



Pacifica's Mobile Nature & Horticulture Center

Rock 'n' Roots: Rocks, Minerals, Soil, and Roots Four and Five Grade Program Outline

Introduction: Our lives depend on oxygen, water, and the soil and sun to grow plants. As a quarter of that equation, soil (and its antecedent rocks) is not only a fascinating subject, but a vital one.

This discussion will include identifying minerals (the inorganic building blocks of rocks), classifying the three main groups of rocks: igneous (crystallization of magma), sedimentary (layers of igneous or metamorphic rocks weathered by climate), and metamorphic (igneous or sedimentary rocks changed or metamorphic by chemical or physical processes), and studying soil.

NATURE CENTER STATION OBJECTIVES:

1. To examine the characteristics of minerals.
2. To identify the different types of minerals.
3. To learn the three main groups of rocks.
4. To list the rock cycle and the different types of rocks formed during each part of the cycle.
5. To identify the layers of soils and rocks.

ACTIVITIES:

YELLOW:

1. Students will learn about the three (3) different kinds of rocks and how they were formed from following clues in the rock cycle.

BLUE:

2. Students will explore the characteristics that identify a mineral from other matter, using worksheet the Mystery to solve: What mineral am I?

HORTICULTURE CENTER STATION OBJECTIVES:

1. To identify different soil types.
2. To explore how soil affects plant growth.
3. To examine materials that makes up soil.
4. To set up an experiment to compare the growth of plants in different soils.

ACTIVITIES:

RED:

1. Students will compare clay, sand, and humus type soils. They will decide whether a pile of soil given to them is missing clay, sand, or humus.
2. Students will learn how to test soil to see whether it is "clay soil" or "sandy soil".

* Note: Students will test their own soils in the classroom, because of the time constraints with the mobile classroom.

GREEN:

1. Students will set up an experiment to test how long a soil takes to dry out.
2. Students will examine how roots grow in different soil types (i.e. clay or sand).

*Note: Use of the planting station in the mobile classroom will be used for these experiments.

**Connections to the Certificate of Initial Mastery (CIM) Standards:
Nature Center Objectives –**

Physical Science: Understand structures and properties of matter and changes that occur in the physical world.

Common Curriculum Goal: MATTER -- Understanding structure and properties of matter.

Content Standards: Identify structures and properties of matter.

Meets Benchmark at Grade 3:

1. Student will be able to describe objects according to their physical properties.

Content Standards: Identify substances as they exist in different states of matter.

Leads to or meets Benchmark at Grade 5:

1. Student will be able to identify unique properties of each state of matter.
2. Student will be able to give examples of or identify each state of matter alone and in combinations, such as solids with liquids in them.

Earth and Space Science: Understand physical properties of the Earth, how those properties change, and the Earth's relationship to other celestial bodies.

Common Curriculum Goal: THE DYNAMIC EARTH -- Understand the properties and limited availability of the materials which make up the Earth.

Content Standard: Identify the structure of the earth system and changes that can occur in its physical properties.

Meets Benchmark at Grade 3:

1. Identify materials that make up the earth.

Content Standard: Identify properties and uses of Earth materials.

Leads to or meets Benchmark at Grade 5:

1. Student will recognize that Earth materials have different physical and chemical properties that can be used in different ways such as for building materials, as sources of fuel, or as an environment for growing plants.
2. Identify how soils vary from place to place in color, texture, components, reaction to water, and ability to support the growth of plants.

Content Standard: Identify causes of Earth surface changes.

Leads to or meets Benchmark at Grade 5:

1. Identify effects of wind and running water on Earth materials, for example erosion of soil by wind.

Horticulture Center Objectives –

Earth and Space Science: Understand physical properties of the Earth, how those properties change, and the Earth's relationship to other celestial bodies.

Common Curriculum Goal: THE DYNAMIC EARTH -- Understand the properties and limited availability of the materials which make up the Earth.

Content Standard: Identify the structure of the earth system and changes that can occur in its physical properties.

Meets Benchmark at Grade 3:

1. Identify materials that make up the earth.

Leads to or meets Benchmark at Grade 5:

Content Standard: Identify properties and uses of Earth materials.

1. Student will recognize that Earth materials have different physical and chemical properties that can be used in different ways such as for building materials, as sources of fuel, or as an environment for growing plants.
2. Identify how soils vary from place to place in color, texture, components, reaction to water, and ability to support the growth of plants.

These benchmark standards can be used for both the Nature Center and Horticulture Center Objectives.

Scientific Inquiry: Use interrelated processes to pose questions and investigate the physical and living world.

Common Curriculum Goal: Formulate and express scientific questions and hypotheses to be investigated.

Content Standards: Formulate and express scientific questions and hypotheses to be investigated.

