

# *Unit E: Basic Principles of Soil Science*

## **Lesson 4: Understanding Soil Texture and Structure**

# *Important Terms*

- Clods
- Loam
- Peds
- Permeability
- Soil structure
- Soil texture
- Soil workability
- Textural triangle
- Water-holding capacity



# *What is soil texture and why is it important?*



- Soil texture is the fineness or coarseness of a soil.
- It describes the proportion of three sizes of soil particles. These are:
  - Sand - large particle
  - Silt - medium sized particle
  - Clay - small particle

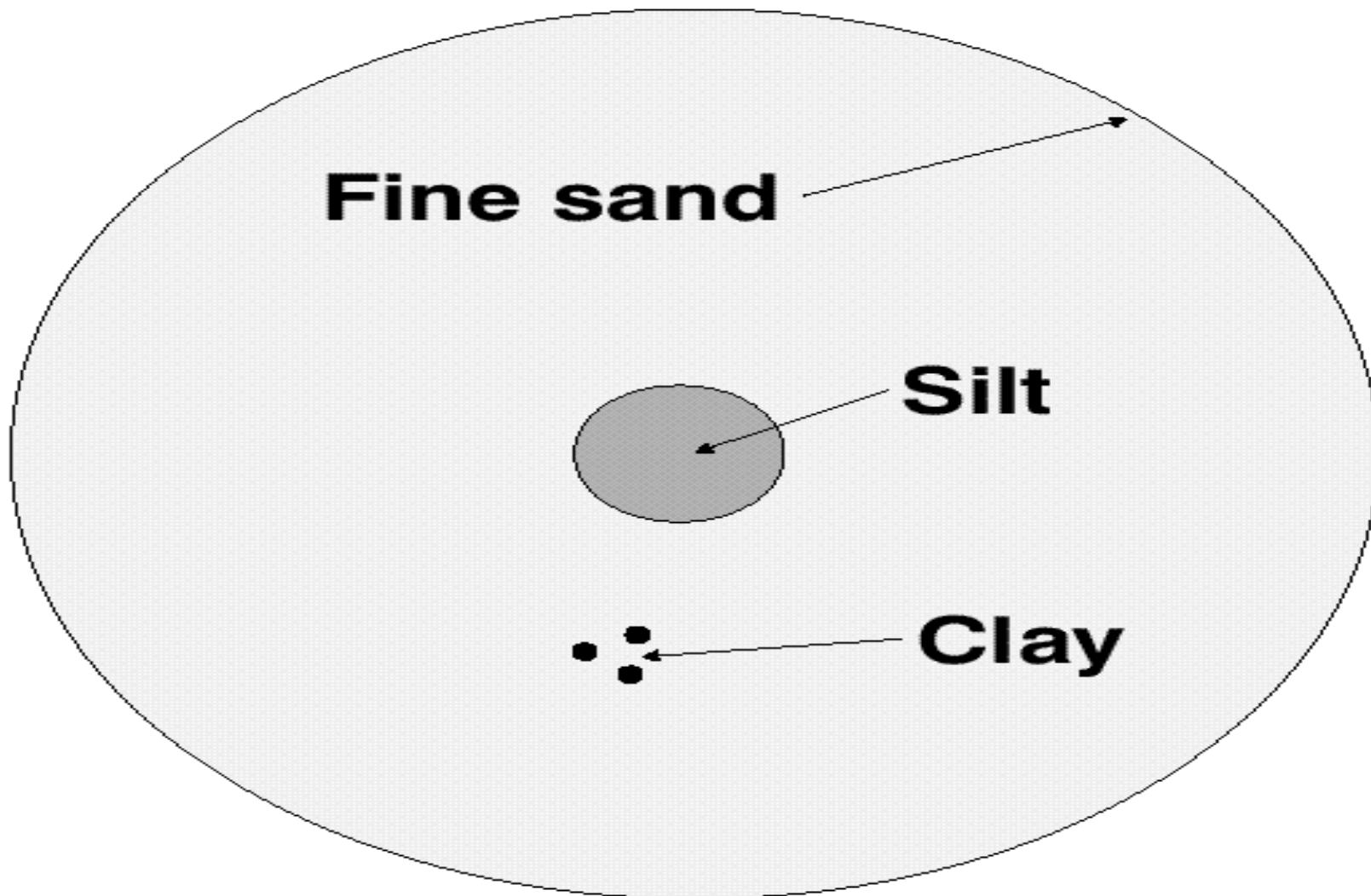
# *Texture is important because it affects:*

- Water-holding capacity the ability of a soil to retain water for use by plants
- Permeability the ease with which air and water may pass through the soil.

