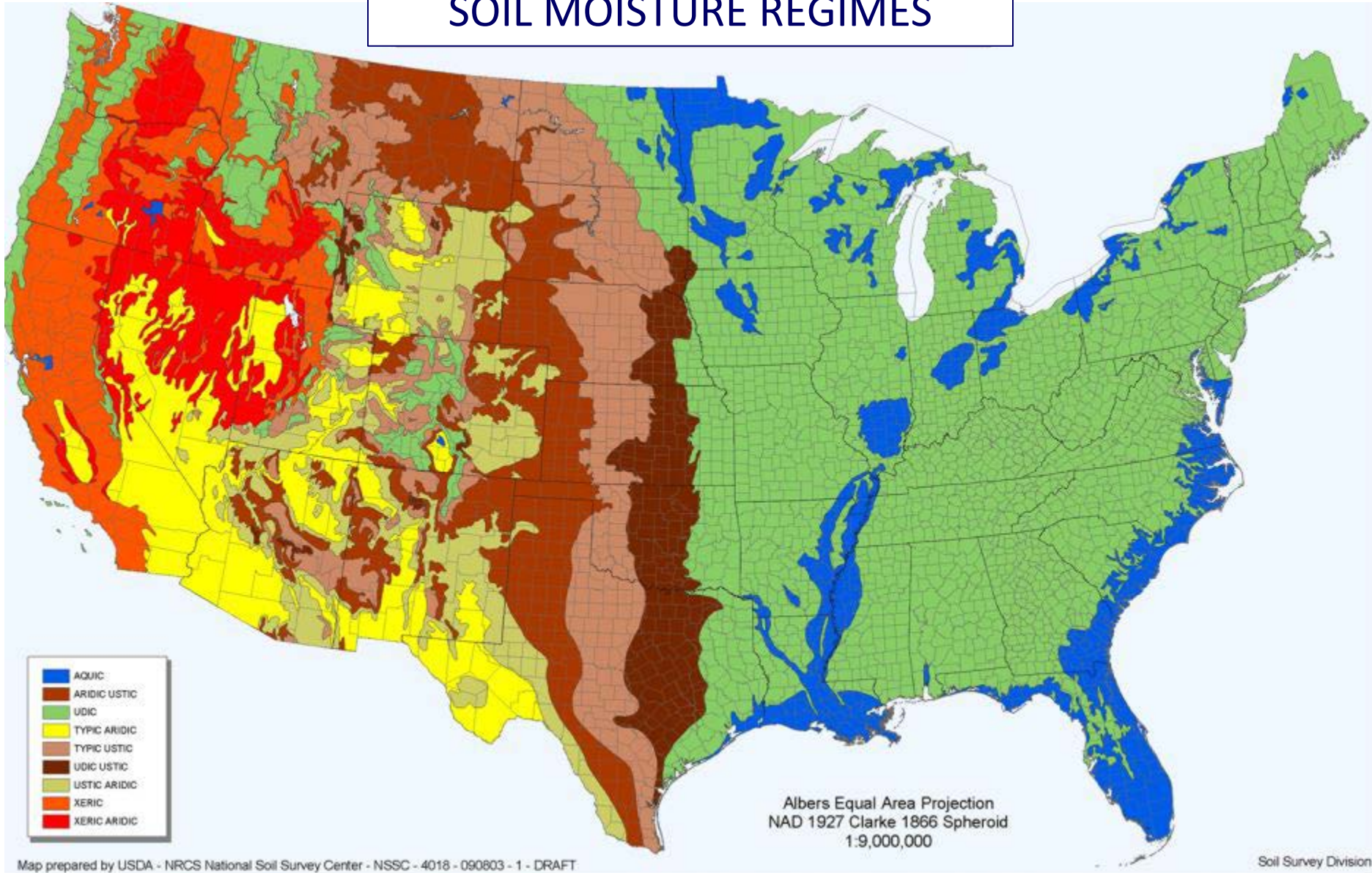


Map prepared by USDA - NRCS National Soil Survey Center - NSSC - 4018 - 902703 - 1 - DRAFT

Soil Survey Division



SOIL MOISTURE REGIMES



Map prepared by USDA - NRCS National Soil Survey Center - NSSC - 4018 - 090803 - 1 - DRAFT

