

# Student Soil Quality Card Teacher Guide

## 1. Is the soil free of compacted layers?

Soil moisture content greatly affects penetration into the soil. Do this assessment when there is adequate moisture in the soil for crop growth.

*Materials needed*

- Wire flag

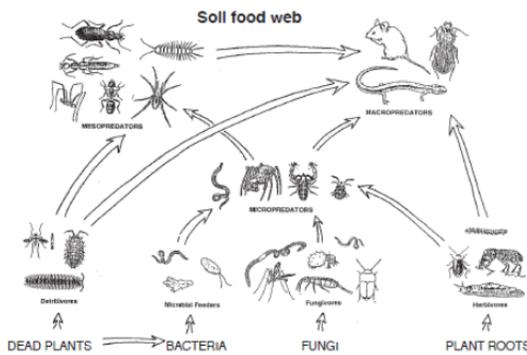
*What to do*

Hold the wire flag near the flag end and push it vertically into the soil at several different locations in the field. In observation column, record depth when flag bends.

Rating the indicator		
Least desirable=0	Moderate=5	Preferred=10
The flag bends readily. Plant roots that turn horizontally indicate a hardpan.	Some restrictions to a penetrating wire flag, some root growth restrictions.	The wire flag can penetrate all the way into the topsoil beyond the tillage layer and into the sub-soil without bending.

## 2. Is the soil full of living organisms?

Soil organisms are not active in hot, dry conditions. Assess this indicator in the late spring and as soon as possible after fall rains when soil is moist and relatively warm. Time of day and weather should be consistent among assessments since these factors also affect the activities of soil organisms.



*Materials needed*

- Shovel
- Hand lens
- Watch

*What to do*

1. Dig out a shovelful of soil down to at least 6 inches. Place soil sample on tray and spread it into pieces.
2. Put a spoonful of soil into a lid and flood with water.
3. Examine the soil in both samples for an exact amount of time (2 to 4 minutes). Keep track of the numbers of individuals of each kind of soil organism you see.

*Notes*

It is important to search for the organisms for the same amount of time and with the same degree of interest each time so that comparisons are valid. Many soil organisms avoid the light and are very small. Carefully and patiently pick apart the soil sample to see them. Soil organisms smaller than 1/4 inch require special equipment to be seen. The larger soil animals such as beetles, centipedes, and spiders also are difficult to see because they move quickly.

Rating the Indicator		
Least Desirable = 0	Moderate = 5	Preferred = 10
Almost no moving organisms are seen in the soil after 4 minutes of searching.	1 or 2 individuals of at least 2 kinds of organisms are found after 4 minutes of searching.	Several individuals of at least 4 different kinds of organisms are seen after 4 minutes of searching.

### 3. Do plant roots grow well?

Assess root growth at the same time that plant vigor is assessed—during the growing season of the plant. Moisture conditions in the soil should be similar for each assessment because the wetness of the soil may change the ease with which finer roots can be observed.

#### Materials needed

- Shovel
- Mat
- Hand trowel

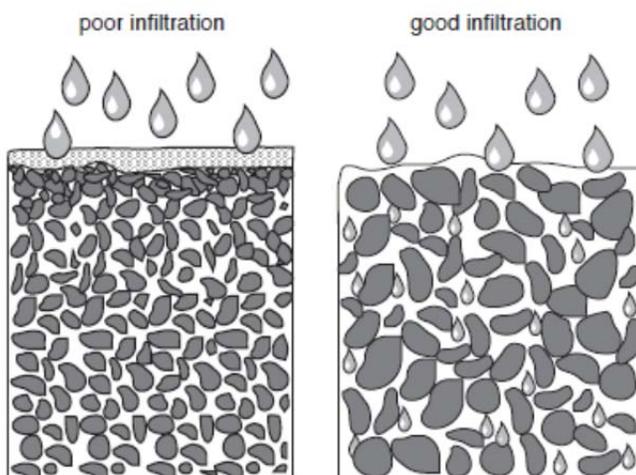
#### What to do

1. Dig around a crop plant as extensively as possible to get an idea of how deep the roots extend into the soil.
2. Examine the root system by separating the soil from the roots. Look for:
  - Extent of root system development
  - Number of fine roots
  - Color of new roots

Note: Weeds or annual crop plants can be removed completely from the soil for assessment. Examine perennial crop root systems in place by digging soil away from beside the plant and removing soil from around the roots with the trowel.

Rating the indicator		
Least desirable=0	Moderate=5	Preferred=10
A poorly developed root system has only a few fine roots; brown, diseased, or mushy-looking roots extend only a very short distance into the soil away from the crown of the plant.	The plant has some fine roots with a mostly healthy appearance, and only some evidence of restricted growth.	The root system is fully developed with many fine roots; grows into the soil well below the top-soil layer; and (for annuals only) has a white, healthy appearance on the new roots.

### 4. Does water infiltrate quickly?



Assess water infiltration after a heavy rainfall when you know the soil is completely saturated. Observe and record the duration of any ponding on the soil surface. • If you use the open cylinder method (see below) to determine water infiltration, you can perform the test at any time of year. This assessment method is more quantitative and may be performed at more than one location in the same field.

#### Materials needed

- Notebook
- Sturdy infiltration ring
- Container with several gallons of water

#### What to do

1. Push the cylinder into the soil so that about 3 inches extend above the top of the soil to allow water to be “ponded” there.
2. Place a cloth or burlap bag on the soil surface to absorb the energy of the water as it is poured.

3. Gently fill the top of the cylinder with water and keep it full by adding water as it percolates down. Note that pouring water too vigorously on the soil surface may disrupt infiltration. Continue adding water and refilling the cylinder for about one-half hour or until you are sure the soil within the cylinder is completely saturated.
4. Observe the amount of time a known amount of water (e.g., 1 gal) remains on the surface within the cylinder after the soil within the cylinder is saturated.
5. It is important to note whether the cylinder has been placed in a tractor wheel track, because these areas usually allow slower infiltration than nontrack areas.

Rating the Indicator		
Least Desirable = 0	Moderate = 5	Preferred
Infiltrometer takes >8 minutes to drain	Infiltrometer takes 2-8 minutes to drain	Infiltrometer takes 0-2 minutes to drain

## 5. Is water available for plant growth?

Soil structure and organic matter are soil-quality factors that determine the ability of soil to retain water between rains or irrigations. Good water availability in a soil is another sign that soil structure and organic matter are in a desirable state.

### Materials needed

- Soil sample
- Hands

### What to do

Use the Soil Moisture by Feel Method brochure. (Texture must be determined first.) Test results are most reliable 2-3 days after a rain event.

Rating the Indicator		
Least Desirable = 0	Moderate = 5	Preferred = 10
0-25% soil moisture	25-50% soil moisture	50-100% soil moisture

Rating the indicator		
Least desirable=0	Moderate=5	Preferred=10
The soil does not hold water for plant growth; frequent extra irrigation is necessary.	The soil has water available for some time after irrigation or rain.	The soil provides enough water to crops for an adequate period of time between rains or irrigations.



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