

Soil Builders



TARGET GRADES 3-8

OBJECTIVES Students will become aware of the many factors that contribute to the formation of soils.

GROUP SIZE 15-30

MATERIALS None necessary, although props may be created if desired.

SUMMARY

Students participate in a group "game" in which they act out the components of soil formation.

KEY WORDS

soil, parent material, erosion, weathering, climate, topography, decomposition, leaching

SUBJECT AREAS

science, drama

DURATION

45 minutes

PROCEDURE

1. Students are assigned the following roles and actions, trying them out individually.

Roles:

1. **parent material** - lie on floor, murmuring "gonna be soil, gonna be soil".
2. **lichens** - sit on or near parent material, emitting "fweet" sounds through teeth (lichens give off a weak acid, which works to break down parent material).
3. **wind** - run around parent material, "blowing".
4. **rain** - run around parent material "raining" with hands, making dripping sound effects.
5. **glacier** - slowly walk or roll around saying "scrape, scrape".
6. **water** - (at least two people) one "freezes", clasping hands around body and shivering, then "thaws", pretending to heat up and become liquid; one leaches, traveling around the parent material (in a watery manner) slurping minerals away.
7. **plants, roots** - kneel, hands move above heads, legs stretch, stand up, "grow", then die.
8. **bison** - on hands and knees, pretend to eat plants, defecate.
9. **dung beetles** - follow bison, roll dung (like rolling a large ball) under legs, walking backwards, "bury" it. (Dung beetles then will lay their eggs in the buried dung, which provides food for the larvae.)
10. **gopher or mole** - digging motion, murmuring "dig and mix, dig and mix".

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11. earthworms - squirm around, saying "in comes the old plants, out goes the good soil."
 12. bacteria and fungi - crouch and whisper "rot, rot, rot".
2. The number of students per role will depend on the number in the class and may be assigned at the teacher's discretion.
 3. When all roles have been assigned and practiced, they are put together and acted out simultaneously.
 4. Bring closure by reviewing the five basic factors of soil formation, asking which of these factors each "role" represented.

BACKGROUND FOR EDUCATORS

There are five basic factors that influence the formation of soils - parent material, climate, plant and animal life, topography of the land, and the length of time the processes have acted on soil material. These factors work so closely in combination that it is difficult to discuss the influence of one factor on a soil type without discussing the others. All soils have not been equally influenced by these factors, resulting in weakly developed, moderately developed, and well developed soils.

Parent material: Parent materials are mineral and organic matter that accumulate in a particular area and provide the initial ingredients for the formation of soils. This material is sometimes already in a particular location, such as weathered bedrock, and other times is transported to an area by wind or water. Some of these transported materials were carried to the place long ago by glaciers, which acted like giant bulldozers as they moved across the land. Ice scraped the surface of the earth, picking up and grinding large boulders. Areas in the path of the glaciers were changed by deposits of gravel, sand and rock that were left when the glaciers receded. Glaciers even influenced the formation of soils in areas not in their paths. When the ice began to melt, sediments were carried by the water to other places.

Other materials are of more recent origin, resulting from volcanic eruptions or flooding streams and rivers. As flood water moves through an area, the heavier particles of sand and silt are deposited first, closest to the river. Finer particles of silt and clay are deposited last, farther from the river channel where water has spread out and moves more slowly.

Information about the parent material of soils in your area may be obtained through your Soil Conservation Service office.

Climate: Influences of climate include weathering and breaking down of parent materials into smaller particles by water and temperature. Freezing and thawing can crack and shift parent material. Water is often trapped in cracks and pores in the soil and parent material. When it freezes it expands, breaking down the material more. In warmer seasons, wetting and drying causes weathering because some materials absorb more water and expand more than others. Some materials will contract more than others. Water moving through the soil and parent material cause changes by *leaching* - dissolving some of the minerals and washing them down through the soil.

Plant and animal life: Different types of plants have different influences on the formation of soils. Soils formed under prairie grasses have thicker, darker topsoil than the soils formed

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under trees. This is because when the prairie plants die, they decompose in and on the soil. Most of the decaying material in a forest is leaf litter which stays primarily on the surface, forming a thinner, lighter topsoil. In any case, plants add organic matter, decomposing plant material, that mixes with weathered parent material to form soil. Plants also help in soil formation by altering the structure of soil and parent material with the forceful growth of their roots. Growing roots have been known to fracture boulders if they begin growing in cracks.

Animals such as earthworms, crayfish, gophers, and moles allow air and water to move in by digging through the soil. They also mix the soil, bringing organic matter down from the surface to decompose and enrich the soil and minerals up to the vicinity of plant roots. Bacteria, fungi, and nematodes break down organic matter into units small enough to be taken up by plant roots. This also enriches the soil, providing plants with valuable nutrients.

Topography: The amount of slope or "hillyness" of the land influences the formation of soil because it affects the amount of moisture and erosion. The bottoms of hills tend to be wetter and accumulate eroding soil from the tops of hills. Hill tops tend to be drier and more freely drained. These areas have a tendency to erode, especially in cases where the soil is exposed through tillage, overgrazing, or construction.

Time: How long a parent material has been present and how long soil forming factors have had to work greatly influences the degree of soil formation. Soils with recent decomposition of parent material, as with flooding, tend to be less developed than soils with parent material deposited by glaciers.

EVALUATION

Students illustrate their concepts of how soil is formed, incorporating factors from the activity.

REFERENCES

Sustainable Agriculture and Wildlife: Piecing Together a Habitat Puzzle, ISU-Extension Curriculum (#EDC 3), ISU Extension Service.

EXTENSIONS

Students may wish to further research their specific roles or add new ones as they learn more about soil