Soil Survey Division

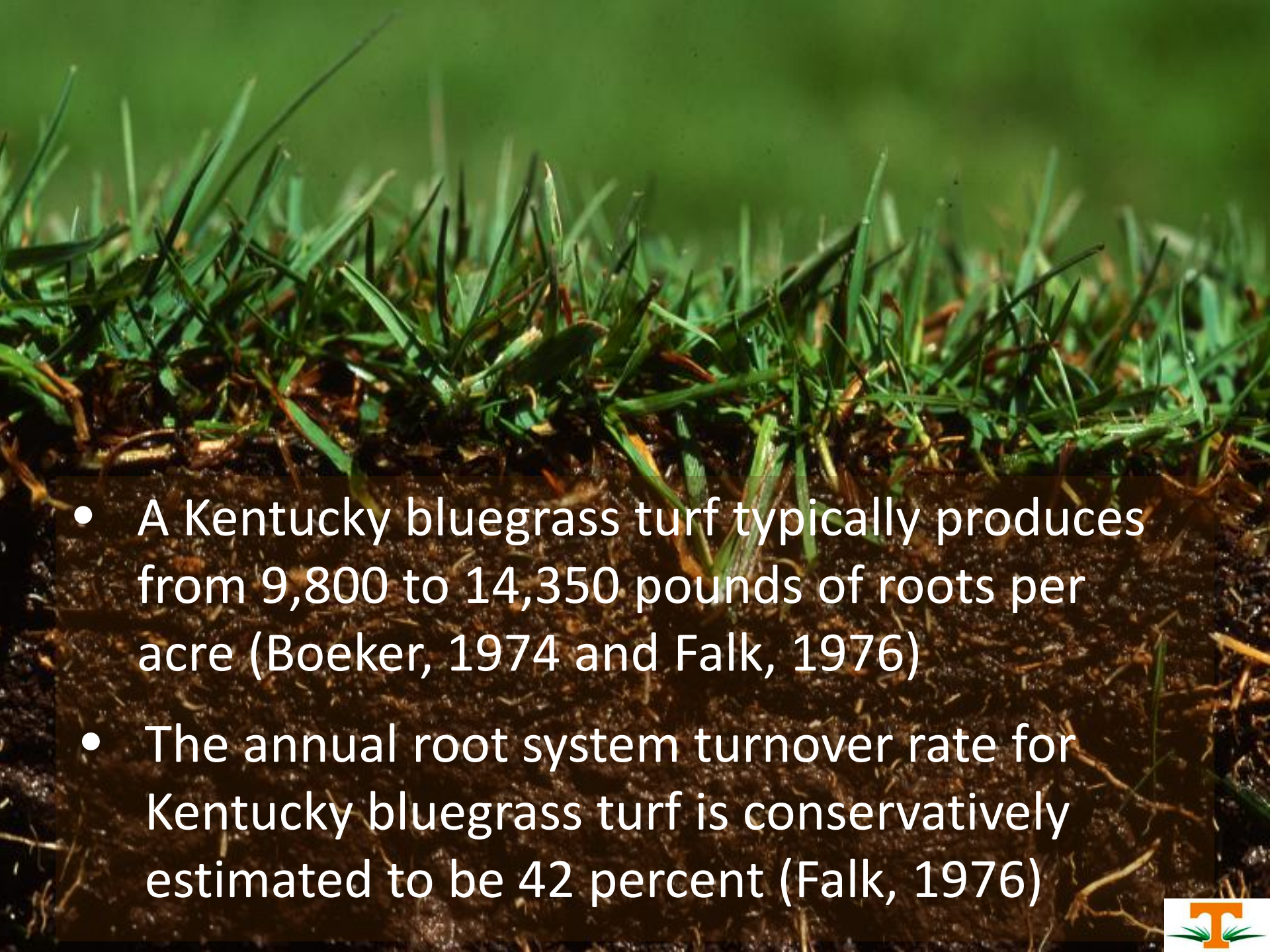


THE SOIL PROFILE

— A Horizon

- The A horizon generally contains more organic matter than the other horizons
- A 1% increase in organic matter can increase the water holding capacity of 1 acre-foot of soil by ~6,000 gallons



