

Soil Basics and Erosion

Erosion

- Erosion
 - Process by which weathered rock and soil particles are moved from one place to another
 - Carries away products of weathering
- Deposition
 - Process by which sediments are laid down in new locations
 - Final stage in the erosion process
- Erosion moves materials; deposition builds new landforms

Agents of Erosion

- Gravity
- Wind
- Running water
- Waves

These are all forces that move soil materials from place to place

Gravity

- Pulls rocks and soil down slopes
- Agent of mass movements
 - Landslides
 - Mudflows
 - Avalanches

Wind Erosion

- Occurs in places with little precipitation
- Suspension
 - Particles are in the air for a long period of time
- Saltation
 - Particles bounce around
- Deflation
 - Lowering of land surface due to removing surface particles
- Abrasion
 - Rocks shaped by abrasion are called ventifacts

Wind

- In Florida the types of soil particles most affected by wind are fine muck and clay
- Fine sand can also be blown into other plantings and cause damage through “sand blasting”

Wind Deposition

- Wind carries particles like sand through the air
- When something blocks their movement, the sand gets deposited
- Over time, the pile of sand becomes a dune
- There are different types of dunes
 - Dunes are classified by shape
- Human activity in coastal regions has disrupted dune formation/damaged sand dunes

Wind

- Wind barriers (windbreaks) are used to reduce effects of wind erosion
 - Trees, plants planted perpendicular to wind's direction
 - Reduces soil erosion, can trap blowing snow, protect crops, etc.

Flowing Water

- Water has more power than wind to move particles (exceptions are hurricane and tornado winds)
- When water moves faster, erosion is greater
- Erosion by running water in small channels on side of slope is **rill erosion**
- When channels become deep it evolves into **gully erosion**

Water Erosion

- Soil particle size will determine, to the greatest extent, which will be moved more easily by water.
- Muck soils are the most difficult to manage because they are susceptible to both wind and water erosion due to low density (light weight) particles.

Water Erosion

- Methods to deal with eroding muck, clay, and fine sand particles are limited depending upon the area exposed to the forces of erosion.
- Smaller areas can be treated with mats, blankets, hydromulch, and other products designed to reduce soil particle detachment through wind and water.

Mass Movements

- Downslope movement of loose sediments and weathered rock caused by gravity
- A form of erosion
- Only occur on slopes
- Also Known As Mass Wasting

Gully Erosion vs. Rill Erosion



Plants, Animals, Humans

- Materials get moved from place to place
- Digging tunnels underground (animals)
- Excavation for numerous projects
- Constructing roads, buildings, etc.

Soil Composition

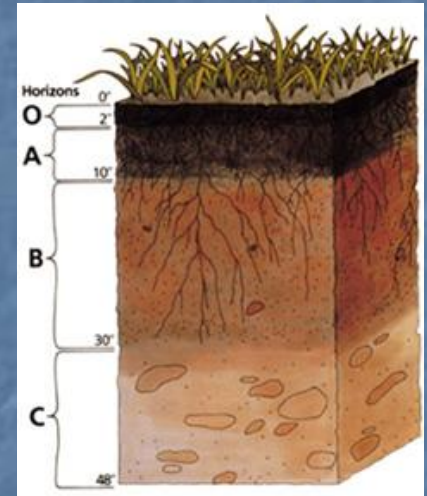
- Soil **forms in layers** during the process of its development.
- The **parent rock** is the solid bedrock from which weathered pieces of rock first break off.
- The smallest pieces of weathered rock, along with living and dead organisms, remain in the very top layer.
- Rainwater seeps through this top layer of materials, dissolves soluble minerals, and carries them into the lower layers of the soil.

Soil Composition

- **Residual soil** is soil located above its parent bedrock.
- **Transported soil** is soil that has been moved to a location away from its parent bedrock by agents of erosion, such as running water, wind, and glaciers.
- The parent bedrock determines what kinds of minerals a soil contains.
- The parent rock and climatic conditions of an area determine the length of time it takes for soil to form.

Soil Profiles

- What is a soil profile?
 - A vertical sequence of soil layers
 - A **soil horizon** is a distinct layer, or within a soil profile.
 - There are three major soil horizons: A, B, and C.
 - Horizon A contains high concentrations of organic matter and humus.
 - Horizon B contains subsoils that are enriched with clay minerals.
 - Horizon C, below horizon B and directly above solid bedrock, contains weathered parent material.
 - The O horizon is organic material, that may or may not be present.



Topography

- The topography of a region affects the thickness of developing soil.
- Soils on slopes tend to be thin, coarse, and infertile.
- Soils formed in lower areas, such as in valleys, are thick and fertile.

