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4-H Plant , Soils, and Entomology Curriculum

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Exploring the World of Plants and Soils

Project Book 1

It's More Than Just Dirt



Virginia Cooperative Extension
Virginia Tech • Virginia State University

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It's More Than Just Dirt

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It's More Than Just Dirt

Note to Project Helpers

It's More Than Just Dirt is the second Project Book in the Exploring the World of Plants and Soils series. This Project Book looks at environmental and internal factors that affect plant growth. It is written to interest youth aged 12 to 14.

The *Exploring the World of Plants and Soils* Project Books include:

It's More Than Just Dirt

Stems and Stamens

Sprouting Out and Growing Up

Exploring the World of Plants and Soils Project Goals

The objectives of this series are to give young people the opportunity to:

- Learn basic facts about plants and soils including plant growth factors, plant reproduction, plant characteristics, how people utilize plants, and the function and characteristics of soil.
- Gain knowledge about plants and soils through experimentation and exploration.
- Stimulate an interest in gardening, plants, soils, and the natural world.
- Appreciate human accountability towards responsible earth stewardship and environmental decision making.
- Relate to life cycles and other cycles found in nature.

Project Helper's Role

For youth to gain the most from this learning experience you should:

- Review the *It's More Than Just Dirt* Project Book.
- Support the youth as he or she sets goals and completes each activity.
- Play a proactive role in selecting activities, assisting in activity completion, and answering questions.
- Help the young person to think about what they are experiencing and learning through active listening and open-ended questioning.
- Encourage the youth to keep a Project Journal to document activity recordkeeping requirements, answer activity questions, and record personal thoughts and ideas.
- Serve as a resource person to help connect the young person with the community, resource materials, and others knowledgeable about plants and soil.

These experiences can be fun and educational for both you and the young person who takes on this challenge. You don't have to be an authority on plant and soil science to be a leader in this project, but you do need the enthusiasm and desire to help youth learn and grow as they explore the world of plants and soils.

What's Inside

As you participate in the *It's More Than Just Dirt* project activities you will have many interesting and exciting experiences learning about plants and the many internal and external factors that affect their growth.

Here is a look at the various sections found in each activity:

Skills: The 4-H life and science process skills practiced as you do the activity. You will also have many opportunities to share what you learned with others.

Educational Standards: The Virginia Standards of Learning (SOL) for life sciences (LS), mathematics (Math), and language arts (LA) and the National Science Standards (grades 5 to 8) addressed by the activity.

Achievement Check: The skill you should learn by finishing this activity. Keep working on the activity until you have mastered each skill.

Materials: The supplies and equipment needed for each activity.

Let's Investigate: The exploration or experiment you carry out to learn about plants and soil.

The following information is found in each activity:



Diggin' In

Diggin' In: The information needed to help you complete the activity.



Considering Plants
and Soil

Considering Plants and Soil: Questions you answer and discuss with your helper that are related to what you have learned about plant parts, plant life cycles, and plant reproduction.



Branching Out

Branching Out: Additional activities to help you utilize and understand what you learned in the activity.



Cool Connections

Cool Connections: Interesting facts about plants and soil.



Word Power

Word Power: New words to learn and use. New words are found in bold print in the activities. Definitions are found in the glossary at the end of this book.

Project Guidelines

To complete the *It's More Than Just Dirt* project you must:

- Select a 4-H Project Helper
- Complete a minimum of four Required Activities and four Optional Activities in the *It's More Than Just Dirt* Project Book
- Participate in a minimum of two Leadership Experiences
- Participate in a minimum of one Service Learning activity
- Keep a Project Journal

4-H Project Helper

Select an adult project helper to support and assist you with these activities. This person may be a parent, family member, 4-H project leader, teacher, neighbor, or friend. The choice is yours. As you do the activities, discuss the activity process and your conclusions with your helper. Ask your helper to assist you throughout this project. Your helper can assist you as you set your project goals, discuss activity questions with you, and help you locate resources.

