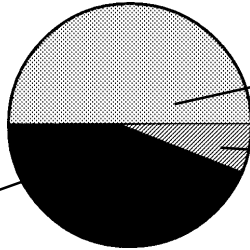


WHAT'S IN SOIL? Science Page

Soil is made of rock particles, organic matter, and spaces—or pores. The pores are filled with water and air. The soil is home to billions of living things.



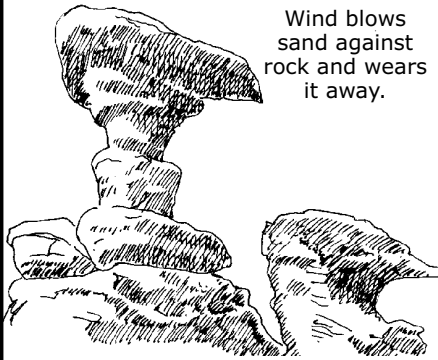
Rock particles of different sizes make up a little less than 50% of the soil.

Spaces—or pores—between solid rock particles and organic matter make up 50% of the soil.

Usually less than 6% is organic matter, such as dead leaves, roots, twigs, animal wastes, and remains of living things.

ROCK PARTICLES

Rock particles come from rock that has been broken down by weathering.



Wind blows sand against rock and wears it away.

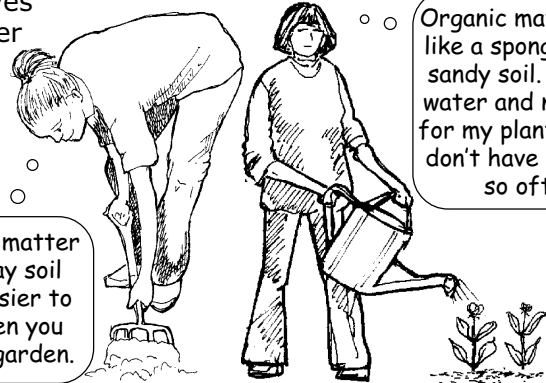
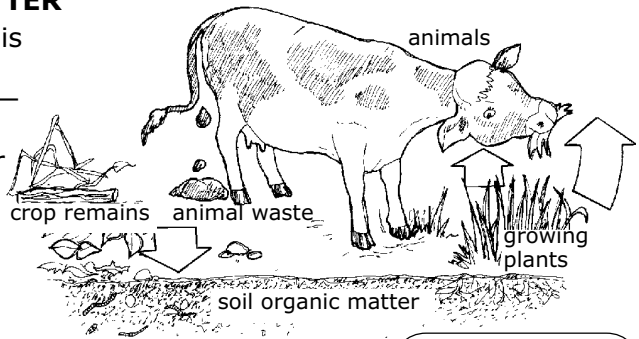
Moving water wears down rocks with the help of particles of sand and gravel.



Many plant nutrients, such as potassium and phosphorus, come from rock particles. Nutrients within rocks are not readily available to plants. But as rocks are weathered, mineral nutrients are slowly released and become available to plants.

ORGANIC MATTER

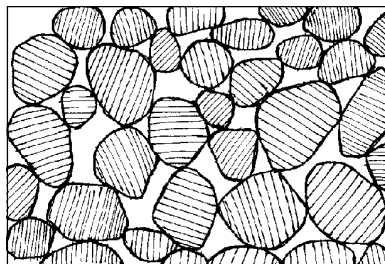
Organic matter is broken down—or decomposed—by bacteria, fungi, and other tiny organisms that live in soil. It provides nutrients for plants. Organic matter improves the soil in other ways, too.



Organic matter acts like a sponge in this sandy soil. It holds water and nutrients for my plants. Now I don't have to water so often.

Adding organic matter makes this clay soil lighter, and easier to work with when you are planting a garden.

PORE SPACES

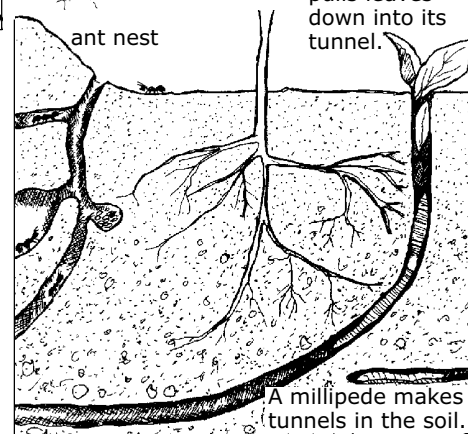


Spaces exist in soil because rock particles do not fit together perfectly. Soil pores are filled with air and water. Plant roots and soil life use the air in soil when they burn food to make energy. Plants take up water that is stored in the pore spaces. The nutrients they need to grow are dissolved in the soil water.