Leads to or meets Benchmark at Grade 5:

Ask questions and make predictions that are based on observations and can be explored through simple investigations—

1. Student will be able to ask questions about objects and events in the world.
2. Student will be able to identify questions that can be explored through scientific investigation.

Scientific Inquiry: Use interrelated processes to pose questions and investigate the physical and living world.

Common Curriculum Goal: Design scientific investigations to address and explain questions and hypotheses.

Content Standards: Design scientific investigations to address and explain questions and hypotheses.

Leads to or meets Benchmark at Grade 5:

Design an investigation to answer questions or check predictions.

1. Student will be able to identify which tools to use for the investigation.
2. Student will be able to use appropriate units of measure for the investigation.
3. Student will be able to recognize reasons for controlling variables.

Scientific Inquiry: Use interrelated processes to pose questions and investigate the physical and living world.

Common Curriculum Goal: Conduct procedures to collect, organize, and display scientific data.

Content Standards: Conduct procedures to collect, organize, and display scientific data.

Leads to or meets Benchmark at Grade 5:

Collect, organize, and summarize data from investigations—

1. Student will be able to select and use an appropriate organization for data summary.

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2. Student will be able to select and use familiar tools, such as magnifiers, thermometers, and rulers, to gather data.
3. Student will be able to recognize how to measure and record simple properties such as temperature, time, distance, volume, and mass.

Scientific Inquiry: Use interrelated processes to pose questions and investigate the physical and living world.

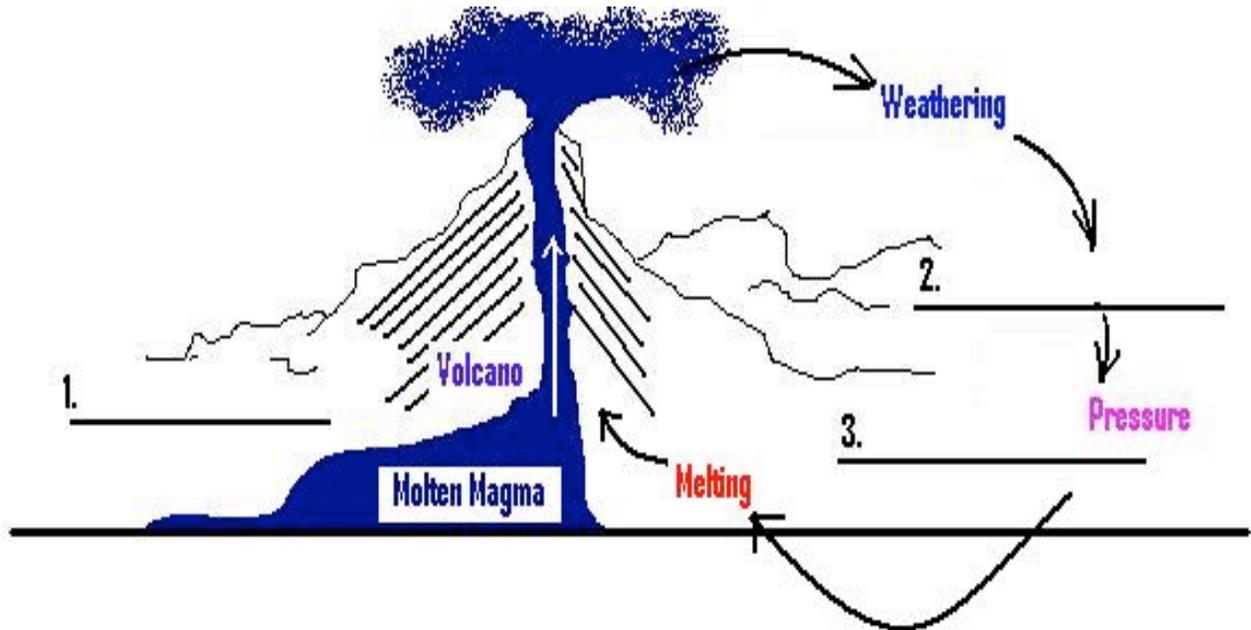
Common Curriculum Goal: Analyze scientific information to develop and present conclusions.

Content Standards: Analyze interpret, and summarize the data from investigation.

Leads to or meets Benchmark at Grade 5:

1. Student will be able to analyze and interpret data related to the question or hypothesis.
2. Explain why the data from one person's investigation might differ from the data of others performing the same investigation.
3. Analyze data to determine possible questions for further investigation.

Rock Cycle Activity



The Rock Cycle Diagram

Fill in the Blanks for the three types of rocks (igneous, sedimentary, and metamorphic).

Rocks are laid down in layers over time. Although, different kinds of rocks are not always found in the same area.

Clues:

Layer 1 looks like a sandwich made of different kinds of sand. It has fossils in it.

