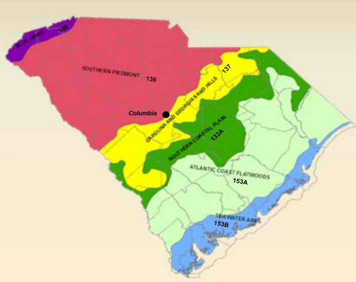
Objectives

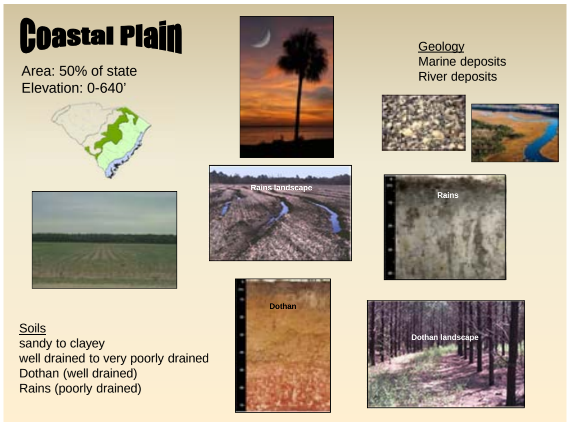
- Define SC's Major Land Resource Areas
- Define soil
- Define various soil properties
- Discuss the soil survey/web soil survey/soilweb
- Define soil health

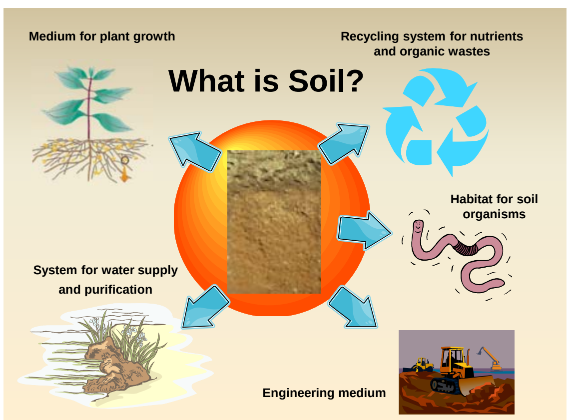
Major Land Resource Areas (MLRA)

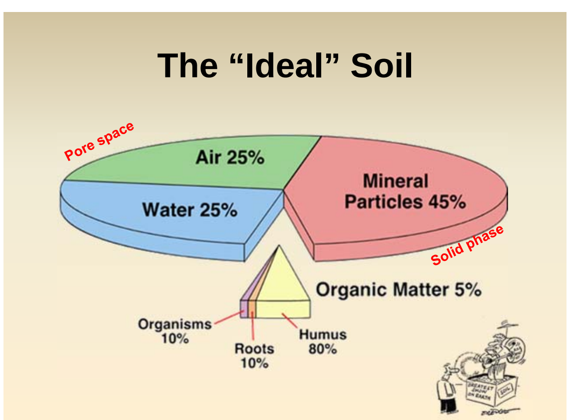


Geographically, the Blue Ridge physiographic consists of Blue Ridge and Inner Piedmont. Geologically these two are different. Table Rock Mtn and Caesar's Head are in the Inner Piedmont and are granite gneiss monadnocks. Rocks on the Blue Ridge are predominantly schists, gneisses, and amphibolites.
Monadnocks stand tall because their granite gneiss cores are more resistant to weathering than the surrounds schists and phyllites

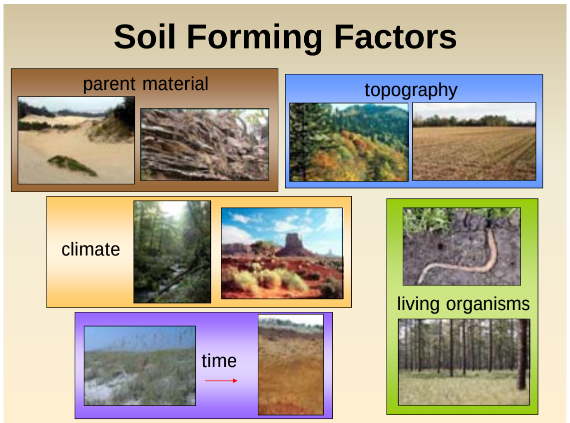
Difference between schist and gneiss: schist=fine, thin foliations; low in feldpar; gneiss=thicker foliations, high in feldspar