Name _____ Phone _____ Email _____

Project Activities

Carry out at least four Required Activities located under *Let's Investigate*. Ask your helper to date and initial this log as you complete the activities.

Required Activity	Date Completed	Helper's Initials	Required Activity	Date Completed	Helper's Initials
It's All About Minerals	_____	_____	Help! I'm Drowning!	_____	_____
How Much Does Organic Matter Matter?	_____	_____	Soil Lends a Hand	_____	_____
Soil is Alive!	_____	_____	Holding Things Together	_____	_____
What Goes in the Spaces?	_____	_____	Picky Plants	_____	_____
The Ways of Water in Soil	_____	_____	Is Your Soil a Lemon or an Egg White?	_____	_____
Nature's Nutrients	_____	_____	How Does Your Garden Grow?	_____	_____

Optional Activities

Carry out at least four Optional Activities located under **Branching Out** and list them here.

	Date Completed	Helper's Initials
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

Leadership Experiences

Select and participate in at least two of these leadership experiences or devise one of your own. A leadership activity requires the organization of and the participation in an event, presentation, or tour.

Leadership Experience	Date Completed	Helper's Initials
Give a soil testing demonstration	_____	_____
Teach someone something about soil	_____	_____
Teach someone something about soil testing	_____	_____
Attend a gardening demonstration	_____	_____
Give a speech on a soil subject	_____	_____
Exhibit a soil project	_____	_____
Plan a tour of a soil testing lab	_____	_____
My own activity:		
_____	_____	_____
_____	_____	_____
_____	_____	_____

Service Learning Experience

Select and participate in at least one of these service learning experiences or devise one of your own. A service learning experience requires that you do something for someone in your community.

	Date Completed	Helper's Initials
Plant something to improve the environment	_____	_____
Share something you have grown with someone	_____	_____
Plant a vegetable garden and share the produce with a food bank, neighbor, or family	_____	_____
Gather flowers to share with an elderly person	_____	_____
My own activity:		
_____	_____	_____
_____	_____	_____
_____	_____	_____

Project Journal

Keep a Project Journal to document activity record-keeping requirements, answer activity questions, and record personal thoughts and ideas.

Activity 1. It's All About Minerals

Have you ever thought about soil and where it comes from? Most people do not give much thought to soil, yet it is the foundation upon which plants grow and as a result is vital to our existence here on earth!

Soil itself is made up of very small rocks, mineral particles, living organisms, air, organic matter, and water. The small rocks and mineral particles found in soil are derived from weathered larger rocks. In fact, rock is called the parent material of soil. The weathering of different types of rocks by heat, cold, water, wind, and the movement of living organisms makes every soil unique.

Let's Investigate

Soil Layer Cake

The mineral components of different soil types are made up of different amounts of sand, silt, and clay mineral particles. This soil activity demonstrates the different types and proportions of mineral particles that make up different soils. Compare two or more topsoils from diverse locations to see the differences in soil types found in your neighborhood. Topsoil is specifically the upper 2 to 6 inches of the land surface in which plant roots grow.

1. From two or more areas, collect a quart of topsoil from a garden, flowerbed, woodland, or field. Label each sample by location.
2. Predict which site will have the most sand and which will have the most clay. Write down your predictions in your journal.
3. Empty the soils onto an old newspaper to dry. Crush lumps between your thumb and fingers as the soil dries.
4. After removing trash, rocks, and roots from the soil, label quart jars for each site and fill them $\frac{1}{4}$ full with dry soil from that site.

