USDA SOIL TAXONOMY SYSTEM

LESSON PLAN NRES B2-11

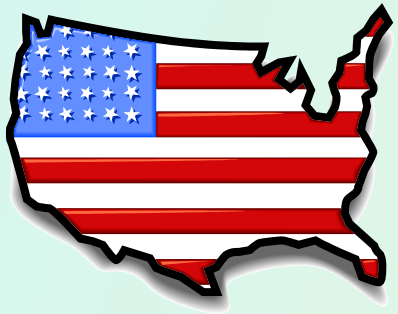
Anticipated Problems

1. What is the USDA soil taxonomy system?
2. What are the characteristics of the soil orders?

Terms

- Alfisols
- Andisols
- Aridisols
- Entisols
- Extragrades
- Family
- Gelisols
- Great groups
- Histosols
- Inceptisols
- Intergrades
- Mollisols
- Orders
- Oxisols
- Series
- Spodosols
- Subgroup
- Suborders
- Typic
- Ultisols
- Vertisols

Soil Taxonomy



- Soil taxonomy is a classification of soil types based on their properties.
  - Developed by the United States Department of Agriculture and the National Cooperative Soil Survey.

Soil Taxonomy

- The original purpose of soil taxonomy was to serve the purposes of soil surveys.
  - Over time, it has become a means of communication in soil science.

Soil Taxonomy

- Soil taxonomy has six different levels or hierarchies. Beginning with the broadest level, they are:
  - Order
  - Suborder
  - Great group
  - Subgroup
  - Family
  - Series

Soil Orders

- There are 12 recognized soil ***orders***.
  - The differences among the orders reflect the dominant soil-forming processes and the degree of soil formation.
  - Each order is identified by a word ending in -sol.

Soil Orders: Suborders

- Orders are divided into ***suborders*** primarily on the basis of properties that influence soil formation.
  - The ending of the name of a suborder indicates the order.

Soil Orders: Great Groups

- Each suborder is divided into ***great groups***. Determined by:
  - Close similarities in kind, arrangement, and extent of soil horizon development
  - Soil moisture and temperature regimes
  - Base status
  - Identified by the name of a suborder and by a prefix that indicates a property of the soil

Soil Orders: Subgroup

- A ***subgroup*** is a subdivision of a great group.
- The central concept of a great group makes up one group known as a ***typic***.
  - ***Intergrades*** are transitions to other orders, suborders, or great groups.
  - ***Extragrades*** have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil.

Soil Orders: Family

- A ***family*** is a division within a subgroup.
  - Determined primarily on the basis of physical and chemical properties.
  - Usually, the properties of the horizons below plow depth and where there is biological activity are considered.
  - A family name consists of the name of a subgroup preceded by terms that indicate soil properties

Soil Orders: Family

- Family – some properties and characteristics:
  - Particle-size class
  - Mineral content
  - Temperature regime
  - Depth of the root zone
  - Consistence
  - Moisture equivalent
  - Slope, and permanent cracks

Soil Orders: Series

- The ***series*** consists of soils that have horizons similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile.
  - Some differences in the texture of the surface layer or of the substratum within a series may occur.

Soil Orders

- Soils around the world are divided into 12 orders. Each order is a well defined.
  - Alfisols
  - Andisols
  - Aridisols
  - Entisols
  - Gelisols
  - Histosols
  - Inceptisols
  - Mollisols
  - Oxisols
  - Spodosols
  - Ultisols
  - Vertisols

Alfisols

- ***Alfisols*** are moderately leached deciduous forest soils that have relatively high fertility.
  - Well developed soils
  - Contain a subsurface horizon in which clays have accumulated
  - Found in temperate humid and subhumid regions
  - Found in central part of the US

Andisols

- ***Andisols*** are soils that have formed from volcanic activity.
  - Typically are dominated by glass and poorly crystalline colloidal materials
  - Tend to be young
  - Have high water-holding capacity
  - Very fertile, although in tropical regions phosphorus may be fixed and made unavailable for plant use

