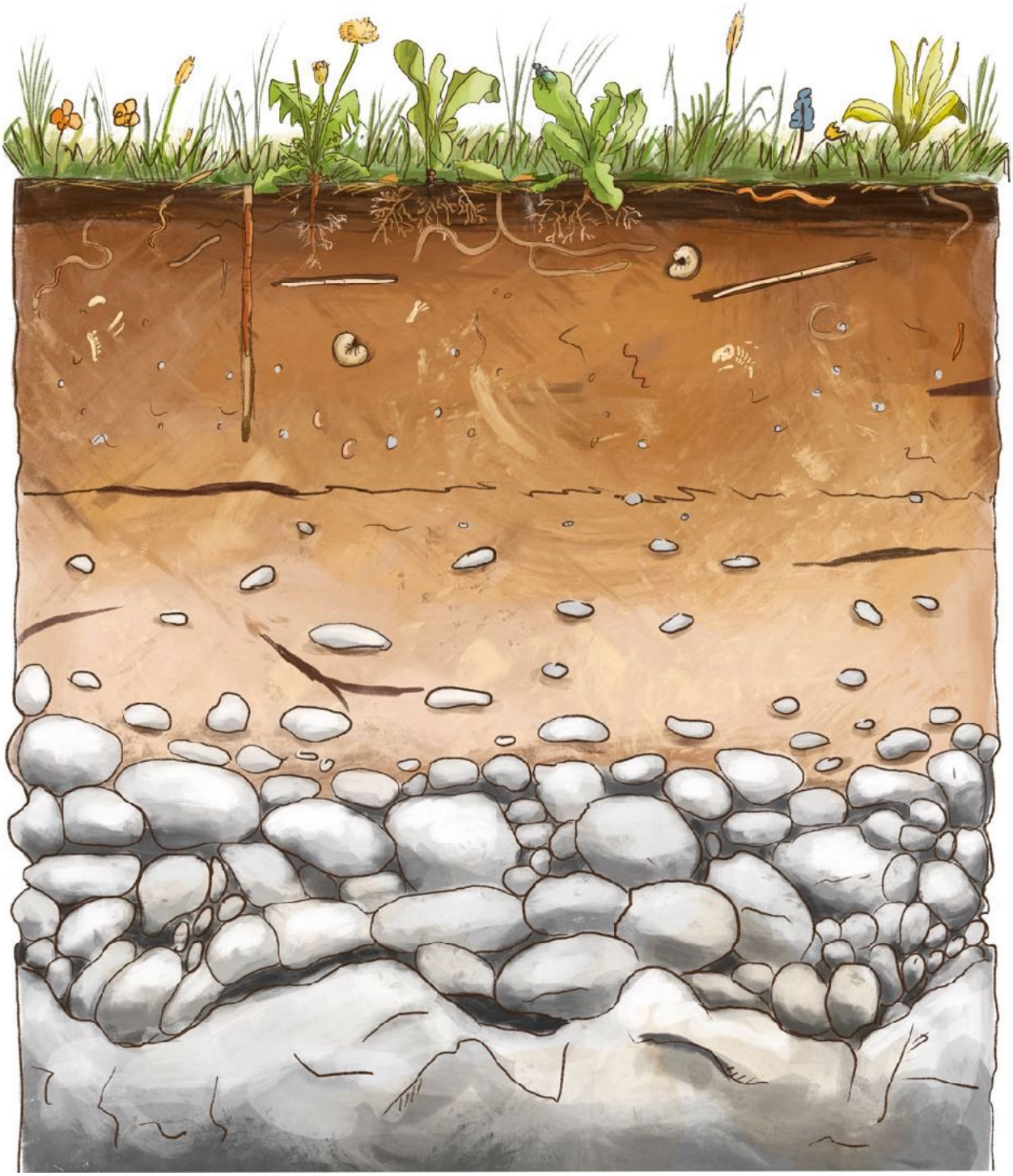
Soil Layers



Forest education module 2

Soil Layers

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SABUKO
Society for Nature Conservation