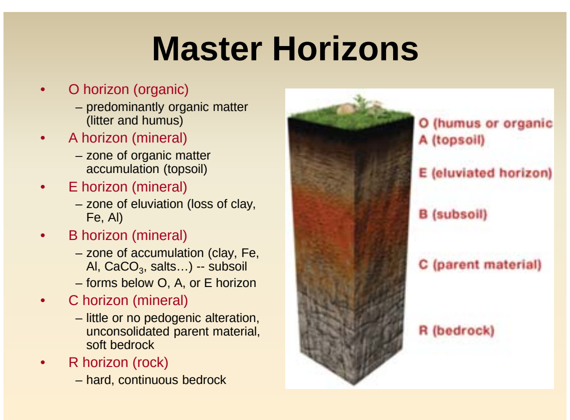






Ideal soil is 50% pore space, equally distributed between air and water; also 5% OM; only see 5% OM in very poorly drained soils; in SC, 3% is good. Piedmont is generally 1% OM content.





Basically, this is how we map.

Parent material. Few soils weather directly from the underlying rocks. These "residual" soils have the same general chemistry as the original rocks. More commonly, soils form in materials that have moved in from elsewhere. Materials may have moved many miles or only a few feet. Windblown "loess" is common in the Midwest. It buries "glacial till" in many areas. Glacial till is material ground up and moved by a glacier. The material in which soils form is called "parent material." In the lower part of the soils, these materials may be relatively unchanged from when they were deposited by moving water, ice, or wind. Sediments along rivers have different textures, depending on whether the stream moves quickly or slowly. Fast-moving water leaves gravel, rocks, and sand. Slow-moving water and lakes leave fine textured material (clay and silt) when sediments in the water settle out.

Climate. Soils vary, depending on the climate. Temperature and moisture amounts cause different patterns of weathering and leaching. Wind redistributes sand and other particles especially in arid regions. The amount, intensity, timing, and kind of precipitation influence soil formation. Seasonal and daily changes in temperature affect moisture effectiveness, biological activity, rates of chemical reactions, and kinds of vegetation.

Topography. Slope and aspect affect the moisture and temperature of soil. Steep slopes facing the sun are warmer, just like the south-facing side of a house. Steep soils may be eroded and lose their topsoil as they form. Thus, they may be thinner than the more nearly level soils that receive deposits from areas upslope. Deeper, darker colored soils may be expected on the bottom land.

Biological factors. Plants, animals, micro-organisms, and humans affect soil formation. Animals and micro-organisms mix soils and form burrows and pores. Plant roots open channels in the soils. Different types of roots have different effects on soils. Grass roots are "fibrous" near the soil surface and easily decompose, adding organic matter. Taproots open pathways through dense layers. Micro-organisms affect chemical exchanges between roots and soil. Humans can mix the soil so extensively that the soil material is again considered parent material.

The native vegetation depends on climate, topography, and biological factors plus many soil factors such as soil density, depth, chemistry, temperature, and moisture. Leaves from plants fall to the surface and decompose on the soil. Organisms decompose these leaves and mix them with the upper part of the soil. Trees and shrubs have large roots that may grow to considerable depths.

Time. Time for all these factors to interact with the soil is also a factor. Over time, soils exhibit features that reflect the other forming factors. Soil formation processes are continuous. Recently deposited material, such as the deposition from a flood, exhibits no features from soil development activities. The previous soil surface and underlying horizons become buried. The time clock resets for these soils. Terraces above the active floodplain, while genetically similar to the floodplain, are older land surfaces and exhibit more development features. These soil forming factors continue to affect soils even on "stable" landscapes. Materials are deposited on their surface, and materials are blown or washed away from the surface. Additions, removals, and alterations are slow or rapid, depending on climate, landscape position, and biological activity.

Soil Texture

Soil Texture = % Sand, Silt, & Clay

- Soil texture is the single most important physical property of the soil. Knowing the soil texture alone will provide information about:
  - water and nutrient holding capacity
  - water movement
  - soil mechanics
  - suitability/potentials for many ag and non-ag uses
    - homes, nitrate leaching, P Index, septic suitability, stormwater runoff,…..