- 
- A Kentucky bluegrass turf typically produces from 9,800 to 14,350 pounds of roots per acre (Boeker, 1974 and Falk, 1976)
 - The annual root system turnover rate for Kentucky bluegrass turf is conservatively estimated to be 42 percent (Falk, 1976)





SOIL TESTING

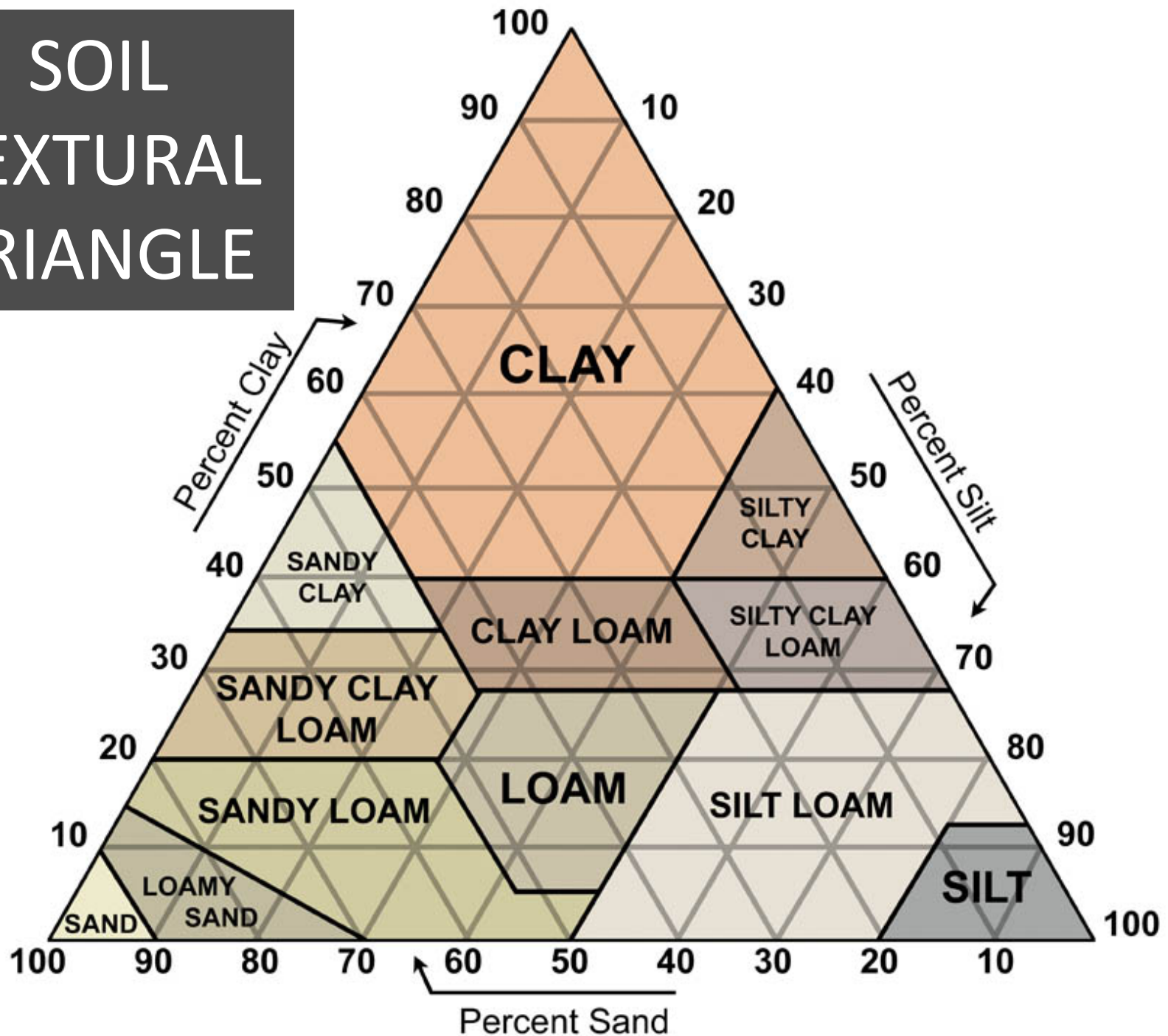


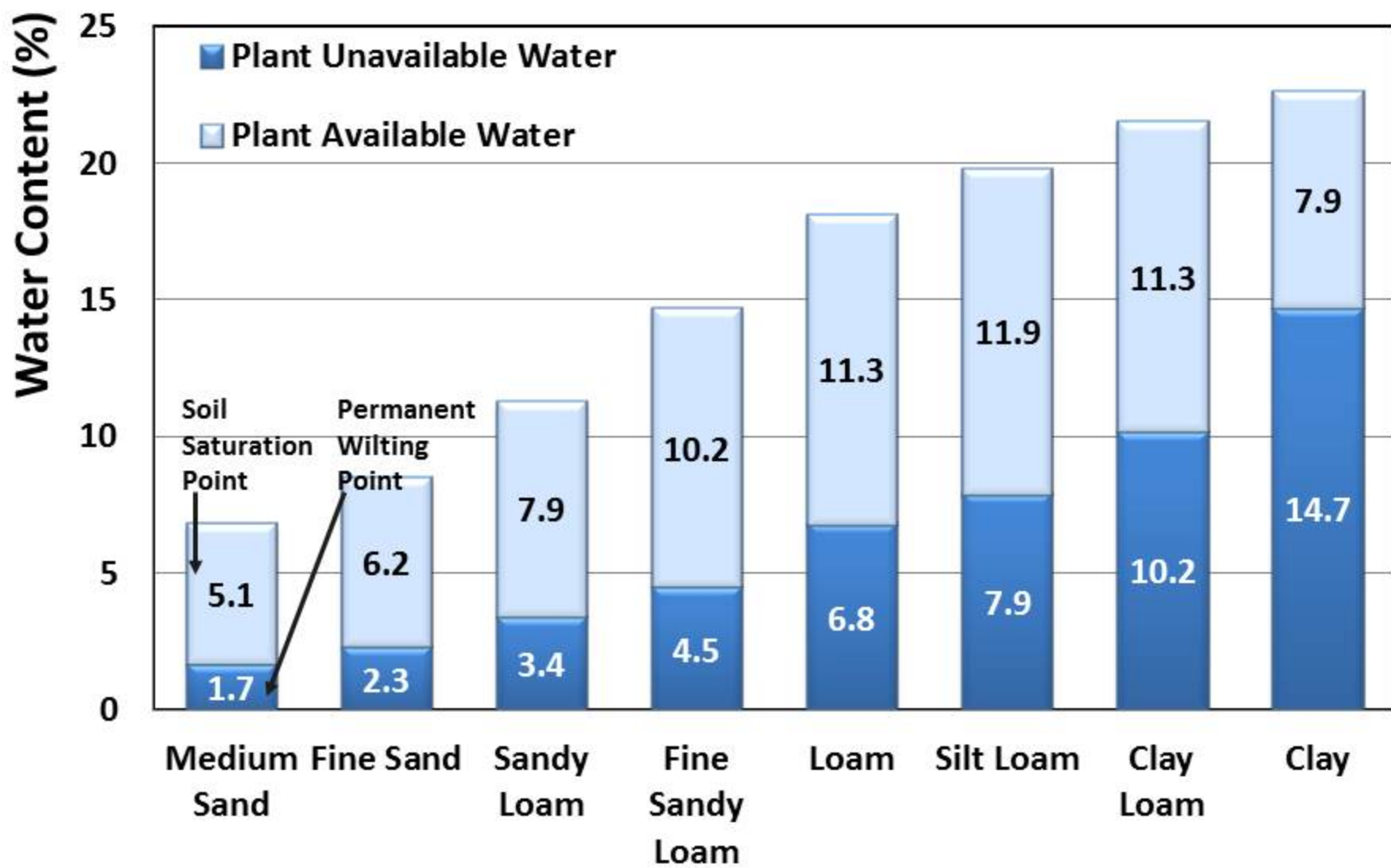
- Physical Properties
- Cation Exchange Capacity
- Nutrient Level
- pH
- Organic Matter

SOIL TEXTURE



SOIL TEXTURAL TRIANGLE





From: Anon. 1955. 'Water' in *Yearbook of Agriculture*. USDA. Washington DC, p. 120