Soil Types

- Temperate Soils
 - Lots of variation
 - Support forests, grasslands, prairies
 - Amount of rainfall determines what grows in this type of soil
 - Grasslands-lots of humus-soil is rich and fertile
 - Forests-soil is less deep/less fertile, containing clays and iron oxides (Eastern US)
 - Prairies-dry soil-lots of grasses and bushes

Soil Types

- Tropical Soils

- High temperatures, heavy rainfall
- Soil is intensely weathered, infertile
- Source of ores (iron), but not great for growing plants

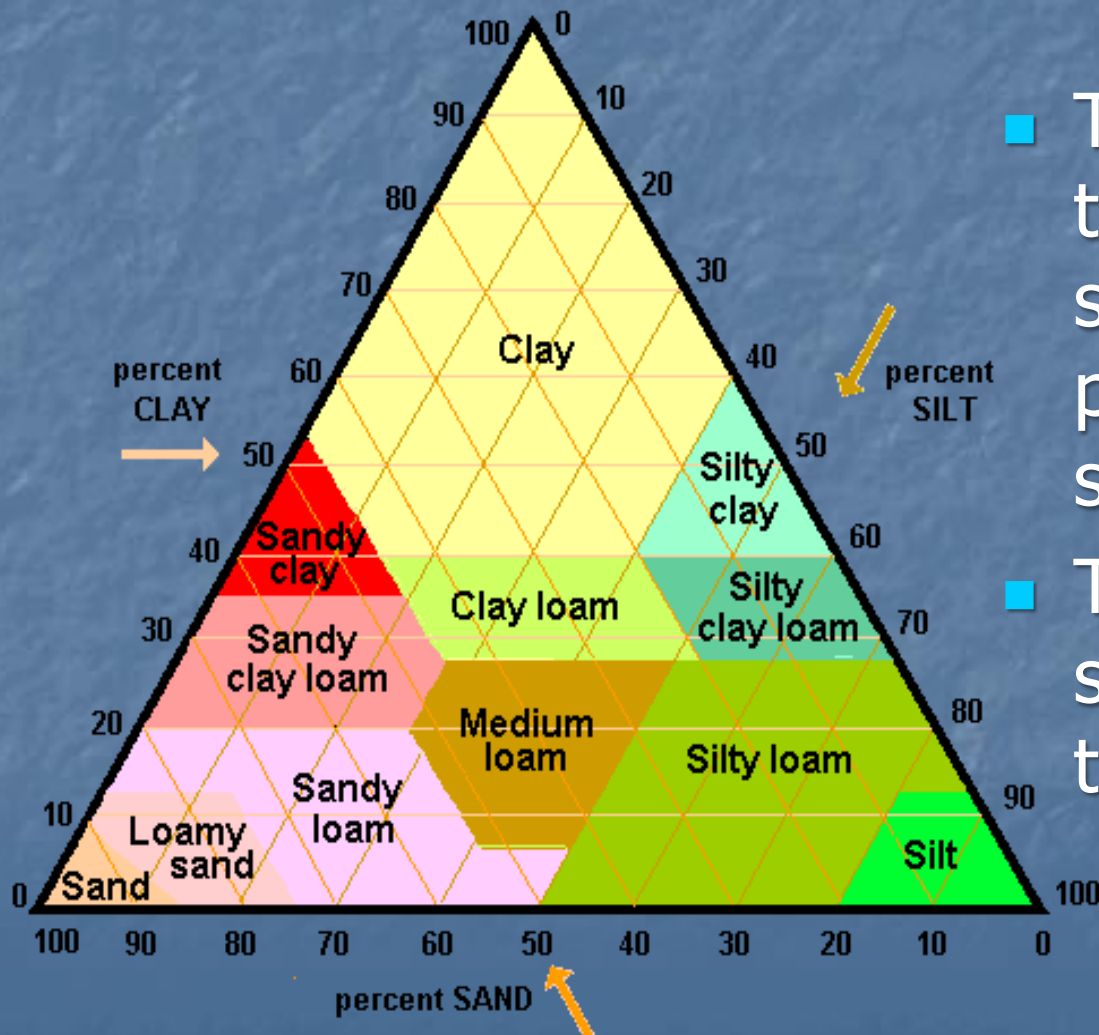
Soil Textures

- Particles of soil are classified according to size as being clay, silt, or sand, with clay being the smallest and sand being the largest.
- The relative proportions of these particle sizes determine a soil's texture.
- The texture of a soil affects its capacity to retain moisture and therefore its ability to support plant growth.

Table 7-2 Soil Textures

Soil Particles	Size
Very coarse sand	2–1 mm
Coarse sand	1–0.5 mm
Medium sand	0.5–0.25 mm
Fine sand	0.25–0.10 mm
Very fine sand	0.10–0.05 mm
Silt	0.05–0.002 mm
Clay	< 0.002 mm

Soil Textures



- To determine the texture of a soil sample, find its percent for sand, silt, and clay.
- The texture of the soil will be where all three lines intersect.

Soil Color

- Factors that determine soil color include:
 - Climate
 - Soil's composition
 - Topsoil-usually dark (rich in humus)
 - Red/yellow soils-caused by iron minerals oxidizing
 - Yellow soils are often poorly drained, associated with environmental problems
 - Gray/bluish soils-poorly drained, constantly wet, lacking in oxygen