



www.natureswayresources.com

NEWS FROM THE WONDERFUL WORLD OF SOIL AND PLANTS

By John Ferguson

Subject: water and soil porosity and permeability

The Woodlands Water newsletter has a YouTube link to a short video on Texas aquifers that is very good. It is from the Texas Water Development Board and can be found at the following link: <https://www.youtube.com/watch?v=uRoVC48eswQ>

In the video they explain two properties of aquifers called *porosity* and *permeability*. These two properties are involved with soils also. Understanding these two properties is essential to having healthy soil and beautiful gardens.

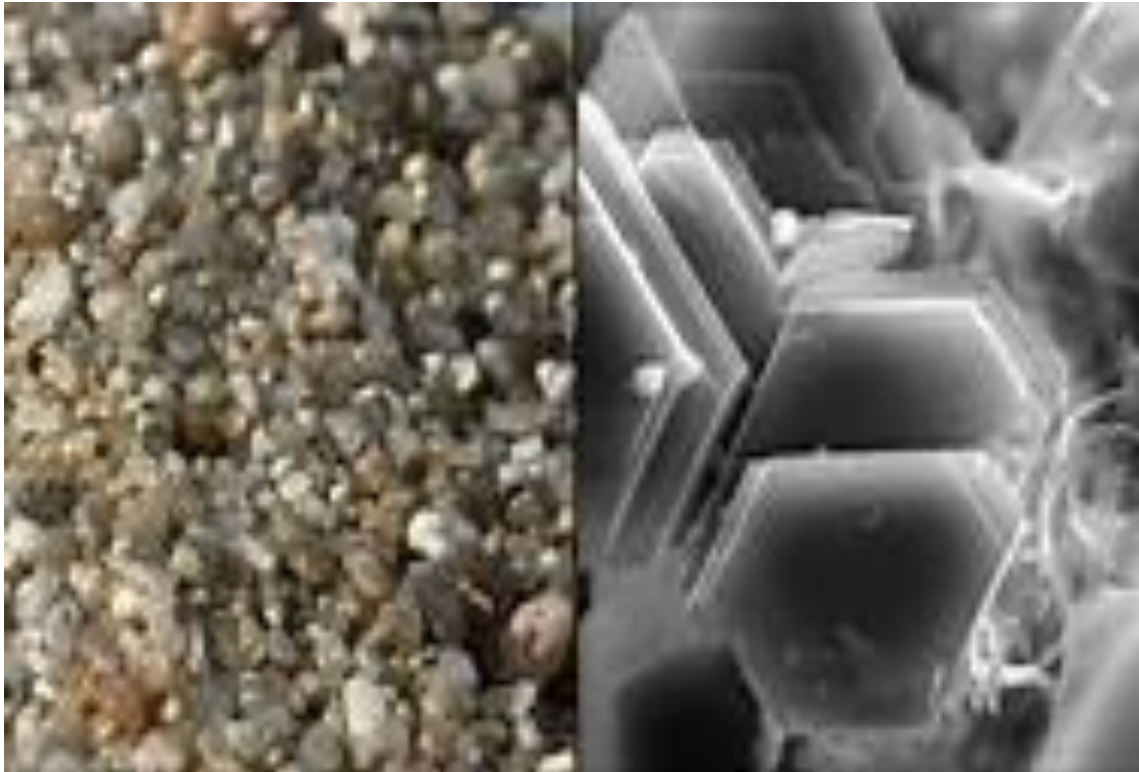
The photo below shows two different soils, one is granular and one is plate like. The plate like soil has more open space which is called porosity than the granular soil hence will hold more water or air. However, the pores are not connected and air and water cannot move through the soil except very slowly. Gardeners often refer to this type soil as poorly draining.

The granular soil will have far less pore space (porosity) but water and air will move through the granular soil easily (permeability).