Soil Texture





SOIL MOISTURE MONITORS





IRRIGATION SYSTEM COMPONENTS AND CONTROL



http://www.watersmartsd.org/sites/default/files/sensor_in_soil.jpg

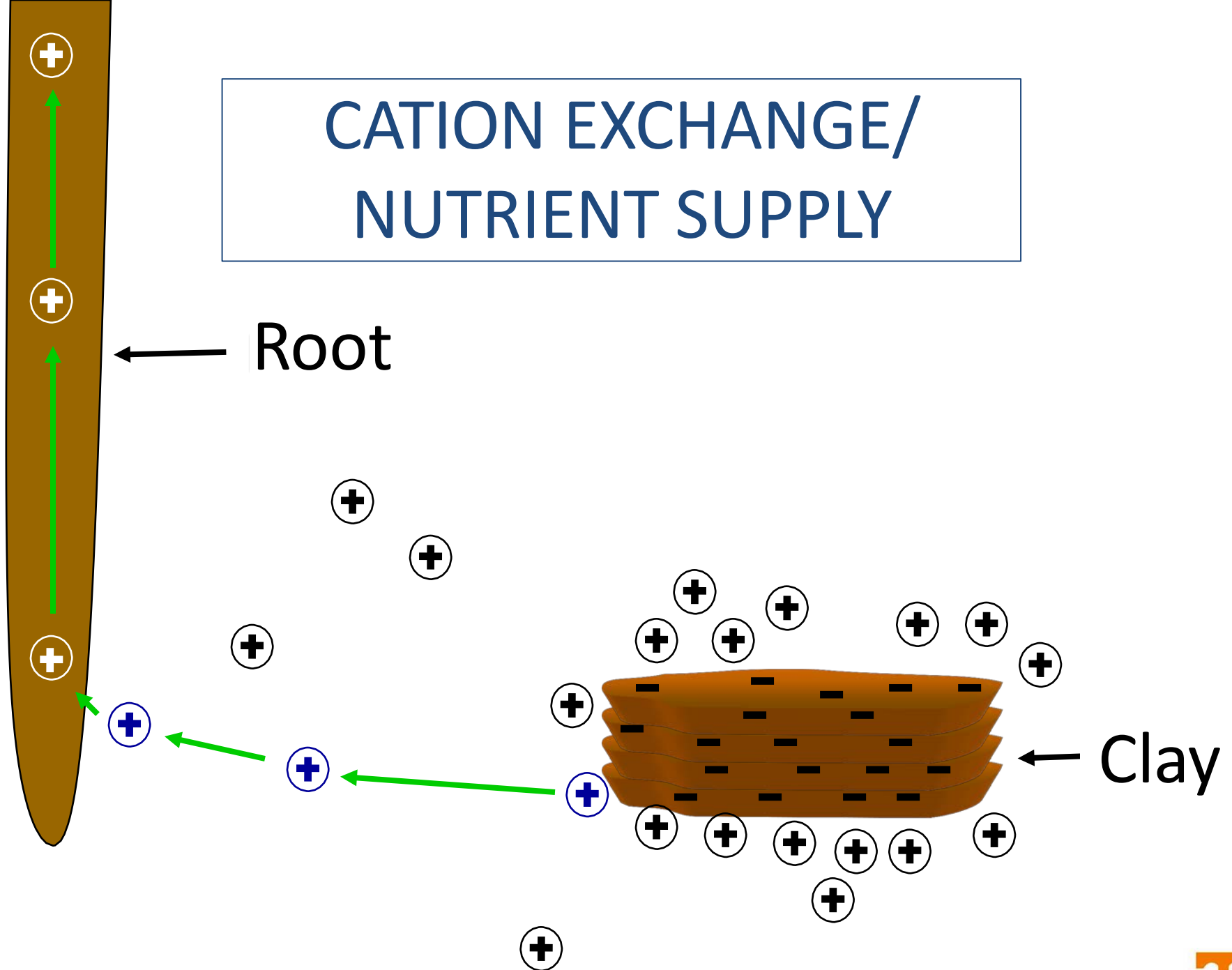


CATION EXCHANGE CAPACITY (CEC)

