

Table 1: Review and comparison of test methods for measuring hydraulic conductivity in the vadose zone (adapted from ASTM D5126).

Characteristics	Single Ring Infiltrometer	Double Ring Infiltrometer	Double-Tube Test Method	Air-Entry Permeameter	Borehole Permeameter	
					Free Surface	2 Head Solution
Relative Accuracy	Low	Fair	Fair	Good	Poor	Variable
Relative Cost	Low	Low-Moderate	Moderate	Moderate	Low-Moderate	
Time required (at $Kfs=10-5cm/s$)	<4h	<4h	4h to 1d	<4h	<4h	
Depth of Testing possible	Surface	Surface	0 to 1ft	0 to 1ft	Any	
Range of Kfs (cm/s) for which the test is suited	10^{-2} to 10^{-6}	10^{-2} to 10^{-6} 10^{-6} to 10^{-8} (with flexible bag for inner reservoir)	$<10^{-6}$	$<10^{-8}$	$<10^{-6}$	
Advantages	Simple apparatus, can estimate Kfs from infiltration data, can increase diameter to reduce scale effects and edge effect	Similar to single ring		Measures vertical Kfs only, accounts for capillary effects	Simple numerical solution, good approximation for sands	Simple solution, accounts for capillarity
Disadvantages	Lateral flow affects accuracy, measures infiltration not Kfs , surface crust reduces infiltration, measures on surface of soil only	Similar to single ring	Cumbersome apparatus, time-consuming numerical solution	Sometimes difficult to drive tube, difficult to identify wetting front in wet soil	Does not account for capillary effects, high error for medium to fine unstructured soils	Occasionally gives negative values