101 Sherbrook Circle • Conroe, Tx 77385-7750
(936) 321-6990 Metro • (936) 273-1200 Conroe

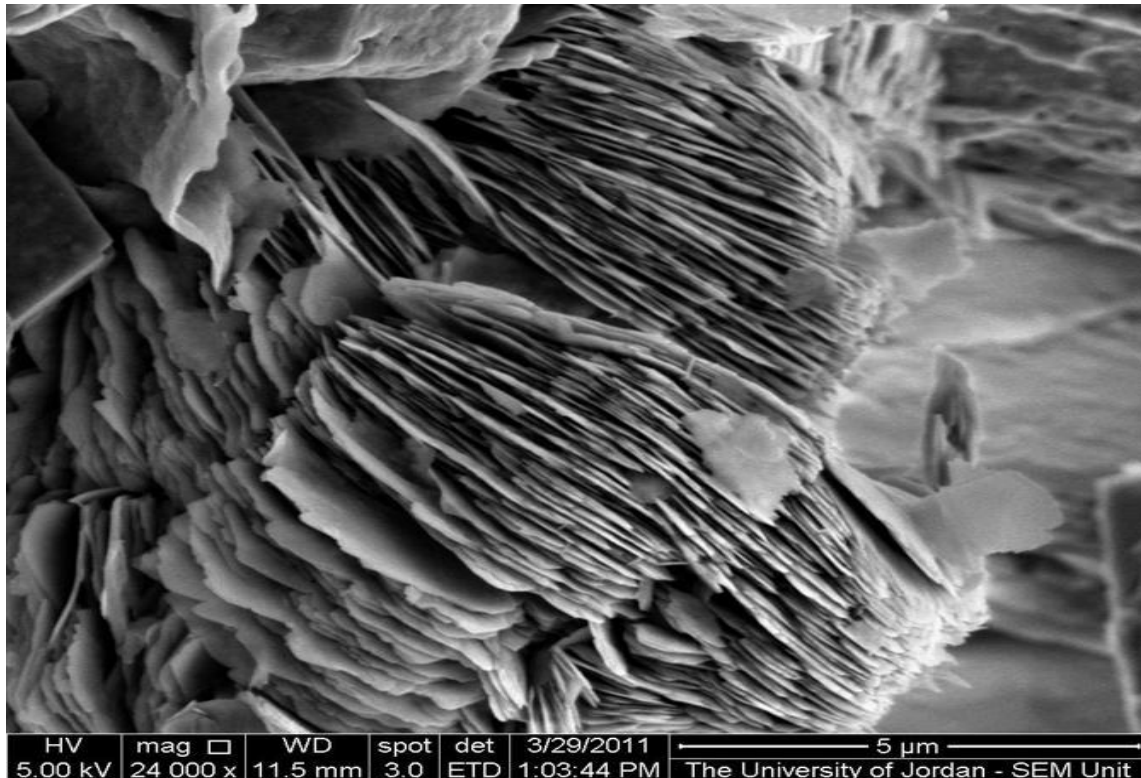
NATURE'S WAY 
RESOURCES
an organically based service company