Animals create pore spaces as they burrow through the soil.



Moles are animals like mice that make tunnels in the soil.



An earthworm pulls leaves down into its tunnel.

A millipede makes tunnels in the soil.



WORD SCRAMBLE

Unscramble these words. They are all things that can be found in soil:

GICORAN TEMART COKR SATECLIPR
RESOP ARI
RAWET VILING NITGHS



TRY THIS

WHAT'S IN YOUR SOIL?

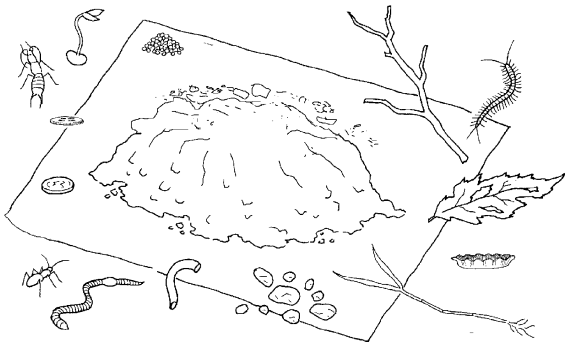
Are all soils the same, or do they differ? Are they all made up of the same kinds of soil particles and living things? Take a closer look and find out!

What you need

- * trowel or small shovel * water
- * newspaper * pencil
- * magnifying glass * paper
- * tablespoon

What to do

- Go to a site where plants are growing, such as a garden or wooded area. Gently dig up the top few centimeters of soil, and place the soil on newspaper. There may be a top layer called soil litter, which is made up of partly rotted plants, dead insects, and other organic materials. Separate out all the animals and plant parts that you can find in the litter.



- Below the litter, you may find almost completely decayed organic matter. This may be a layer or mixed in with the soil. Decayed organic material is usually black in color.
- Now observe the soil samples more closely. Place a tablespoon of soil on a sheet of paper. Spread the soil around, and look at it carefully through a magnifying glass. Is there anything in the soil that looks like a piece of plant or animal? A piece of rock? Try to separate out the different kinds of soil particles.
- Look at the size of the soil particles. Are they large grains of sand or small like clay?

Rub some of the soil between your thumb and forefinger. Does it feel gritty, silky, smooth, or sticky?

- Do the soil particles form clumps? Do the clumps have a shape? Do the clumps easily break apart or stay together when you touch them?
- Record your observations in words or drawings.
- Go to a second site where there are no plants growing and the soil is compacted. For example, this might be along a well-worn path or in an empty lot. Repeat steps 1 - 6 with soil from this site. Compare this soil sample to your first one. Discuss your findings with others.



SPOTLIGHT ON RESEARCH

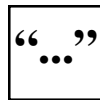
It is possible to make artificial soil

Throughout Europe, the U.S., and other industrialized countries are thousands of "brown field sites." These are areas that used to be mines and factories. Such unsightly places are stripped of healthy soil, filled with rubble, and nearly lifeless.

People also have created millions of tons of waste that needs to be disposed of. This includes sludge from sewage and water treatment plants, waste products from factories and power plants, and household wastes. How can you get rid of all these wastes, and restore brown field sites at the same time?

Engineers at the Imperial College of Science, Technology, and Medicine in England are working on a creative solution. They mix together rubble, sewage sludge, wood chips, plastics, and whatever else they can find locally to produce artificial soil. Once they find a non-toxic artificial soil in which plants can thrive, they can use it to transform brown fields into green open spaces!

Source: Department of Earth Science and Engineering. (2003). Waste management and re-utilisation design. Imperial College of Science, Technology, and Medicine, UK. <<http://www.ese.ic.ac.uk/general.php?GenID=180>>



QUOTE

"...only rarely have we stood back and celebrated our soils as something beautiful and perhaps even mysterious. For what other natural body, worldwide in its distribution, has so many interesting secrets to reveal to the patient observer?"

— *Les Molloy, scientist and award-winning author from New Zealand*