- Typical CEC values of soils:
 - Sand: 0 - 6 meq/100 g
 - Loam: 12 - 30 meq/100 g
 - Clay: 18 - 150 meq/100 g
- As a soil's nutrient cation holding ability increases:
 - Fewer fertility inputs
 - Less leaching potential



CATION EXCHANGE/ NUTRIENT SUPPLY





If there is one milliequivalent of cation exchange capacity in a teaspoon of soil, the soil contains 6.02×10^{20} negatively charged adsorption sites



SOIL STRUCTURE



Soil Structure

1 inch

Granular

Blocky

Platy

Massive

Single grain



Stockpile and Re-distribute Topsoil



SOIL FERTILITY

17 elements considered essential for plants to complete their life cycle:

Carbon, Hydrogen, Oxygen

Nitrogen, Phosphorus, Potassium, Calcium, Magnesium, Sulfur, Copper, Zinc, Manganese, Boron, Molybdenum, Iron, Chlorine, and Nickel



SOIL TESTING LABS



NUTRIENT TESTING METHODS

- **1965** 13 different soil extractants for P, K, Ca and Mg were used among University laboratories in the Southeastern states
- **1983** 9 standard reference procedures presented with only 3 soil extractants for P, K, Ca and Mg. The 3 extractants included Mehlich 1 for P, Bray for P, and ammonium acetate for K, Ca, and Mg
- **1992** Extractants including Mehlich-3 and methods for determining sulfate-sulfur, nitrate-nitrogen and several micronutrients were presented along with other methods to determine soil acidity and organic matter, and to test surface-mined soil, potting media and soils amended with wastes



EXAMPLE SOIL TEST REPORT

Tom Samples
Univ. of Tennessee
Knoxville, TN 37996

Soil, Plant and Pest Center
5201 Marchant Drive
Nashville, TN 37211-5112
(615) 832-5850
soilplantpestcenter@utk.edu

Date Tested: 6/24/2014

County: Knox

Lab Number:

Mehlich 1 SOIL TEST RESULTS and RATINGS*

Sample ID

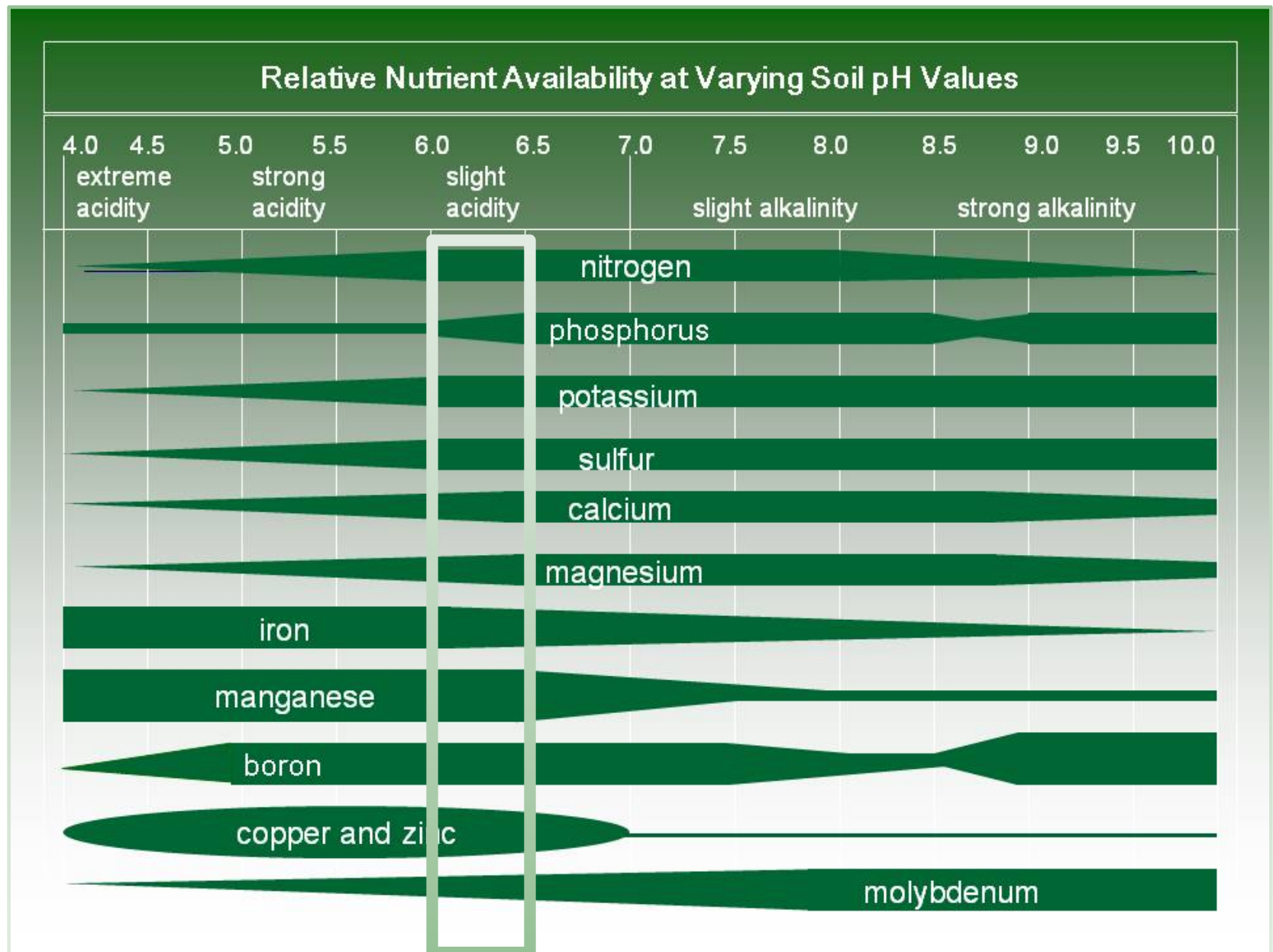
(Pounds Per Acre)