www.natureswayresources.com



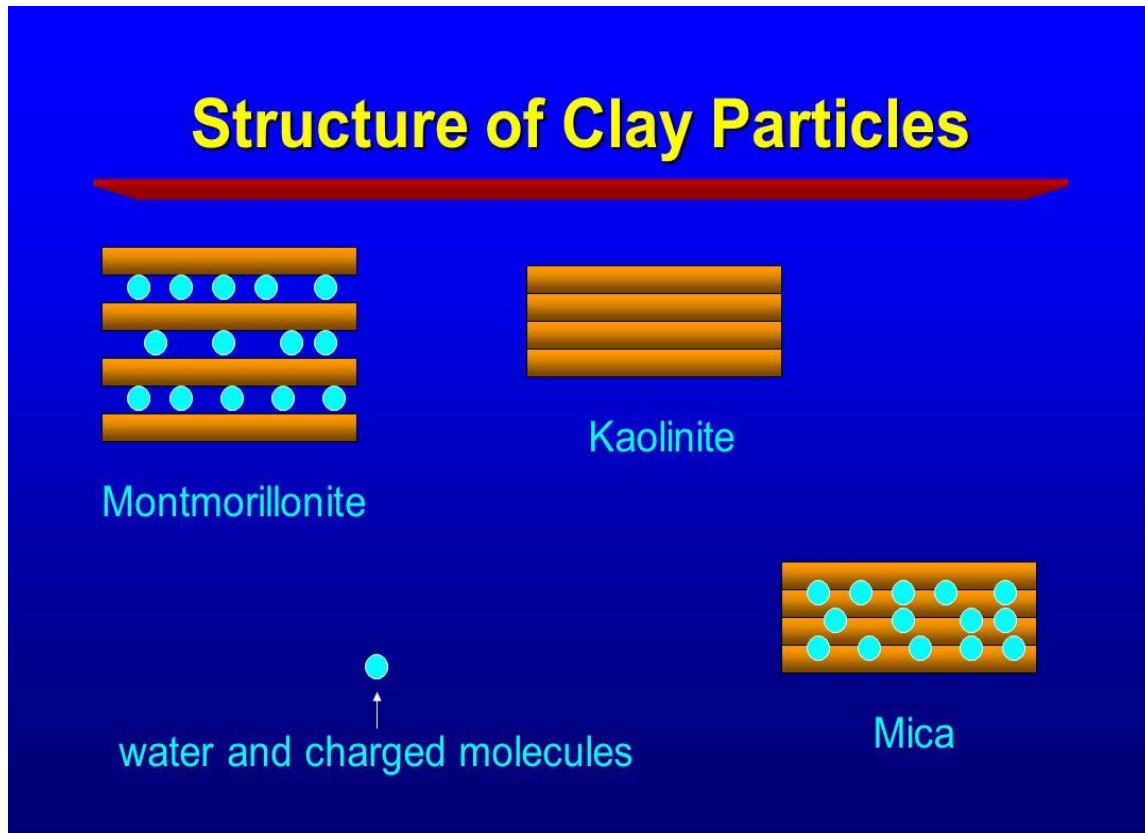
The photo below is a very platy soil that we know as clay. Lots of porosity but very little permability. This is why clay soils are used to line lake bottoms or build the dams.

101 Sherbrook Circle • Conroe, Tx 77385-7750
(936) 321-6990 Metro • (936) 273-1200 Conroe



When water gets into the plates it acts as a lubricant allowing the plates to slide over each other as shown in the slide below. This property is why some clay soils are very slippery when wet.

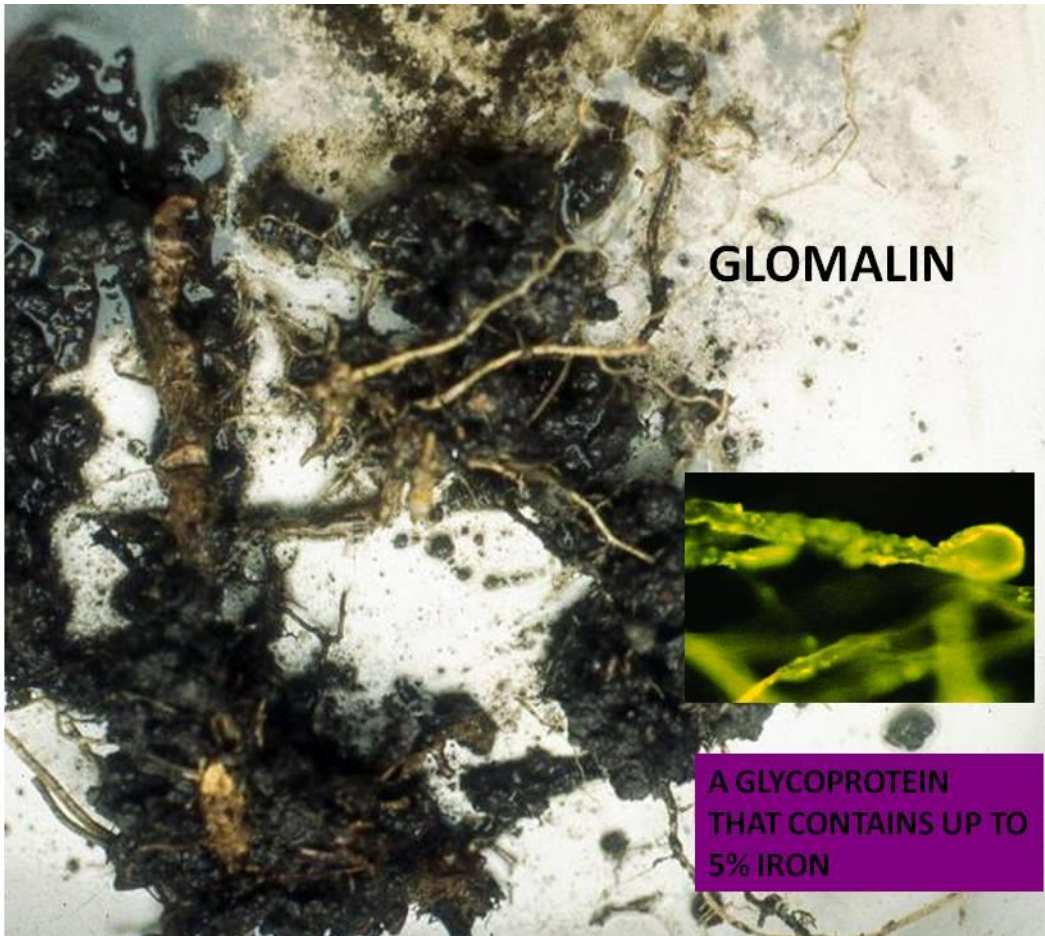
101 Sherbrook Circle • Conroe, Tx 77385-7750
(936) 321-6990 Metro • (936) 273-1200 Conroe