Activity: Compare the mineral make-up of different soils

Life Skill: Acquiring and Evaluating Information – selects and interprets information

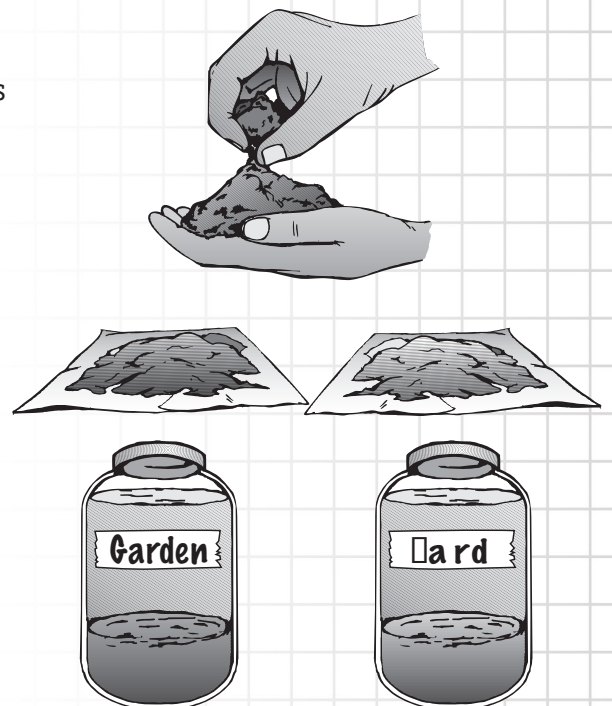
Science Process Skill: Organizing, gathering, and analyzing data

Achievement Check: You can describe the mineral components of different soils

Virginia SOL: LS.7; Math 6.1, 6.9, 7.1; LA 6.2, 7.1

National Science Standard: The number of organisms an ecosystem can support depends on the resources available and abiotic factors, such as soil composition.

Materials: two or more soil samples, newspaper, quart jars, masking tape, marker pen, non-foamy detergent (e.g. Dishwasher soap), measuring spoons, index cards, pencil



5. Add water until each jar is $\frac{3}{4}$ full.
6. Add a tablespoon of non-foamy detergent to each jar.
7. Close the lids and shake hard for about three minutes. Keep shaking until particles are separated from each other.
8. Set the jars on a table and watch very closely for a few minutes. Describe and write down what you observe.
9. Do not disturb the jars for two days.
10. Place an index card along side the jars. Mark off the depth of the clay, silt, fine sand and coarse sand. Label a card for each layer as illustrated. Fasten the card to the jar with tape. Draw a picture of the layers that have settled out in the jar. Be sure to label each card for the correct sample site.
11. Compare the soils. How are they the same? How are they different? Discuss your observations with your helper.
12. What percentage of the soil is clay? Silt? Sand? (example: # mm sand / # mm total soil sample = decimal fraction of the sand. Now convert the decimal fraction into a percentage).
13. Record your observations and calculations in your journal.
14. How do the results compare with your predictions? Discuss what you learned about the components of soil with your helper.



Diggin' In

Where Does Soil Come From?

Many factors contribute to the development of soil from rock. The combined action of these factors is called the weathering of the parent material. The methods for breaking rock into mineral particles include:

- **Heat and cold**

The sun warms rocks during the day causing the rocks to expand, or get larger. At night the rocks cool and shrink, or get smaller. The expanding and shrinking of rock causes small pieces to break off. These small pieces become the mineral particles in a soil.

- **Water**

Water gets into small cracks in rocks. When the water freezes it expands, forces the cracks to get wider, and breaks the rock into small pieces. This process continues until the pieces of rock become the mineral particles in the soil. Water can also dissolve minerals into smaller particles, which eventually become a part of the soil. In addition, rocks tumble in streams and rivers. The force of moving water causes rocks and pebbles to rub together, knocking off rough parts. The rubbed-off mineral particles become part of the soil.

