

# 11. Soil Physical Observations and Estimations

Materials needed in observing the soil physical properties:

- **tape measure**
- **sharpshooter spade or shovel**
- **18-inch metal rod**
- **tap water**

## ① Dig hole

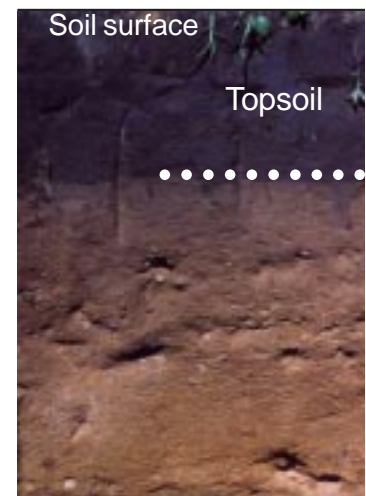
Dig a hole to a depth of 1 foot. Make it wide enough to cut out a slice of soil.

## ② Cut Slice of Soil

Using the shovel, cut a slice of soil from a wall of the hole and lay it on the ground.

## ③ Measure Depth of Topsoil

- Measure the depth of the topsoil. Look for color changes from the soil surface downward through the soil profile. The topsoil is usually distinguished by a darker color than the underlying material (See **Figure 11.1**).
- Record the depth of topsoil on the Soil Data worksheet.



**Figure 11.1**

## ④ Observe Plant Roots

- Observe plant roots in the hole and the slice of soil. To get a better look at the roots, dig down along a plant stem. The roots should be well branched with lots of fine root hairs.
- Things to look for are balled up roots or roots growing sideways. A lack of fine root hairs indicates oxygen deprivation in the root zone. Lateral root growth indicates a hardpan, or compacted layer.

## ⑤ Determine Resistance

- Use the metal rod to probe one of the side walls, starting from the soil surface to the bottom of the hole. Determine changes or differences in penetration resistance as you probe the side wall (See **Figure 11.2**).
- Look for compacted layers that may restrict root growth and water movement.



**Figure 11.2**

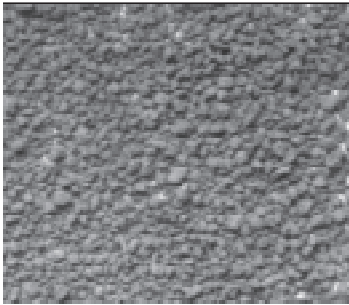
## 6 Examine Soil Structure

Observe soil structure in the slice of soil to a depth of about 12 inches. Measure and mark, starting at the surface and moving downward; depth increments of 0 to 4 inches, 4 to 8 inches, and 8 to 12 inches. Note and record the type, size, and grade of the soil structural units or aggregates for each depth increment.

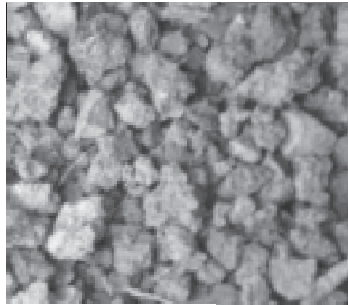
**Note: Soil structure is how particles of soil are grouped together in stable collections or aggregates.**

### 6a Note the type of soil structure at each of the three depth increments.

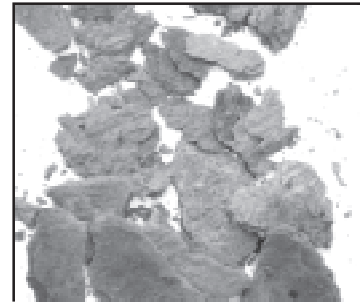
- The three general types of soil structure are granular (Figure 11.3), blocky (Figure 11.4), and platy (Figure 11.5).