When our soils have good organic matter content the microbes feeding on and living in the organic matter can help hold the soil particles apart and glue them together to increase both permeability and porosity by producing soil glues called glomalin. The organic matter is also home and food for many species of microbes that helps plants grow.

As shown in the photo below this type soil makes it easy for plant roots to grow into. This allows the plant to spend more of its energy on growth, flowers, and fruit.

101 Sherbrook Circle • Conroe, Tx 77385-7750
(936) 321-6990 Metro • (936) 273-1200 Conroe



The photo below shows a mycorrhizal fungal hypha that colonizes plant roots, produces soil glues that hold sand particles to its body giving the soil some structure. The sand helps protect the fungi from being eaten by other microbes and this process will help the soil resist erosion better.

101 Sherbrook Circle • Conroe, Tx 77385-7750
(936) 321-6990 Metro • (936) 273-1200 Conroe




The chart below from USDA studies shows how organic matter helps the soil hold water. A good quality compost is one of the best ways to build soil organic matter along with an aged (partially composted) native mulch.

101 Sherbrook Circle • Conroe, Tx 77385-7750
(936) 321-6990 Metro • (936) 273-1200 Conroe

NATURE'S WAY RESOURCES

an organically based service company

www.natureswayresources.com



USDA-NRCS SOIL HEALTH INFOGRAPHIC SERIES #002

what's underneath

unlock the SECRETS OF THE SOIL

healthy soil has amazing water-retention capacity.

Every **1%** increase in organic matter results in as much as **25,000** gal of available soil water per acre.