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Sand

- 0.05 mm - 2 mm
- Visible without microscope
- Feels gritty
- Sand grains usually quartz if sand looks white or many minerals if sand looks brown
- Some sands in soil will be brown, yellow, or red because of Fe and/or Al oxide coatings
- Considered non-cohesive
  - does not stick together in a mass unless it is very wet
- Low specific surface area
- Sand has less nutrients for plants than silt and clay
- Voids between sand particles promote free drainage and entry of air
- Holds little water and is prone to drought

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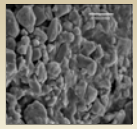
Silt



- 0.002 mm - 0.05 mm
- Not visible without microscope
- Floury feel
  - smooth like silly putty
- Quartz often dominant mineral in silt since other minerals have weathered away
- Wet silt does not exhibit stickiness, plasticity, malleability
- Smaller particles retain more water for plants and have slower drainage than sand
- Easily washed away by flowing water
  - highly erosive
- Holds more plant nutrients than sand
- Silt trivia
  - Yellow River in China gets its name from the erosion of loess, a high silt material

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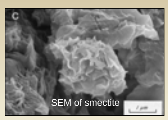
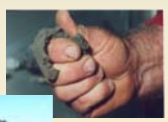
Clay



- < 0.002 mm
- Flat plates or tiny flakes
- Small clay particles are colloids
  - if suspended in water will not settle
- Large surface area
  - spoonful will cover a football field
- Wet clay is very sticky and plastic
- Easily formed into long ribbons
- Pores spaces are very small and convoluted
  - movement of water and air very slow
- Water holding capacity
  - tremendous capacity to adsorb water; not all available for plants
- Shrink swell
  - none to considerable depending on the type of clay
- Soil strength and shrink/swell affects buildings, roads, and foundations
- Chemical adsorption is large



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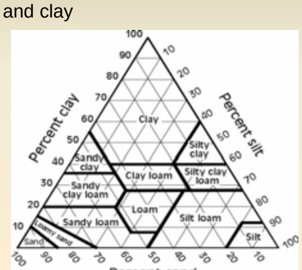
Soil Textural Classes -- USDA

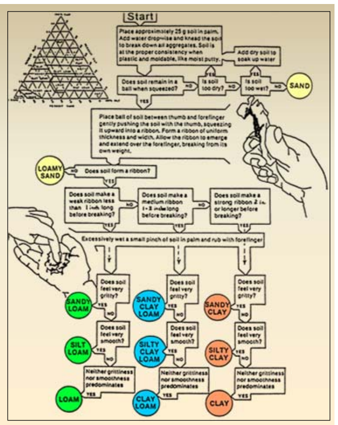
Combinations of sand, silt, and clay

1. sand
2. loamy sand
3. sandy loam
4. loam
5. silt loam
6. silt
7. sandy clay loam
8. clay loam
9. silty clay loam
10. sandy clay
11. clay
12. silty clay



Texture Flowchart

Texturing soil by the "Feel" method.



Soil Color

- Most easily determined soil property
- Important characteristic in separating soil horizons

Color charts

Munsell Notation

Universal standard for soil color.

7.5 YR 4/3

Number and letter symbols represents the **Hue.**
Hue represents the dominant color of the soil
Notation is at the top right of the color book
Y=Yellow, R=Red, G=Green, B=Blue, YR=Yellow Red

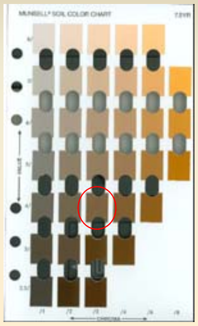
7.5 YR 4 / 3

The number before the slash is the **Value**.

- Lightness of a color. 0=pure black; 8=pure white.
- Notation at left side of color book.

The number after the slash is the **Chroma**.

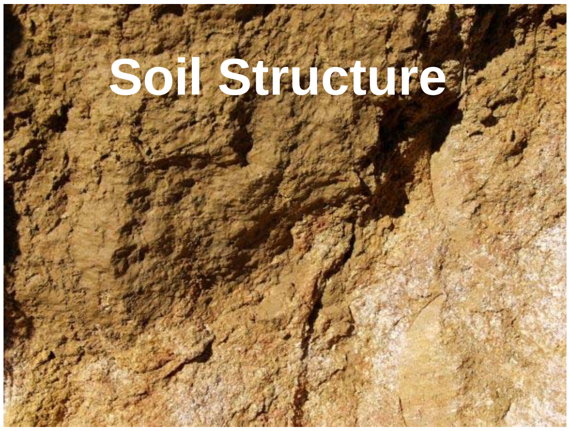
- Intensity of a color. 1=less intense; 8=most intense.
- Notation at bottom of color book.



Why is Color Important?