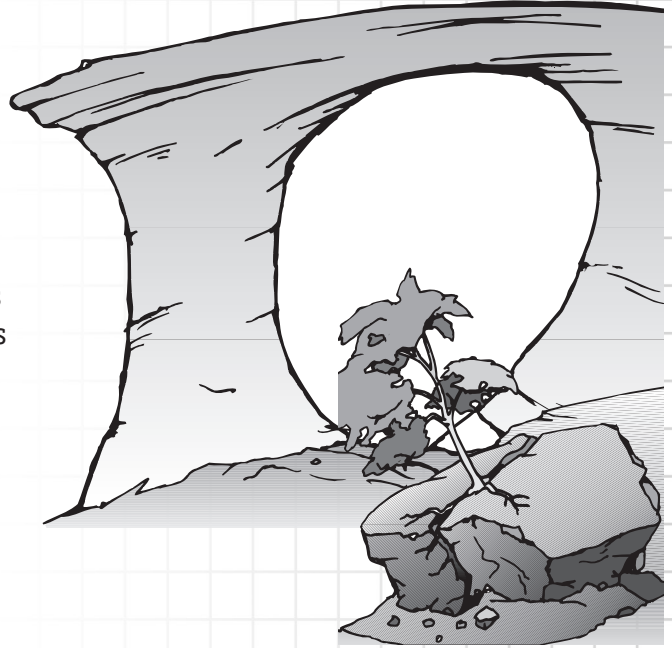


- **Wind**

Wind helps break rocks into smaller pieces that eventually become the mineral particles in the soil. The wind also picks up soil particles and carries them from one place to another.

- **Plants**

Plant roots spread and grow into cracks and crevices of rocks, forcing the rocks to split into smaller rocks and mineral particles.



Soil Structure and Texture

Not all soils are the same. Soils vary between countries, states, cities, towns and even between backyards. The minerals that make up different topsoils are dependent on the type of parent material that lies below. Soil has many properties that help us identify different types of soil, but it is primarily identified by soil structure and texture (how the soil looks and feels). A soil's texture is dependent on the size of the mineral particles of which it is composed. Particle sizes are classified as:

Sand Large particles that can be seen with the naked eye; coarse feeling

Silt Medium particles that are best seen with the aid of a microscope. Dry silt particles feel smooth like flour when rubbed between the fingers.

Clay Smallest particles that are sticky and slick when wet, and extremely smooth like talcum powder when dry; cannot be seen without the aid of a very powerful microscope.



Considering Plants and Soil

Let's Talk

How does the soil sample's original location affect the soil's composition?

Why do you think there are differences in the mineral composition of the soils you tested?

Let's Reflect

Plant roots grow in the topsoil level of a soil profile. Why do farmers spend a large amount of time taking care of the topsoil layer at their farms?

Why does it take hundreds of years for the topsoil layer to form? How would erosion affect this process?

Let's Use It

How would you prepare your garden plot for planting if it had so much clay that water could not seep in?

Pretend you are a farmer. What would you do to protect and maintain your topsoil?



Branching Out

1. Repeat this activity using soil samples from the topsoil and the subsoil layers of the same garden. Explain to your helper why you think the topsoil has different proportions of sand, silt, and clay than the subsoil.
2. Look at the banks of road cuts, excavations, and other places where soil depth is exposed. Describe what differences you observe between the topsoil, subsoil, and parent material. Share your observations with your helper.
3. You can demonstrate some of the physical forces of nature that break up rocks to form soils:
 - Using tongs, hold a piece of limestone over a flame or stove (BE CAREFUL. HOT TONGS. DO NOT BURN YOURSELF). Drop the hot rock into a pan of cold water. Record what happens. From what you observed, explain how the heat and cold of summer and winter can break rocks into smaller pieces.
 - Fill a small jar with water and screw the lid on tightly. Wrap a towel around the jar. Place the jar in a zip-lock plastic bag. Place the bag in a freezer. Record the effect of freezing on the glass. What happened? Why?
 - Rub two soft stones or rocks together. Record how rubbing stones together helps make soil.
 - Sodium chloride is a mineral element found in table salt. Put one tablespoon of table salt in a glass of water and stir. Explain the effect water has on minerals.
 - In your own words, explain the term "weathering."



Cool Connections

Rainfall is considered the most influential climatic factor in soil development. More topsoil is formed in areas of high rainfall, such as a deciduous forest, than in areas of low rainfall, such as a desert.



Word Power

Clay	Erosion	Parent material	Sand	Silt
Soil	Soil structure	Subsoil	Topsoil	Weathering