Aridisols

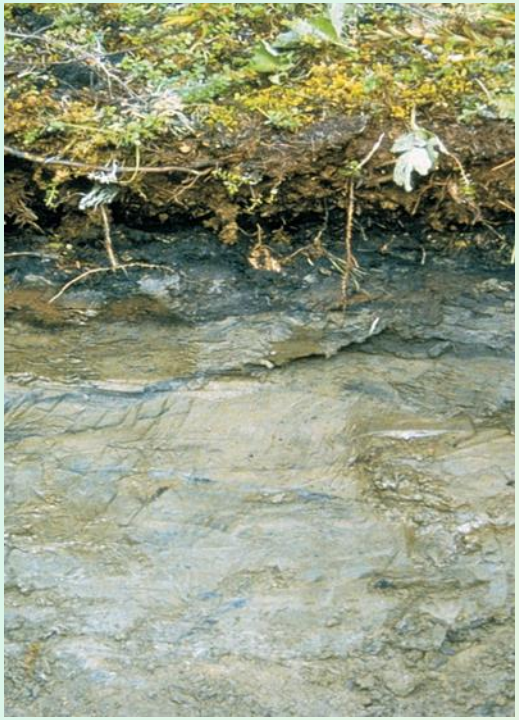
- ***Aridisols*** are soils that contain calcium carbonate.
  - Characteristic of arid regions
  - Exhibit at least some subsurface horizon development
  - Dry most of the year
  - Very low percentage of organic matter
  - Subsurface horizons in which clays, calcium carbonate, silica, salts, and/or gypsum have accumulated
  - Salts may accumulate on the soil surface and inhibit plant growth

Entisols

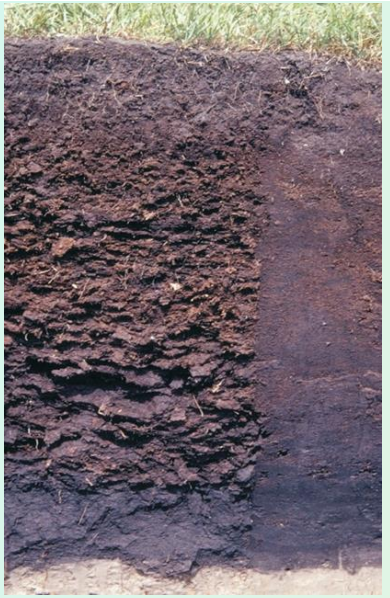
- ***Entisols*** are soils of recent origin.
  - Consists of unaltered parent material usually with no genetic horizons, except an A horizon.
  - All soils that do not fit into one of the other soil orders are classified as Entisols.
  - Great diversity, environmental setting and land use
  - Many Entisols are found in steep, rocky settings, such as the Rocky Mountains.

Gelisols

- ***Gelisols*** are soils of very cold climates that contain permafrost within 2 meters of the surface.
  - Found in high-latitude polar regions and localized areas at high mountain elevations



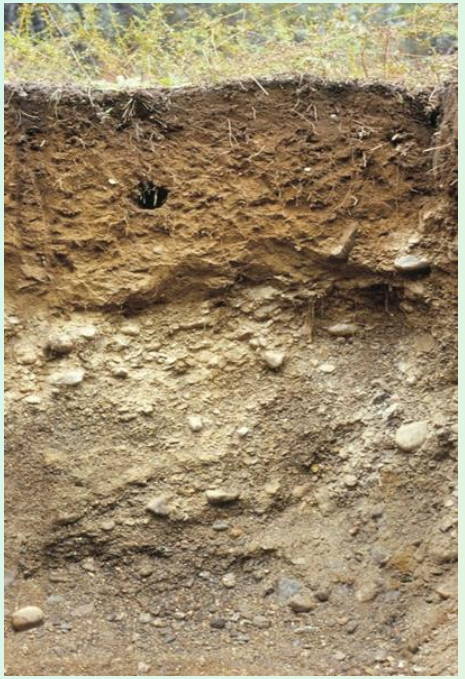
Histosols



- ***Histosols*** are soils composed mainly of organic materials.
  - Contain at least 20-30% organic matter
  - Bulk densities are quite low, often less than 0.3 g/cc.
  - Form in settings, such as wetlands
  - Ecologically important: contain large quantities of carbon
  - Often referred to as peats and mucks
  - Have physical properties that restrict their use for engineering purposes