გერმანიის თანამშრომლობა
DEUTSCHE ZUSAMMENARBEIT

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თბილისის მერია

Discover the forest soil

Required time:	≈ 2 1/2 hours
Material needed:	Identification chart soil critters
	Colored rope or thick threat for each child
	Small containers (small cups for example)
	Basket
	Several devious little bags
	Small shovel
	Magnifying cups, or petri dishes, or any container to keep the critters in for observation and magnifying glasses
	Brushes
	2 tablets, spade
	Watering can with nozzle
	Timer
	Can without bottom, small board

Relevance in context to the curriculum

- Development of plants, describe and documentation
- Describe adaptation of animals and plants to their habitat
- Show connectivity between different forms of life

BACKGROUND INFORMATION

Soil is the thin layer of material covering the earth's surface and is formed from the weathering of rocks. It is made up mainly of mineral particles, organic materials, air, water and living organisms —all of which interact slowly yet constantly.

Most plants get their nutrients from the soil and they are the main source of food for humans, animals and birds. Therefore, most living things on land depend on soil for their existence.

Soil is a valuable resource that needs to be carefully managed as it is easily damaged, washed or blown away. If we understand soil and manage it properly, we will avoid destroying one of the essential building blocks of our environment and our food security.

How soils form

Soil forms continuously, but slowly, from the gradual breakdown of rocks through weathering. Weathering can be a physical, chemical or biological process:

- physical weathering—breakdown of rocks from the result of a mechanical action. Temperature changes, abrasion (when rocks collide with each other) or frost can all cause rocks to break down.
- chemical weathering—breakdown of rocks through a change in their chemical makeup. This can happen when the minerals within rocks react with water, air or other chemicals.
- biological weathering—the breakdown of rocks by living things. Burrowing animals help water and air get into rock, and plant roots can grow into cracks in the rock, making it split.

The accumulation of material through the action of water, wind and gravity also contributes to soil formation. These processes can be very slow, taking many tens of thousands of years.

From leafs to humus

Soil formation is influenced by organisms (such as plants), micro-organisms (such as bacteria or fungi), burrowing insects, animals and humans.

As soil forms, plants begin to grow in it. The plants mature, die and new ones take their place. Their leaves and roots are added to the soil. Animals eat plants and their wastes and eventually their bodies are added to the soil.

This begins to change the soil. Bacteria, fungi, worms and other burrowers break down plant litter and animal wastes and remains, to eventually become organic matter. This may take the form of peat, humus or charcoal.

Dead Wood

Dead wood will as well add to the humus layer with the help of many organisms. It just takes a bit longer. Until than it is food resource for many species. It actually is an own habitat.

Function of soil

Soils serve as media for growth of all kinds of plants.

Soils modify the atmosphere by emitting and absorbing gases (carbon dioxide, methane, water vapor, and the like) and dust.

Soils provide habitat for animals that live in the soil (such as groundhogs and mice) to organisms (such as bacteria and fungi), that account for most of the living things on Earth.

Soils absorb, hold, release, alter, and purify most of the water in terrestrial systems.

Soils process recycled nutrients, including carbon, so that living things can use them over and over again.

Soils serve as engineering media for construction of foundations, roadbeds, dams and buildings, and preserve or destroy artifacts of human endeavors.

Soils act as a living filter to clean water before it moves into an aquifer.

PREPARATION

AT SCHOOL

Prepare the children for the visit of the forest. Discuss:

- Who has been in a forest before?
- What did you do there?
- Which animals live in the forest?
- How do we behave in a forest?

WHAT TO BRING

Make sure everyone knows how to dress and what to bring!

Everyone should be dressed according to weather. This can be, protection against cold, wind or rain, head cover, sun screen.

