



# MEASURING SOIL HEALTH: INFILTRATION

Infiltration is the downward entry of water into the soil. The velocity at which water enters the soil is infiltration rate, which is typically expressed in inches per hour. Water from rainfall or irrigation must first enter the soil for it to be of value to crops.

The inherent factors affecting infiltration rate are soil texture (percentage of sand, silt, and clay) and clay mineralogy. Water moves more quickly through large pore spaces in sandy soil, and slower through the small pores of a clayey soil. This is especially if the clay is compacted and has little or no structure or aggregation.

Infiltration rates are affected by a number of factors including:

- climate
- landscape position
- management practices
- crop demand

Existing soil water content also affects the ability of the soil to pull additional water into it. As the soil becomes wet, the infiltration rate slows to the rate at which water moves through the most restrictive layer, such as a compacted layer or a layer of dense clay.

Crop and land management practices that affect surface crusting, compaction and soil organic matter impact infiltration. Since tillage negatively affects all of these properties, it plays an important role in a soil's infiltration rate.

Soil organic matter affects infiltration through its positive affect on the development of stable soil aggregates. Highly aggregated soil has increased pore space and infiltration. Soils high in organic matter also provide good habitat for soil biota, such as earthworms, that through their burrowing activities, increase pore space and create continuous pores linking surface to subsurface soil layers.

## **IMPROVING INFILTRATION**

Conservation practices that build organic matter, reduce soil disturbance and compaction help maintain or improve water infiltration.

These practices include no-till and cover crops, which protect the soil surface from erosion and increase soil organic matter. No-till also reduces soil disturbance and trips across a field. This helps preserve pore spaces and minimizes soil compaction.

Application of animal manure also helps to increase soil organic matter. Increased organic matter results in increased aggregation and improved soil structure leading to improved infiltration rates.



# HOW TO MEASURE INFILTRATION

If the soil is saturated, infiltration will not occur. Wait for one or two days to allow for some drying.

## Materials needed to measure infiltration:

- 6-inch diameter ring
- plastic wrap
- 500 ml plastic bottle or graduated cylinder
- distilled water
- stopwatch or timer

### STEP 1

**Drive ring into the soil:** Clear the sampling area of surface residue, etc. If the site is covered with vegetation, trim it as close to the soil surface as possible. Using a hand sledge and block of wood, drive the 6-inch diameter ring, beveled edge down, to a depth of three inches.

### STEP 2

**Firm soil.** With the 6-inch diameter ring in place, use your finger to gently firm the soil surface only around the inside edges of the ring to prevent extra seepage. Minimize disturbance to the rest of the soil surface inside the ring.

### STEP 3

**Line ring with plastic wrap.** Line the soil surface inside the ring with a sheet of plastic wrap to completely cover the soil and ring as shown. This procedure prevents disturbance to the soil surface when adding water.

### STEP 4

**Add water:** Fill a plastic bottle or graduated cylinder with 444 mL with distilled water. Pour the water (1 inch) into the ring lined with plastic wrap.

### STEP 5

**Remove wrap and record time:** Remove the plastic wrap by gently pulling it out, leaving the water in the ring. Note the time.

Record the amount of time (in minutes) it takes for the 1inch of water to infiltrate the soil. Stop timing when the surface is just glistening.

If the soil surface is uneven inside the ring count the time until half of the surface is exposed and just glistening. Record the time.

### STEP 6

**Repeat infiltration test:** In the same ring, perform Steps 2, 3 and 4 with a second inch of water. Record the number of minutes elapsed for the second infiltration measurement. If soil moisture is at or near field capacity, the second test is not necessary.

The moisture content of the soil will affect the rate of infiltration; therefore, two infiltration tests are usually performed (if the soil is dry). The first inch of water wets the soil, and the second inch gives a better estimate of the infiltration of the soil.

## RECORD INFILTRATION TIMES

Date	1st Infiltration rate in minutes (W)	1st Infiltration rate (in/hr)*	2nd Infiltration rate time in minutes (W)	2nd Infiltration rate (in/hr)*

\* Conversion of infiltration time to inches per hour (in/hr):  $\text{in/hr} = (1/W) \times 60$