Inceptisols

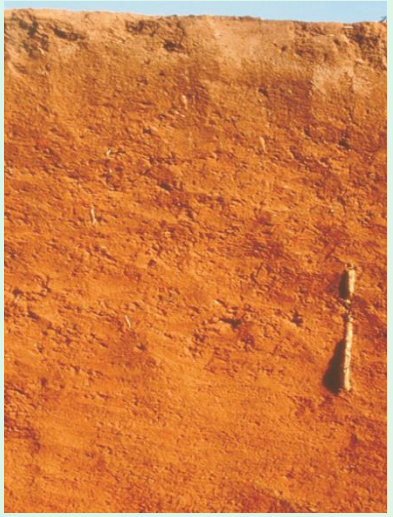
- ***Inceptisols*** are soils that exhibit minimal horizon development.
  - More developed than Entisols but still lack the features characteristic of other soil orders
  - Widely distributed and are found in a wide range of ecological settings
  - Often found on fairly steep slopes, young geomorphic surfaces, and on resistant parent materials



Mollisols

- ***Mollisols*** are the soils of grassland ecosystems.
  - Characterized by a thick, dark surface horizon
  - Known as a mollic epipedon, results from the long-term addition of organic materials derived from plant roots
  - Primarily occur in the middle latitudes and are extensive in prairie regions
  - Great Plains of the United States

Oxisols

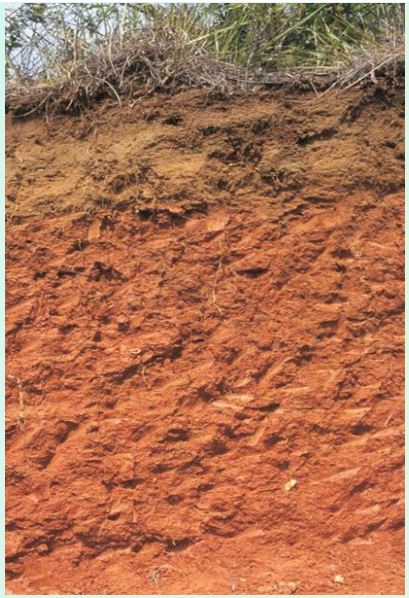


- ***Oxisols*** are very highly weathered soils found primarily in the tropical regions of the world.
  - Extremely low fertility; low cation exchange capacity
  - Always a red or yellowish color
  - High concentration of iron and aluminum oxide minerals - results in high phosphorus retention
  - few soluble minerals, low levels of organic matter
  - Most nutrients are contained in the standing vegetation and decomposing plant material on surface

Spodosols

- ***Spodosols*** are acid soils characterized by a subsurface accumulation of humus integrated with aluminum and iron.
  - Coarse-textured
  - Light-colored E horizon overlying a reddish-brown spodic horizon
  - Coniferous forest in cool, moist climates