Water pH	Buffer Value	P Phosphorus	K Potassium	Ca Calcium	Mg Magnesium	Zn Zinc	Fe Iron	Mn Manganese	B Boron	Na Sodium	S-NH4OAC Sulfur	Nitrates-ISE (ppm)
6.8		104 H	260 H	3189 S	281 S							

Organic Matter %	Soluble Salts PPM**
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3.7%





Most Turfgrasses Grow Best in Slightly Acid Soil



Indicator Weeds

Acidic Soil pH: Sheep Sorrel (pH 4)



Rumex acetosella

Indicator Weeds

Acidic Soil pH: Ground Ivy



Indicator Weeds

Acidic Soil pH: Cinquefoil



Potentilla simplex



Indicator Weeds

Basic Soil pH: Common Plantain









AERIFIERS/DETHATCHERS



Seed-to-Soil Contact



Seed-to-Soil Contact



Limited-tillage, Slit-seeders or Aero-seeders





TOPDRESSERS



WETTING AGENTS / SURFACTANTS

Aquatrols' Dispatch[®] Sprayable


CONTAINS NON-PLANT FOOD INGREDIENTS:
Guaranteed Analysis:
Active Ingredient 30.0%.....Alkoxyated polyols
21.0%.....Glucoethers
Inert Ingredient 49.0%.....Water

NOT RECOMMENDED FOR USE AS A FERTILIZER SUBSTITUTE
All ingredients are exempt from the requirements of a tolerance as specified in 40 CFR 180.1001 ©.

US Patent No. 6,480,290; 6,651,219
European Patent No. 0968155; 1442087
Canadian Patent No. 2,463,525 Patents pending worldwide

US Volume	US Weight	Metric Volume	Metric Weight
<input type="checkbox"/> 30 gal	267.9 lbs	<input type="checkbox"/> 115 L	123.1 kg
<input type="checkbox"/> Other		<input type="checkbox"/> Other	

For chemical emergency spill, leak, fire, exposure or accident, call CHEMTREC day or night. Domestic North America 800-424-9300 International call 703-527-3887 (collect calls accepted)

LOT NO: 

Aquatrols'
1273 Imperial Way
Pauisboro, NJ 08066 USA
1-800-257-7797
www.aquatrols.com

NOT A PLANT FOOD INGREDIENT.
NJTSRN26934800000-5089
06/12

<http://aquatrols.com/?LOCALE=USA>

Hydro-Cure

PRODUCT INFORMATION
Hydro-Cure is a soil surfactant treatment chemistry formulated to easily and effectively relieve existing water related problems such as localized dry spots or wet spots. Hydro-Cure is easy to use and will not harm turf and ornamentals when used in accordance with product directions. When used as directed, Hydro-Cure can be applied at anytime of the year when water repellency and/or localized dry spots impact the vigorous appearance of turfgrass and ornamentals.