# *Texture is important because it affects:*

- Soil workability the ease with which soil may be tilled and the timing of working the soil after a rain
- Ability of plants to grow some root crops like carrots and onions will have difficulty growing in a fine-textured soil

# **The Relative Sizes of Sand, Silt, and Clay Particles**



# *How is the texture of soil determined?*



- Soil texture may be determined in one of two ways:
  - The percentages of sand, silt, and clay may be tested in the lab.
    - Once tested, you may determine the textural class of the soil by referring to the textural triangle.
  - The ribbon method.

# *Textural Triangle – 12 basic textural classes*

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- Silt
  - Silt loam
  - Silty clay loam
  - Loam
  - Sandy clay loam
  - Loamy sand
  - Sand
  - Sandy loam
  - Sandy clay
  - Clay loam
  - Silty clay
  - Clay

# *The Ribbon Method.*

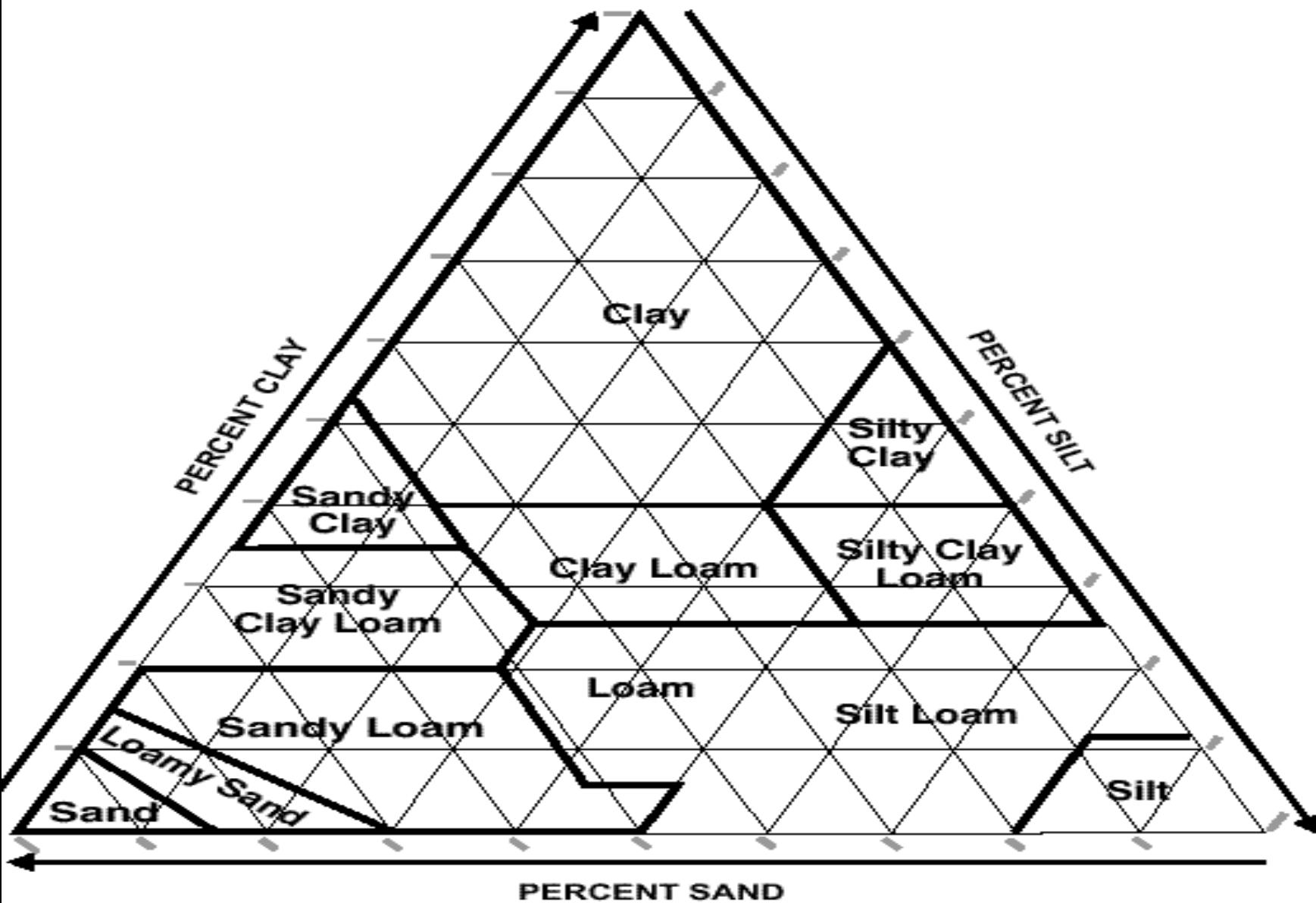


- Fine-textured a ribbon forms easily and remains long and flexible.
- Moderately fine-textured a ribbon forms but breaks into pieces  $\frac{3}{4}$  to 1 inch long.
- Medium-textured no ribbon forms.
  - The sample breaks into pieces less than  $\frac{3}{4}$  inch long. The soil feels smooth and talc-like.

