CFAES

HEALTHY SOIL HEALTHY ENVIRONMENT

Soil Infiltration

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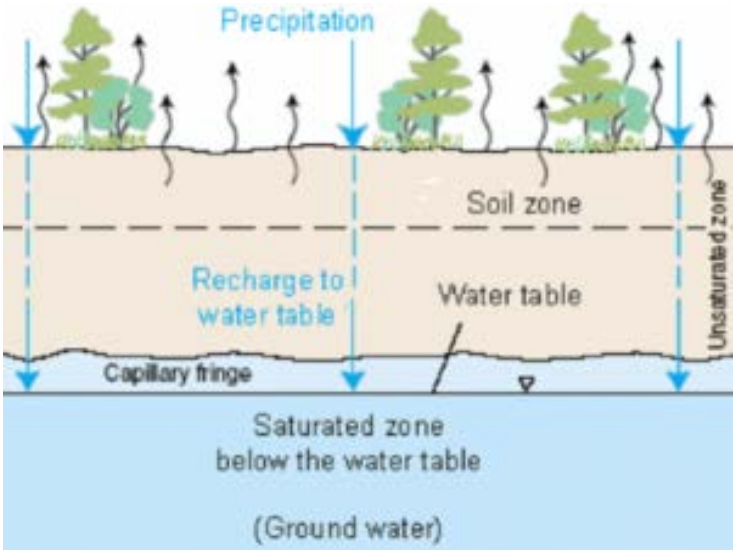
Infiltration is the downward entry of water into the soil. Infiltration rate is expressed in inches per hour. Rainwater must first enter the soil for it to be of value. Water moves more quickly through the large pores of a sandy soil compared to slower movement through a clay soil with small pores. Infiltration is an indicator of the soil's ability to allow water movement into and through the soil profile. Soil temporarily stores water, making it available for root uptake, plant growth and habitat for soil organisms.



Infiltration is affected by crop and land management practices that affect surface crusting, compaction, and soil organic matter. Without the protective benefits of vegetative or residue cover, bare soil is subjected to the direct impact and erosive forces of raindrops that dislodge soil particles. Dislodged soil particles fill in and block surface pores, contributing to the development of surface crusts that restrict water movement into the soil.

Soil organic matter affects infiltration through its positive affect on the development of stable soil aggregates, or crumbs. 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.

Farming practices that lead to poor infiltration include:
• Incorporating, burning, or harvesting crop residues leaving soil bare and susceptible to erosion,
• Tillage methods and soil disturbance activities that disrupt surface connected pores and prevent accumulation of soil organic matter,
• Equipment and livestock traffic, especially on wet soils that cause compaction and reduced porosity.

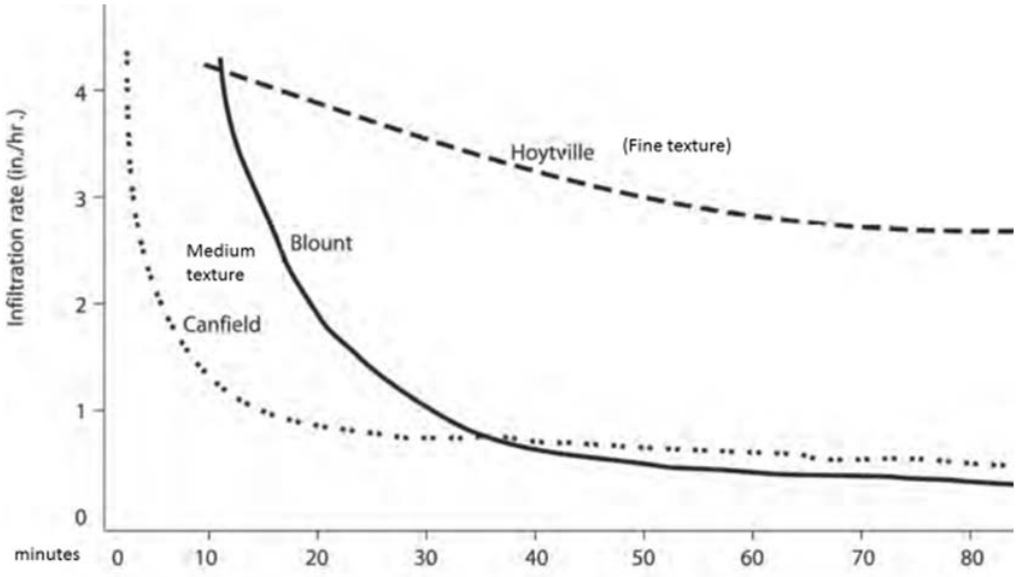


Chart #1

When no more water will drain from the large soil pores, which occurs within one or two days after rainfall , the moisture level is described as being at field capacity. Much of the moisture held in the soil at this level is available for uptake by growing plants.

