

HEALTHY SOIL RECIPE

OBJECTIVE

Students follow instructions to make soil and discover the various components involved in healthy soil as well as the value and benefit it has for the environment. Students appreciate that healthy soil cannot be quickly made and that it is created by natural processes and microorganisms over a long period of time.

OVERVIEW

Soil is the material that makes up the outermost layer covering practically all of the Earth's land surface. Soil is made of air, water, humus (decayed organic material) and rock particles. Soil is formed by the slow process of weathering (the breaking down of rock), erosion (the moving and deposition of weathered rock material) and the combining of the resulting rock particles with air, water and organic material. It can take 600 years or more for nature to make one inch of topsoil. Often one inch of topsoil is removed from land by erosion in one year.

Healthy soils are extremely important. They are full of biodiversity, mainly microorganisms that are an important food source as well as ecosystem engineers and waste recyclers. Healthy soils are also well aerated, so help prevent droughts and flooding, by absorbing and retaining water. They are also full of organic material, including carbon, which makes them important carbon sinks, drawing carbon out of the atmosphere, and locking it up. Finally, and crucially, healthy soils are full of nutrients that help plants grow.

Unfortunately, lots of human activity can damage soils, this includes covering it over with building material, compacting it, eroding it into rivers, polluting it with chemicals, and killing or disrupting microorganisms. The result is unhealthy soil that doesn't provide us with all of the environmental benefits.

TIME NEEDED

2 x 1 hours

PARTICIPANTS

Individuals or small groups.

RESOURCES NEEDED

- soil recipe sheets (or students can make their own)
- cloth soil-making bag
- dead leaves and other plant material
- pebbles
- sand
- water
- hammer, rolling pin or mortar and pestle
- flowerpots
- fast growing seeds (radish, grass, lettuce)

LEARNING OUTCOMES

- understand that soil is a mixture of organic matter, minerals, gases, liquids, and organisms that together support life.
- appreciate that soils can be degraded or improved by human activity
- value the importance of healthy soils

INSTRUCTIONS

1. Explain to students that they will be making a recipe for something really healthy, which is good for the whole planet – soil. Hand out recipe sheets (or students can make their own).
2. Discuss the value of healthy soil and the benefits it brings to the environment.
3. Ask students if they can work out the ingredients and proportions for healthy soil. After discussion and speculation, reveal that the most basic recipe is 25% air, 25% water, 45% rock particles and 5% organic material.
4. Hand out the pebbles and organic material and have students prepare them in the right proportions. Organic material can be collected from outside (for example, dead leaves, flower petals and twigs).
5. All recipes have ingredients, but also a method, the processes and steps involved in making the dish. Students will write down their method as they go. Explain to the students that the method they are going to use today replicates the natural processes of weathering and eroding, breaking down and mixing up the rock particles, organic material and water. Demonstrate how this is done by mixing the ingredients in a cloth bag and breaking them together using a mortar and pestle, hammer or rolling pin until the pebbles are pulverised.
6. Once ground down, remove soil from the bag, place in flowerpot, and add water. The act of pouring the materials into the pot will add air to the mixture.
7. Repeat the process until you have enough soil to fill a small cup or flowerpot three-quarters full.
8. Plant seeds in the newly created soil as well as some seeds in a pot containing natural soil (not potting soil). This is to observe and compare growth.
9. After a week, compare the growth of the plants in the soil created by the students, and the normal soil from the garden. Relate the components of soil to the growth of plants in soil.
10. Review the differences between the different types of soil, why is their soil not as healthy as soil from the garden? Explain that there is no shortcut to make good healthy soil, and that it can take 600 years or more for nature to make one inch of topsoil. Add this to the method.
11. Explain to students that they also haven't accounted for the action of microorganisms. There are more microbes in 1/3 cup of soil, than there are people on Earth. Review some of the most important soil organisms and the role they play in recycling nutrients, and creating structure and air pockets in soil. Such as earthworms, nematodes, dung beetles, woodlice, springtails, fungi and bacteria. Add these to the recipe.

COMPONENTS OF HEALTHY SOIL

- Water is necessary to carry nutrients into the roots and up the stem. It is also necessary for the plants to grow.
- Air is necessary to allow the roots to “breathe”. Also, air spaces create places for water to enter the soil.
- Organic material – plant and animal parts – helps hold the water in the soil. It also provides nutrients.
- Rocks and minerals provide nutrients to the plants and structural support to the roots.

POSSIBLE EXTENSION

Search for soil superstars – create a checklist for some of the most valuable soil invertebrates and then go out looking for them in the school grounds. Has your school got healthy soil biodiversity?

MasterChef – students can elaborate on their recipes, suggesting even more detail on how to make healthy soil, taking photos or even filming their recipes in the style of a cooking show.

CLASS DISCUSSION

- What are the biggest threats to soil in urban environments? How can we protect soil?
- What are the benefits of healthy soil, beyond being able to grow food?
- Is it possible to grow food without soil? How?
- How do some modern farming practices damage soil?
- Can we grow enough food using organic farming?
- How can we get people to care about soil, when it is so brown and boring?