- Infer soil characteristics such as:
  - drainage class
  - organic matter content
  - provenance of soil (where it came from)
- Color is affected by:
  - organic matter content
    - the higher the organic matter content, the darker the soil
  - oxidation/reduction state of the soil
    - presence of Fe – orange, red, yellow, brown
    - absence of Fe – gray

Soil Structure



What is Soil Structure?

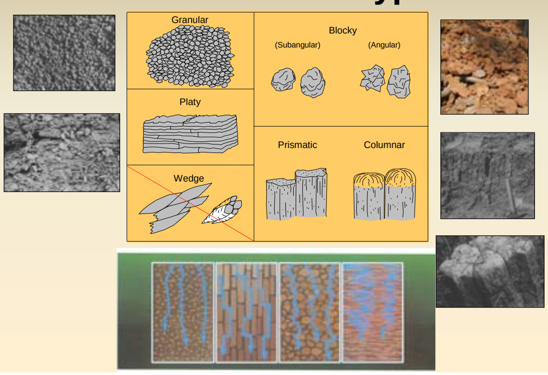
- arrangement of soil particles into aggregates
- Individual units are called a **PEDS (Latin, *earth*)**

Why is Structure Important?

- Influences
  - water movement
  - aeration
  - porosity

important indicator of soil health

Soil Structure Types



Soil Taxonomy

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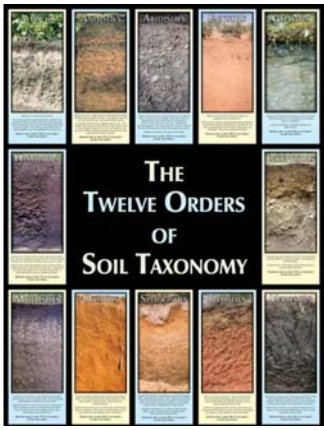


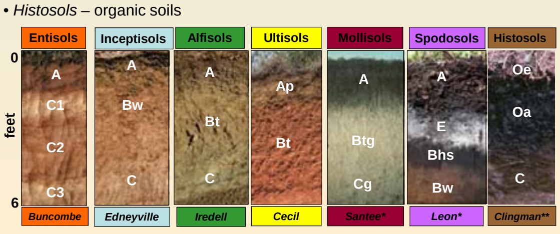
Soil Taxonomy is the basic system of soil classification for making and interpreting soil surveys.

Why Classify?

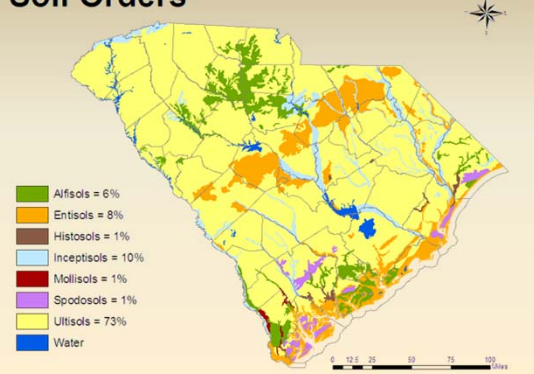
- Show relationships
- Remember properties
- Establish groups for various purposes and uses
- Develop new knowledge and relationships
- Communication for the discipline of soil science

Soil Orders in South Carolina

- *Entisols* – little development, usually A-C horizons
- *Inceptisols* – little more development, Bw horizons
- *Alfisols* – argillic/kandic horizon (Bt) less than 2 m, base saturation is > 35%
- *Ultisols* – argillic/kandic horizon (Bt) less than 2 m, base saturation is < 35%
- *Mollisols* – dark, high organic matter, high native fertility
- *Spodosols* – spodic horizon (Bhs), high in subsoil Fe/Al and/or humus
- *Histosols* – organic soils



Soil Orders



Soil Survey

Soil Mapping or Surveying

Soil mapping is a method to inventory the different types of soils in a survey area.