Soil moisture is considered low when it is present only in very small pores. Because water in small pores is held tightly, the energy available to roots for removing water is not sufficient to extract it at the rate that it is being transpired.

When this condition exists, the plant leaves wilt or curl, and this soil moisture level is called the wilting point. The amount of soil water between field capacity and the wilting point is the available water-supplying capacity of the soil.

Available water-supplying capacity is designated as inches of water per inch of soil, or as a percent by weight. This water is available to plants when root development and aeration are adequate for optimum plant growth. An acre inch of water is approximately 27,000 gallons. Soils have available water capacities of from 4 to 8 inches in 4 feet of soil.

As shown in Chart # 1, Hoytville soil is fine textured with durable structure and contains considerable clay and organic matter. This fine textured soil can maintain a high infiltration rate at the soil surface compared to medium texture soil with weak structure. Raindrop impact can greatly reduce water infiltration by breaking down soil structure.

A single ring infiltrometer method was used to measure infiltration in a Hoytville clay soil in Wood County , Ohio. The 2nd test represents the infiltration capacity of soil after a one inch rainfall event. As shown in Chart #2, conventional tillage in a corn / soybean rotation field resulted in very slow water infiltration. A 3 crop rotation of corn /notill soybean / notill wheat improved infiltration. Adding clover to the rotation greatly improved water infiltration.

Conclusion

Best management practices to improve soil infiltration include: reduced tillage, avoid soil compaction, crop rotation, and keeping the soil covered with residue and cover crops. A soil with good infiltration can utilize and store plant available water and reduce water runoff which causes flooding.

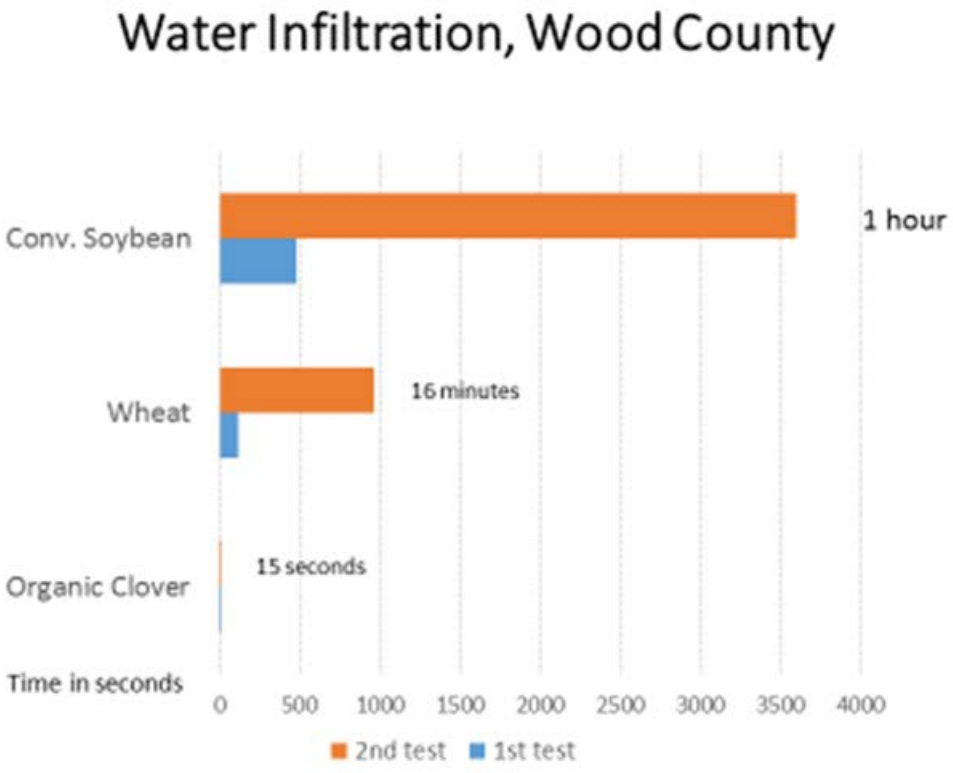


Chart #2

Resources

- USDA Soil Infiltration nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_051576.pdf
- Soil Quality Indicators – Infiltration nrcs.usda.gov/wps/portal/nrcs/detail/soils/health/assessment/?cid=stelprdb1237387
- Infiltration test nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052494.pdf
- Ohio Agronomy Guide – 15th Edition estore.osu-extension.org/Ohio-Agronomy-Guide-15th-Edition-P505.aspx