It is highly recommended to wear long trousers, as high grasses can be very itchy and spiky plants are very annoying. For the same reason it is preferred to wear closed shoes.

Everyone should bring their own drinking water. Preferable in a reusable bottle. Everyone should have a light snack. It should be made clear, that no trash is left behind!

Have the children bring their notebooks and pencils.

Make sure you have all the materials ready with you, which you may need for your activities.

If it is not anyway mandatory from your school, make sure you have basic first aid with you. At least a small bottle of disinfectant and bandaids.

Have your phone charged and ready with relevant contact numbers.

Topic introduction and sensibilisation

Soil

Overall time required for the introduction period: 20 minutes

THE FOREST SOIL

Group discussion - 5 minutes

- What is under your feet?

What do the children connect with soil? What does it mean for them?

MY FAVORITE SPOT

Activity - 15 minutes

Direct the focus to the soil.

Every child is asked to look out for a spot where he or she likes the forest floor the most. May be something interesting is growing here. Or different elements form an interesting structure. May be it is simply the soil itself a child is interested in.

Every child marks his / her spot by surrounding it with a well visible threat.

Now the children QUIETLY walk the individual ‚pictures' like a gallery.

Use your senses

Part I - Overall time required: 30 minutes

The children will approach the forest floor with all senses. Therefor you form three small working groups. Each group gets the task, to set up one sensory station for their companions: a perfumery, a radio station, and a feeling station.

SENSORY STATIONS

Set Up the Stations

Perfumery

The children of this station collect different items which have a distinctive smell and place those in small containers. For each version one container. This can be: soil, bark from the floor, intensive smelling plant parts from the ground, …)

Radio

The children of this station collect different items in a basket which can be used to produce sounds. (Rocks, dry leafs, twigs, …)

Feeling

The children of this station collect different items and place them in different bags each.

Experience the Stations

Now the groups visit each other. To intensify the experience, the children who visit a stage close their eyes while the station owners present their elements. Can they identify what they smell, touch and hear?

Explore the Forest Soil

Part II - Overall time required: 70 minutes

After this introduction they are prepared for some research activities. Depending on your group size and time management, you can split the groups again in different working groups who present their results at the end to the others; do all experiments at different stations; or select those most suitable for your approach.

If you have the opportunity, repeat the research in different forest types (deciduous forest vs. coniferous forest) or forest vs. agricultural land or vs. soil of any other different habitat.

RESEARCH STATIONS - PART I

For each research station calculate about 30 minutes
Prepare a worksheet for each station, so the children can set it up by themselves

Soil Grid

Have the children arrange sticks in a way that they have 4 equal sized fields next to each other in a row.

1st square: everything stays as it is

2nd square: remove all plants, twigs, all leafs which are still complete

3rd square: remove everything as in square 2 and in addition everything still recognizable as leafs or twigs.

4th square: remove everything and in addition remove the humus layer until you reach the mineral layer.

This allows visualizes the development form organic material to humus.

Let the children take notes, so they can present their observation later to their peers.

- What happens to the leafs the deeper you get into the soil?
- In which grid do you see most roots? Why there?

Soil Critters

If you have ID sheets, this may be useful here.

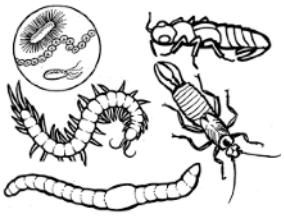
You can also ask the children to make drawings and research their findings afterwards.

It may take some time until the children finally see the creatures in the soil. Most are very tiny and it needs some focusing to realize, they are there. It helps to lift up leafs, bark or branches from the forest floor. They can also dig into the ground.

It is essential, that they work carefully! The brushes are no digging tools! Their purpose is, to lift the critters into the observation container (e.g. magnifying cups). Our fingers are much to big to touch such small animals without harming them.

Let the children take notes and drawings, so they can present their observation later to their peers.