**Figure 11.3** Granular: imperfect spheres, usually sand-size.

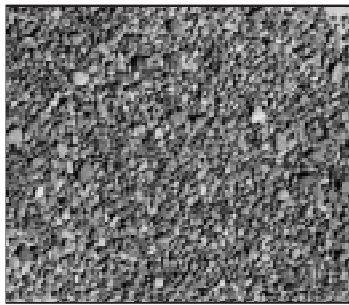


**Figure 11.4** Blocky: imperfect cubes with angular or rounded edges.



**Figure 11.5** Platy: a flattened or compressed appearance.

- If there are no noticeable aggregates or peds, the soil has no structure. It is either single grained (Figure 11.6) or massive (Figure 11.7).



**Figure 11.6** Single grain: unconsolidated mass such as loose sand.

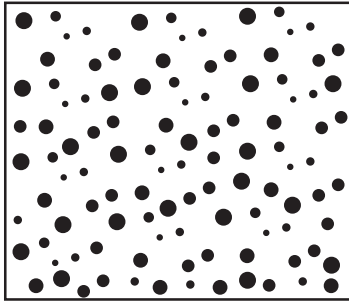


**Figure 11.7** Massive: cohesive mass.

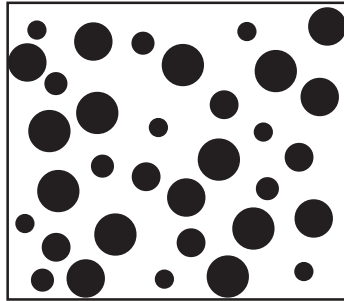
- Record on the Soil Data worksheet the type of structure observed for each depth increment.

6b Note the size of the aggregates or peds at the different depths.

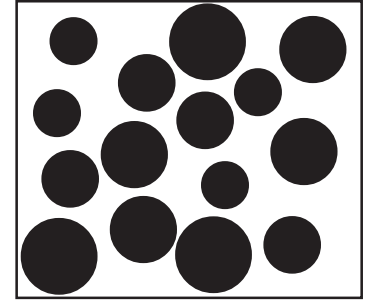
- Estimate the general size of the aggregates or peds. If the structure is granular, choose from fine (Figure 11.8), medium (Figure 11.9) and coarse (Figure 11.10) granule sizes.



**Figure 11.8**  
Fine: < 2 mm.

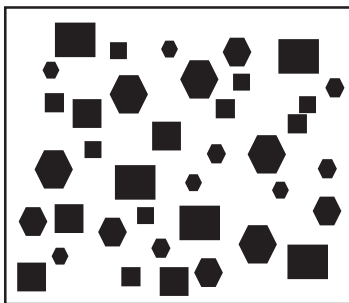


**Figure 11.9**  
Medium: 2 to 5 mm.

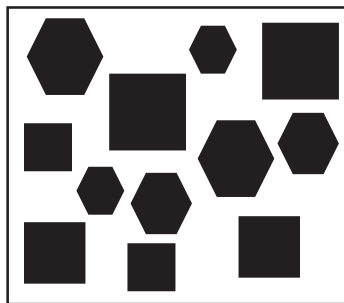


**Figure 11.10**  
Coarse: 5 to 10 mm.

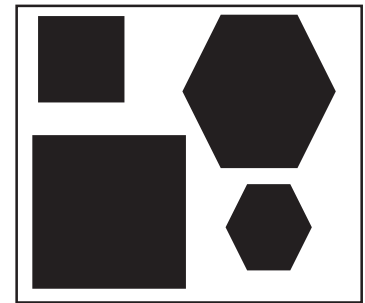
- If the structure is blocky, choose from very fine (Figure 11.11), fine (Figure 11.12), and medium (Figure 11.13) block sizes.



**Figure 11.11**  
Very fine: < 5 mm.



**Figure 11.12**  
Fine: 5 to 10 mm.



**Figure 11.13**  
Medium: 10 to 20 mm.

- If structure is platy, choose from thin (Figure 11.14), medium (Figure 11.15), and thick (Figure 11.16) plate sizes.