Ultisols

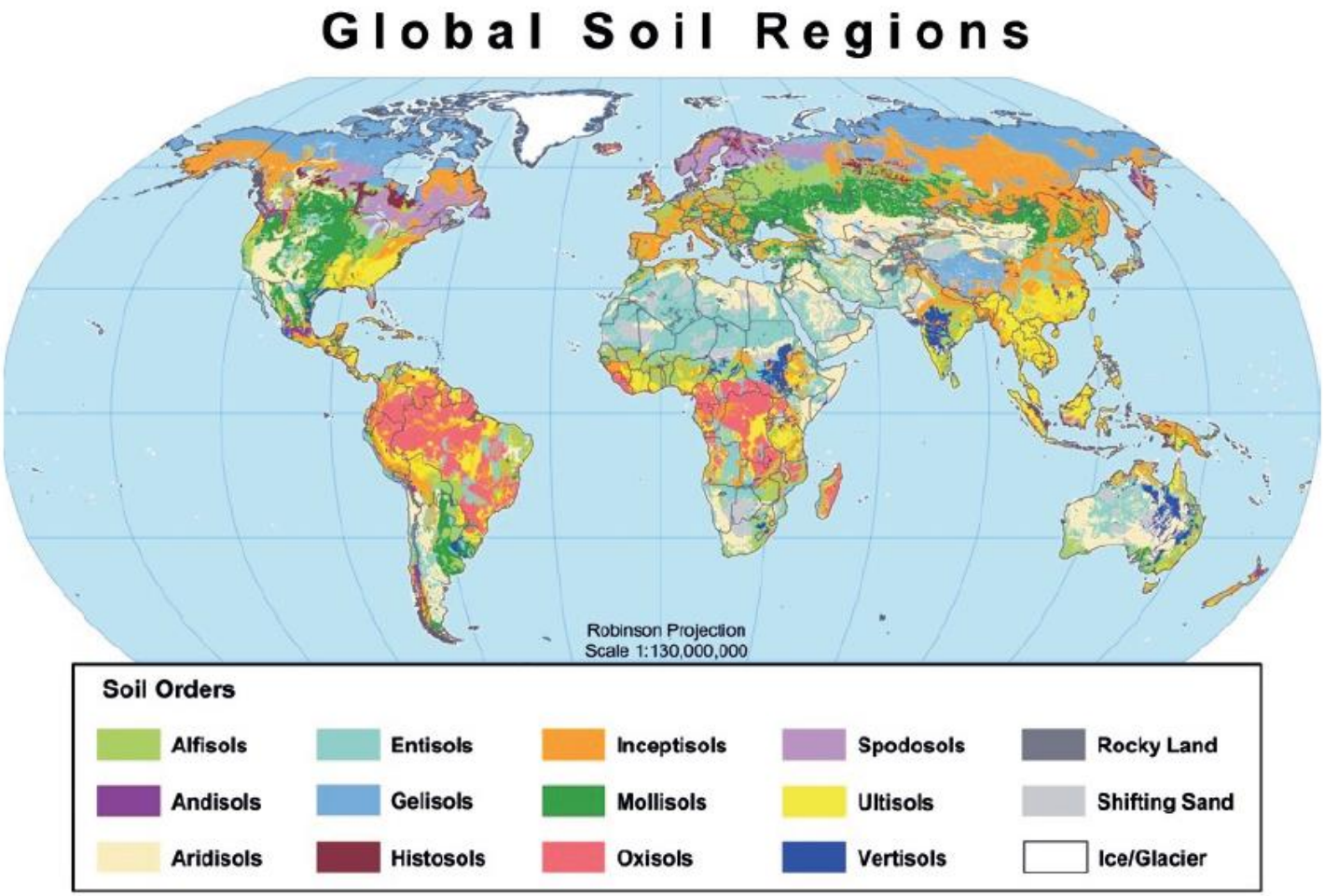


- ***Ultisols*** are strongly leached, acidic forest soils with relatively low fertility.
  - Humid temperate and tropical areas
  - Intense weathering of primary minerals has occurred, and much calcium, magnesium, and potassium has been leached from these soils.
  - Subsurface horizon in which clays have accumulated, often with strong yellowish or reddish colors resulting from the presence of iron oxides.
  - The "red clay" soils of the southeastern United States

Vertisols

- ***Vertisols*** are clay-rich soils that shrink and swell with changes in moisture content.
  - During dry periods, the soil volume shrinks, and deep wide cracks form.
  - The soil volume then expands as it wets up.
  - This shrink/swell action creates serious engineering problems
  - Generally prevents formation of distinct, well-developed horizons in these soils