# *The Ribbon Method.*

- Moderately coarse-textured no ribbon forms.
  - The sample feels gritty and lacks smoothness.
- Coarse-textured no ribbon forms.
  - The sample is composed almost entirely of gritty material and leaves little or no stain.

# Soil Triangle



# *What is soil structure, how does it form, and why is it important?*

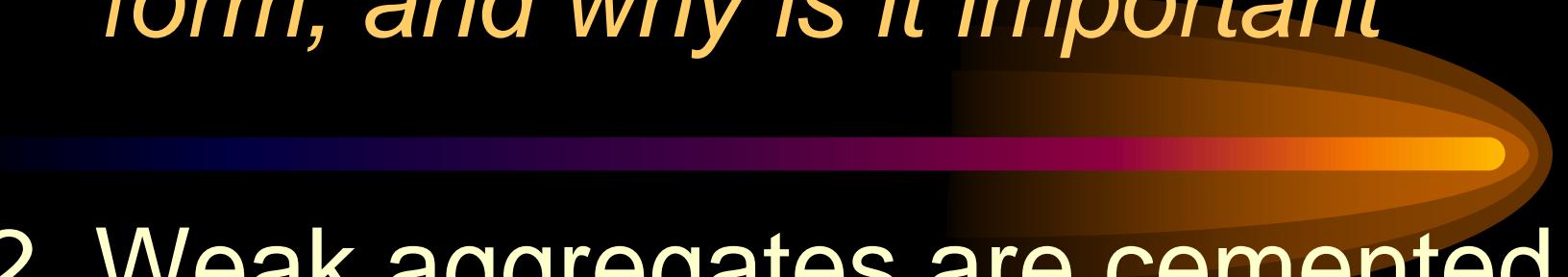


- Soil structure is the arrangement of the soil particles into clusters or aggregates of various sizes and shapes.
- Aggregates that occur naturally in the soil are referred to as peds, while clumps of soil caused by tillage are called clods.

# *What is soil structure, how does it form, and why is it important*

- Structure is formed in two steps.
- 1. A clump of soil particles sticks loosely together. These are created through:
  - Plant roots surrounding the soil and separating clumps
  - Freezing and thawing of soil
  - Soil becomes wet and then dries
  - The soil is tilled
  - Fungal activity

# *What is soil structure, how does it form, and why is it important*



- 2. Weak aggregates are cemented to make them distinct and strong.
- Clay, iron oxides, and organic matter may act as cements.
  - When soil microorganisms break down plant residues, they produce gums that also glue peds together.

# *What is soil structure, how does it form, and why is it important*



- Soil structure is important for several reasons:
  - It improves soil tilth.
  - It improves permeability.
  - It resists the beating action of raindrops, minimizing the formation of crusts that reduce crop stands.

# *What are the various soil structures and what do they look like?*



- There are eight primary types of structure. They are:
  - Granular
  - Crumb
  - Platy
  - Prismatic or Columnar
  - Blocky
  - Structureless
    - 1. Single grain
    - 2. Massive

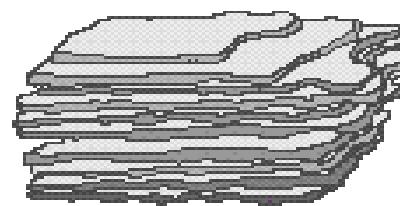
# Common Types of Soil Structure



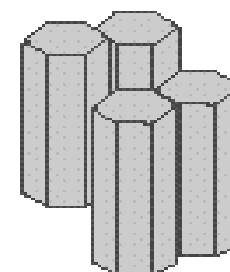
**GRANULAR**



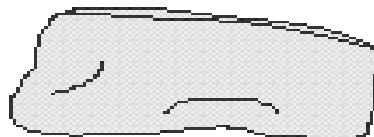
**CRUMB**



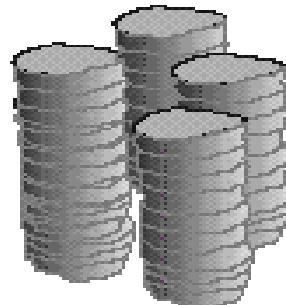
**PLATY**



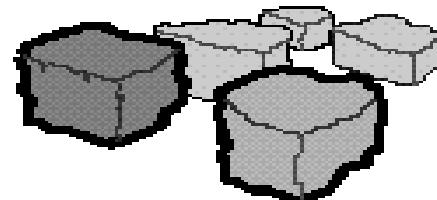
**PRISMATIC**



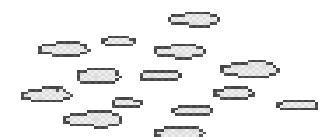
**MASSIVE**



**COLUMNAR**



**BLOCKY**



**SINGLE GRAIN**

# *Review / Summary*



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- Describe the concept of soil texture and its importance.
- Determine the texture of a soil sample.
- Describe soil structure, its formation, and importance.
- Identify various soil structures.