**Figure 11.14**  
Thin: < 2 mm.



**Figure 11.15**  
Medium: 2 to 5 mm.



**Figure 11.16**  
Thick: 5 to 10 mm.

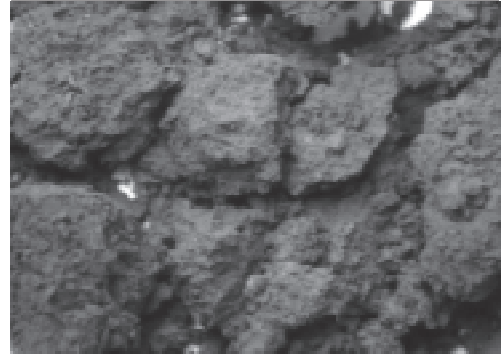
- Record on the Soil Data worksheet the size of the aggregates or peds observed for each depth increment.

- 6c Note the distinctness (grade) of the aggregates in place and when removed from the slice of soil.

The distinctness of the aggregates is either weak, moderate, or strong.

**Weak structure:**

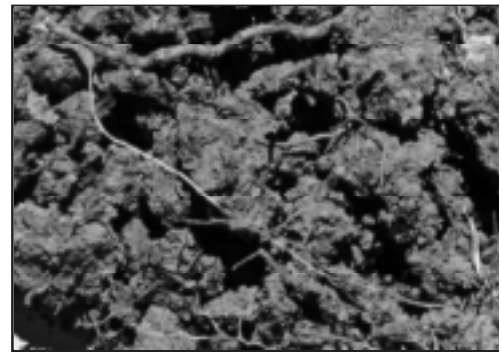
- Aggregates or peds are barely observable in place in moist soil.
- When removed, the structure breaks into a few observable aggregates or peds (**Figure 11.17**).



**Figure 11.17**

**Moderate structure:**

- Aggregates or peds are moderately well-formed and distinct in place.
- When removed, many well-formed aggregates are observable (**Figure 11.18**).



**Figure 11.18**

**Strong structure:**

- Aggregates or peds are well-formed and very evident in place.
- When disturbed, the structure breaks into quite evident aggregates or peds (**Figure 11.19**).

Record on the Soil Data worksheet the grade of the aggregates or peds observed for each depth increment.



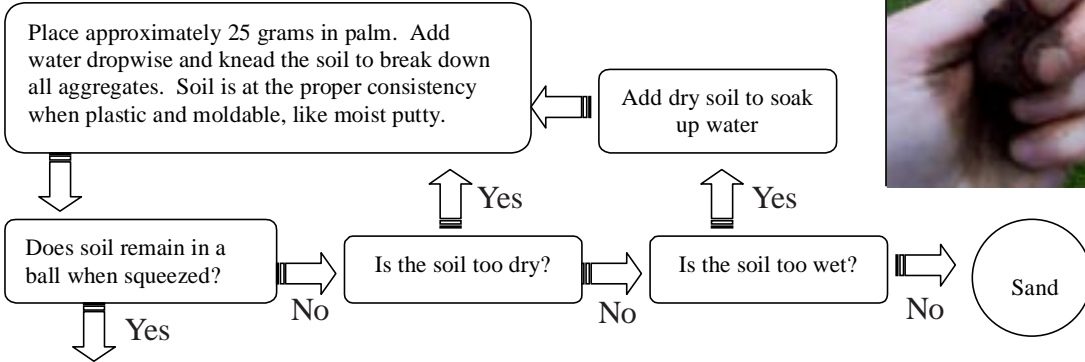
**Figure 11.19**

- 7 **Determine soil textural class**

- Perform the Texture by Feel procedure (**See page 27**) on the top three inches of soil.
- Record on the Soil Data worksheet the soil textural class.

# TEXTURE BY FEEL PROCEDURE

Making a Ribbon



Place ball of soil between thumb and forefinger, gently push the soil with the thumb, squeezing it upward into a ribbon. Form a ribbon of uniform thickness and width. Allow the ribbon to emerge and extend over the forefinger. breaking from its own weight.