DIRECTIONS FOR USE
DO NOT combine Hydro-Cure in the spray tank with pesticides or fertilizers unless prior use has shown the combination physically compatible, effective and noninjurious under local conditions.

PRECAUTIONS
Shake well before each use. Avoid getting in eyes, mucous membranes or on skin. Use of side-shielded safety glasses is recommended. Use with adequate ventilation. Keep container capped when not in use. Do not contaminate feed, seed, or water supplies. Avoid spraying on concrete or painted surfaces as staining may occur.

KEEP OUT OF REACH OF CHILDREN

IN CASE OF EMERGENCY OR SPILL, Contact Hazmat
Response 1-800-424-9300.

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<http://www.precisionlab.com>





EXTENDED-RELEASE NITROGEN



**Polymer-coated
Urea**



**Polymer-coated + Sulfur-
coated Urea**

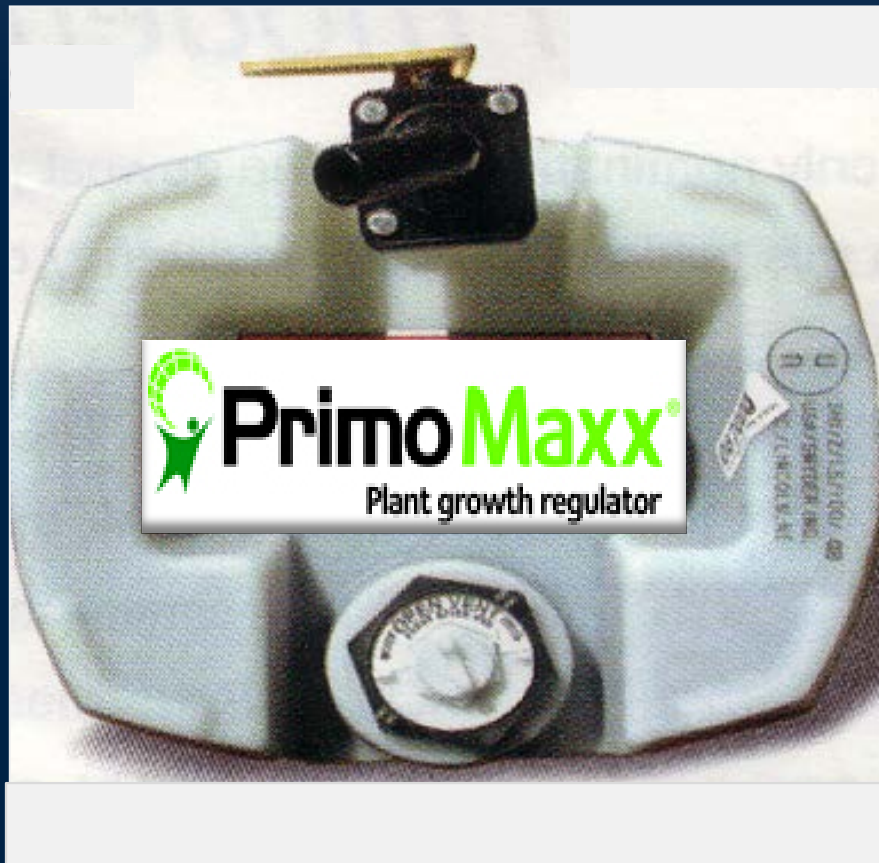


SPRAYERS AND THEIR COMPONENTS





GROWTH REGULATION AND SEEDHEAD SUPPRESSION





Thank You

<http://tennesseeturf.utk.edu/>

<http://www.tennesseeturfgrassweeds.org/>

<http://www.facebook.com/SoilPlantPestCenter>