GLOBAL SOIL REGIONS



USDA NRCS US Department of Agriculture
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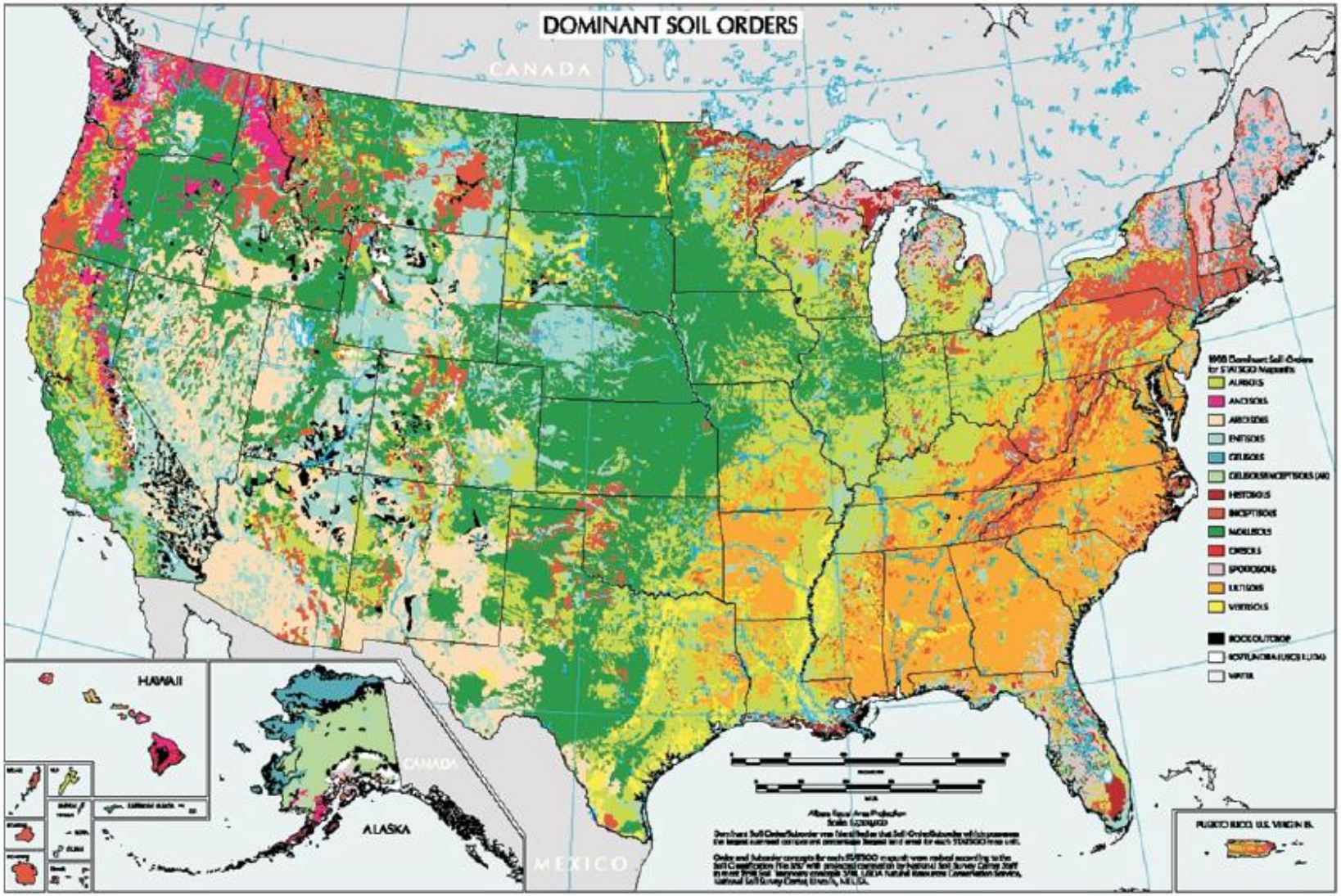
Soil Survey Division
World Soil Resources
soils.usda.gov/use/worldsoils

November 2005

(Courtesy, Natural Resources Conservation Service, USDA)

SOIL ORDERS



(Courtesy, Natural Resources Conservation Service, USDA)

Review

1. Who created the soil taxonomy system? What was its original purpose? How has that changed?
2. Name the twelve recognized soil orders.
3. How are the twelve order further divided?