

Measurement of Infiltration Rate

Accurate measurement of infiltration is crucial for watershed modeling. It helps determine how much rainwater enters the ground versus how much becomes surface runoff. To achieve an accurate estimation of infiltration, two primary types of infiltrometers are used:

Single-Ring Infiltrometers

Double-Ring Infiltrometers

1. Single-Ring Infiltrometer

Apparatus

A single-ring infiltrometer consists of a hollow metal cylinder, typically 30 cm in diameter and 60 cm long. This cylinder is driven into the ground, leaving approximately 10 cm of the cylinder above the soil surface.

Procedure

The cylinder is filled with water to a specific head (typically 7 cm).

As water infiltrates the soil, more water is added to maintain a constant water level (head).

The volume of water added over specific time intervals is recorded to calculate the infiltration rate.

Observations usually continue for 3 to 6 hours until a uniform (constant) infiltration rate is reached.

Drawback

The main disadvantage of this method is that water tends to percolate laterally (sideways) once it leaves the bottom of the cylinder. This causes the water to spread over an area larger than the cylinder's actual diameter, leading to less accurate (overestimated) results.

2. Double-Ring Infiltrometer (Concentric Infiltrometer)

Apparatus

This setup consists of two concentric rings:

Inner Ring: Approximately 30 cm in diameter.

Outer Ring: Approximately 60 cm in diameter.

Purpose

This method is specifically designed to solve the "lateral percolation" problem associated with the single-ring infiltrometer.

Procedure

Water is added to both the inner and outer rings.

A constant depth (approx. 5 cm) is maintained in both rings simultaneously.

The water in the outer ring acts as a barrier. It saturates the surrounding soil, forcing the water in the inner ring to flow vertically downward rather than spreading sideways.

Measurement

To calculate the infiltration rate, only the water added to the inner ring is measured. This represents a truer vertical infiltration rate, as the lateral spreading is handled by the water in the outer ring.

Instructions for Diagrams in Word

To recreate the diagrams from your notes in Microsoft Word, follow these steps:

For the Single-Ring Infiltrometer:

Draw the Cylinder: Use the Insert > Shapes > Cylinder tool. Label the diameter as 30 cm and the total height as 60 cm.

Soil Line: Draw a horizontal line through the cylinder to show the ground level (10 cm from the top).

Water Level: Add a dashed line inside the top of the cylinder and label the water head as 7 cm.

Flow Arrows: Draw arrows pointing down from the bottom of the cylinder, but curve the outer arrows outward to represent lateral flow.

For the Double-Ring Infiltrometer:

Draw the Rings: Use two Cylinder shapes, one inside the other. Label the inner one 30 cm and the outer one 60 cm.

Vertical Flow: Draw arrows pointing straight down from the inner ring. Label these as "True Vertical Infiltration."

Outer Ring Barrier: Draw arrows from the outer ring to show they are saturating the soil to prevent the inner water from moving sideways.