Source: Kansas State Extension Agronomy e-Updates, Number 357, July 6, 2012

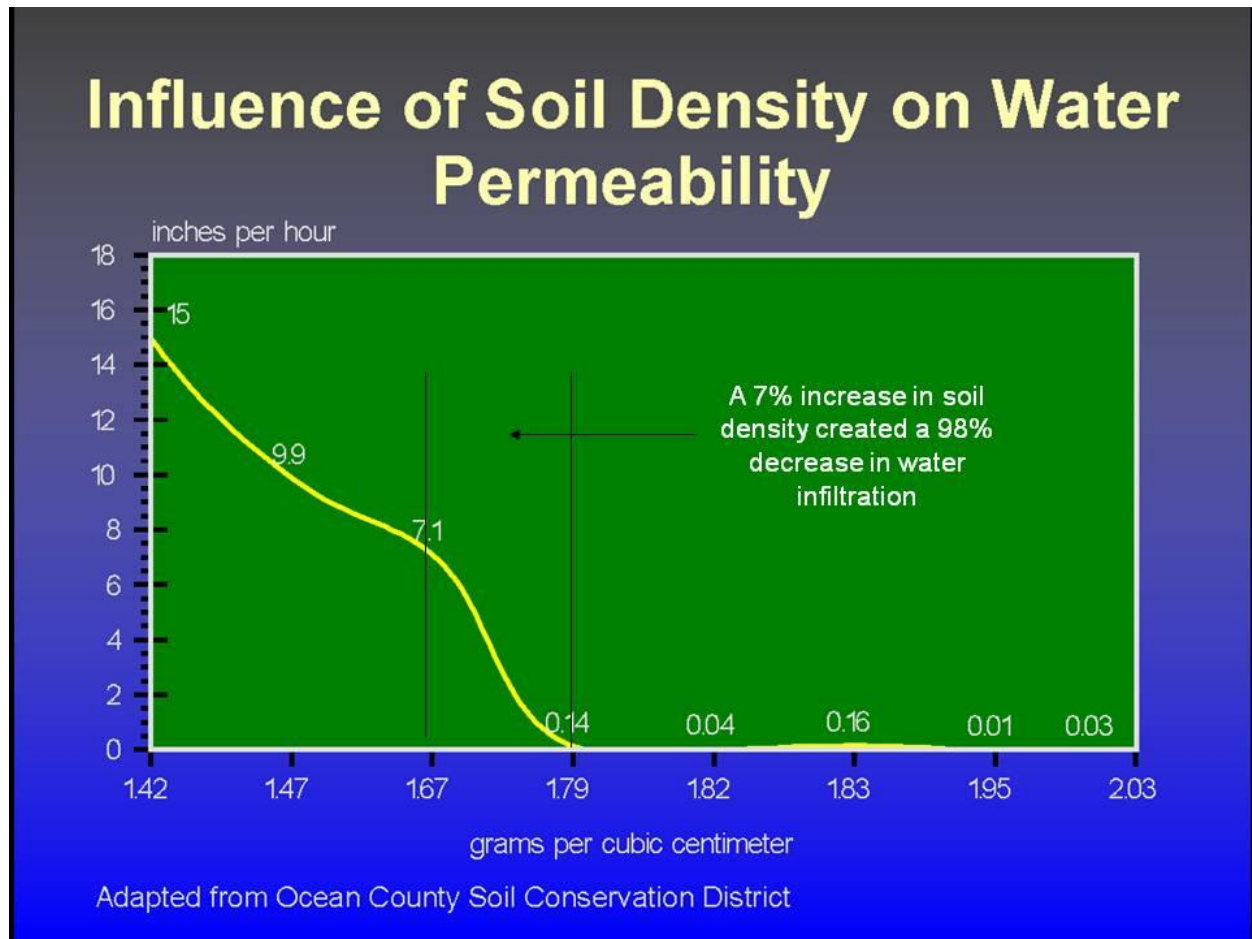
USDA United States Department of Agriculture

Want more soil secrets? Check out www.nrcs.usda.gov

USDA is an equal opportunity provider and employer.