- How do the animals look like? How many legs can you count, how many body parts?
- How many different kinds could you find?
- What do they eat?



Dead Wood

If you have ID sheets, this may be useful here.

You can also ask the children to make drawings and research their findings afterwards. The task is similar to the station for soil critters. First have them find a place with dead wood to work on.

It may take some time until the children finally see the creatures. Some are more visible than others. Most are very tiny and it needs some focusing to realize, they are there. Lift up bark. Carefully open soft wood.

It is essential, that they work carefully! The brushes are no digging tools! Their purpose is, to lift the critters into the observation container (e.g. magnifying cups). Our fingers are much to big to touch such small animals without harming them.

Let the children take notes and drawings, so they can present their observation later to their peers.

- How do the animals look like? How many legs can you count, how many body parts?
- Does it has eyes? How do they look like?
- How do they behave?

- How many different kinds could you find?
- Where exactly did you find your creature?
- How feels the wood, what kind of structure does it has?
- What do you smell?
- What kind of plants, mosses, fungi are there?
- Are there traces of animals which you may be did not see? (E.g. markings from woodpecker, markings from bark beetles)

Covered vs uncovered Soil

Here you need the two tablets. With a spade, the children cut out a piece of soil with vegetation cover. A sod may be. Place it on one tablet. The other tablet is filled with bare soil. Place both tablets elevated. One side higher than the other. Than poor water over the soil with the help of a watering can with nozzle. The same amount of water goes on both tablets.

- What happens?
- Why are the reactions different?
- Which conclusions do you make? Think about landscape.

Absorb Water

Compare soils under different conditions, how they absorb water.

Choose a place in the forest with good forest floor coverage. Place the can without bottom on the ground, place the board on top and hammer on the board, to drill the can into the ground. Pour 200 ml water into the pipe. One child stops with a timer how long the water need to disappear.

Repeat at different ground structures. Include for sure a section with compressed ground (car track).

Compare! What do you observe? What are your conclusions?

RESEARCH STATIONS - PART II

Activity - 40 minutes

The groups visit together every station. The group who conducted the experiment presents their activity and their observations. Discuss the results together.

Farewell from the forest

Overall time: 35 minutes

MY FAVORITE SPOT

Activity - 5 minutes

Every child visits their favorite spot from the beginning and brings one piece they like most. Reflect the activities during your stay. What did they observe, what did they notice. Which conclusions do they take with them. Which impact do we humans have on soil and what does soil mean for humans.

MANDALA

Activity - 15 minutes

As final let them create a mandala from elements they find on the soil. It is finalized by the placement of the special objects everyone brought from their favorite spot.

Before you leave the forest,
make sure you collect everything you brought
and take it back with you!

Take all your waste home!
Garbage causes damage to the environment and animals.
By polluting the environment, we harm ourselves.

FOLLOW-UP AT SCHOOL

- Reflect the process of soil formation and the role of soil critters in this process.
- Why is soil important for us? > Let them create a poster with the most important soil functions for us humans.
- Compare the soil of the different regions of Sakartvelo. Compare with soils of other parts in the world.

Make sure you have taken some soil from the forest. Have the children ask to bring different soils as well. Mix the soils with water and a little oil. Now use them as paint. It can be applied on different materials. It makes as well a nice connection to ancient story telling, petroglyphs.

Ant

Bristle Tail

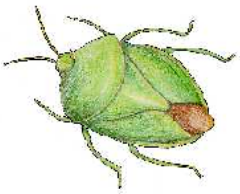
Crane Fly

Ground Beetle

Centipede

Spider

Millipede



Shield Bug

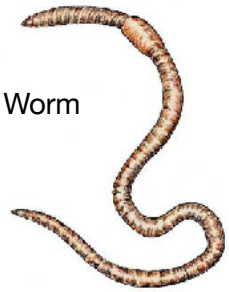
Beetle Larva

Earwig

Harvestman

Wood Louse

Slug



Worm

Snail

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