Made up of 3 Parts

- Soil Maps
- Soil Descriptions
- Suitability Ratings

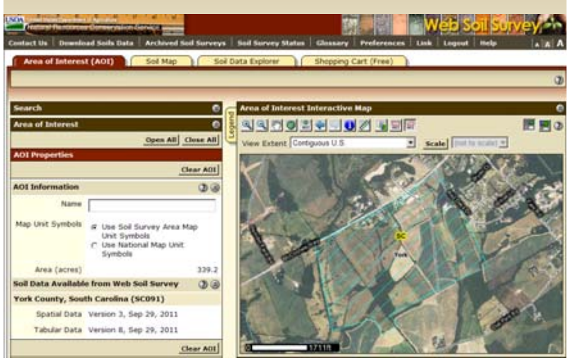
Web Soil Survey

http://websoilsurvey.nrcs.usda.gov

- Wed-based version of the soil survey
- All SC counties are available, as well as most counties in the nation

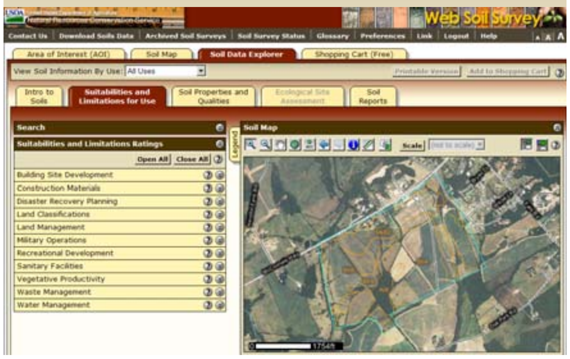
Web Soil Survey

Area of Interest

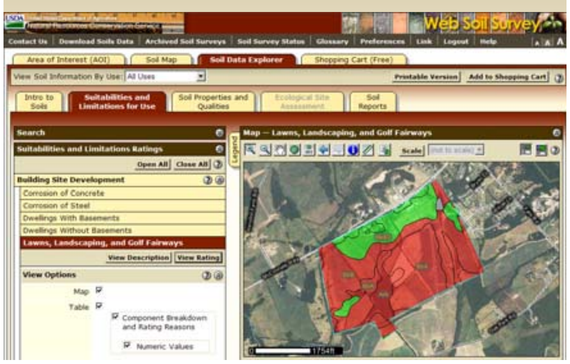


Soil Map/Soil Descriptions

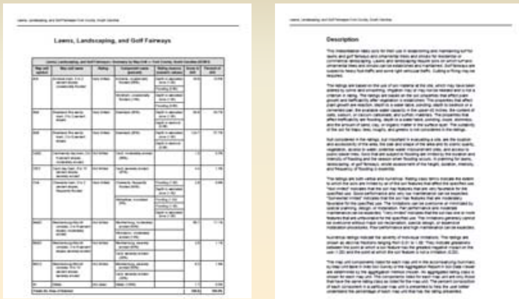
Suitability Ratings



Suitability Ratings



Suitability Ratings



Soil Health

Content help: Changing the way we look at the landscape by changing our paradigms: Time to have fun! Use this slide to stress that the soil is on the upland is bare but should instead be covered at all times. Ask the students." What is wrong with this picture"? This slide has been shown in many parts of the country. It is interesting to note: course participants in the past focused on the stream channel and the buffer strip….rarely did they focus on the bare ground located on the upland. The whole point of this picture is to elucidate the participants about bare ground and our paradigms about the landscape. Illustrate to the group that unless the ground is covered at all times you cannot expect single practices like buffers strips to prevent non-point pollution. The main focus: accentuate that the ground should be covered at all times. The next slides will show how the landscape looks from a birds eye view.

What is Soil Health?

- Once referred to as soil quality
- Defined as how well a soil does what we want it to do
  - Bountiful crops and forests
  - Productive grazing lands
  - Clean air and water
  - Diverse wildlife
  - Beautiful landscapes

Four Basic Soil Health Principles

- Use plant diversity to increase diversity in the soil
- Manage soils more by disturbing them less
- Keep plants growing throughout the year to feed the soil
- Keep the soil covered as much as possible

What's Critical about Soil Health Now?

- World population projected to increase to >9 billion by 2050
- Between 1982-2007, 14 million acres of prime farmland in the US were lost to development
- Improving soil health is the key to long-term, sustainable agricultural production

What Are the Benefits of a Healthy Soil?

- Healthy soil holds more water (and loses less water to runoff and evaporation)
- Organic matter builds as tillage declines and plants and residue cover the soil
- Organic matter holds 18-20 times its weight in water and recycles nutrients for plants to use

Holds more water by binding it to organic matter.

What Are the Benefits of a Healthy Soil?

- One percent of organic matter in the top six inches of soil would hold approximately 27,000 gallons of water per acre!
- Most farmers can increase their soil organic matter in 3 to 10 years if they are motivated about adopting conservation practices to achieve this goal.


Conclusion
South Carolina soils are variable but with the right planning, these soils can meet our needs without damaging or destroying them.


THE END