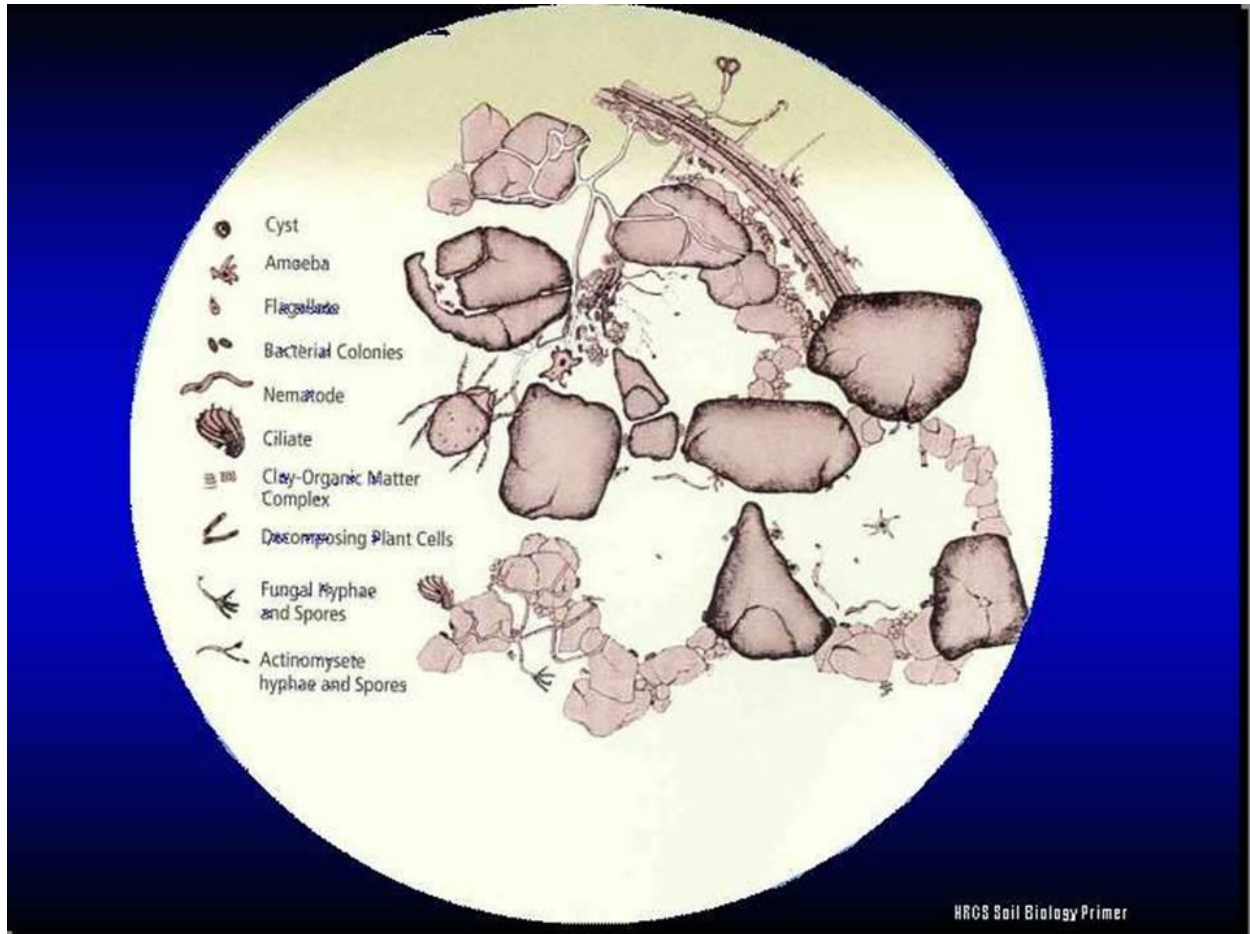
Compaction is a major factor in preventing water (whether from rain or irrigation) from entering the soil. Obviously, compaction reduces permeability and it also reduces porosity so the soil holds less water or air. Think of a slice of bread with all its large pores is light and fluffy. If we squeeze it hard, all the pores are gone and it is harder and tighter and denser (compaction).

101 Sherbrook Circle • Conroe, Tx 77385-7750
(936) 321-6990 Metro • (936) 273-1200 Conroe



The picture below depicts a healthy soil with all its components from sand and clay, to microbes, earthworms, and organic matter. This is the type soil our plants love.

101 Sherbrook Circle • Conroe, Tx 77385-7750
(936) 321-6990 Metro • (936) 273-1200 Conroe



Developing good soil structure is the most important part of water conservation in our landscapes and essential to have beautiful gardens. It is also the *most cost-effective* tool we have.

101 Sherbrook Circle • Conroe, Tx 77385-7750
(936) 321-6990 Metro • (936) 273-1200 Conroe



www.natureswayresources.com

The benefits are many times greater than irrigation systems, rain water harvesting, and water reuse combined. By using compost, native mulches, organic fertilizer, and trace minerals, our soil gets healthier and problems decrease.

For example, a topsoil with a 3% organic matter content by weight can have a 60% porosity. If filled with 35% air and 25% water it can hold over 120,000 gallons of water in the top 18" per acre and the subsoil can hold even more! A gardener can save hundreds to thousands of dollars every year just on their water bill.

A great topsoil can have over 8% by weight (25% by volume) in organic matter. This was the organic matter content of the soils of the great plains before it was tilled under for agriculture. It supported enough vegetation to easily feed millions of buffalo and other animals.

101 Sherbrook Circle • Conroe, Tx 77385-7750
(936) 321-6990 Metro • (936) 273-1200 Conroe