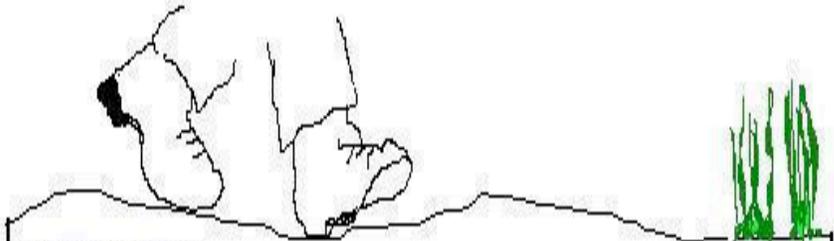
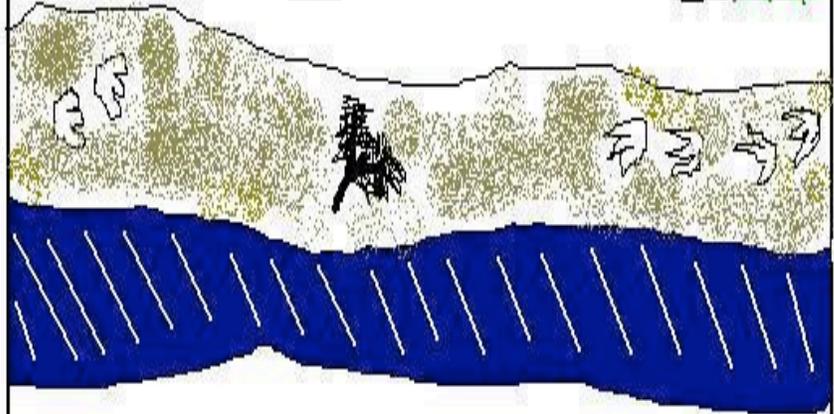
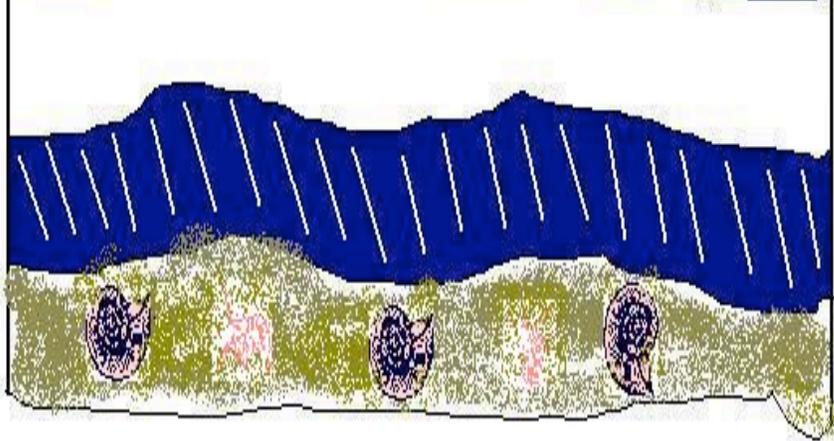
Layer 2 and 4 were formed when a volcano erupted.

Layer 3 has rock which is hard because great pressure has pressed it together. There is marble (made from limestone under pressure) and slate (made from shale under pressure).

Layer 5 has dinosaur bones so this rock layer is probably what? _____
Why would it be unlikely for fossils to be in metamorphic or igneous rocks?

Layer 6 is a very shallow layer made of finely weathered and ground rocks of different kinds mixed with old leaves and organic matter. This is what you grow your garden in.

Instructions: BE A ROCK DETECTIVE by following the clues above to see what layers are here.

	Name the Layers
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Mineral Activity

A MYSTERY TO SOLVE – WHAT MINERAL AM I?

INSTRUCTIONS: Detectives use tests to discover clues. Geologists do too! They test rocks and minerals to find out what they are made of and how they were formed. Although, rocks can be made up of combinations of different minerals, each mineral is always the same.

Choose a sample from the box and use a magnifying glass to examine it.

1. What color is it _____
2. Luster: (circle one) GLASSY PEARLY METALLIC DULL
3. Carefully **SCRATCH** your mystery mineral across the white tile or “streak plate” (make sure it is clean first). Write down what color the **STREAK** your rock makes. It may be hard to see if it's white. If it doesn't make any streak, however, just write “none”. That means that the streak plate is harder than the mineral. (After you're done, please wipe the streak off the plate so the next person can use it).

What color streak did your mineral make? _____

4. Depending on what can scratch a mineral, there is a hardness scale of 1 to 10. Try scratching your mineral with your fingernail, with a penny, and with a nail.
 - a. If your fingernail scratches your mineral, it has a hardness of 2 ½ or less.
 - b. If a penny makes a scratch on your mineral, it has a hardness of 3 ½ or less.
 - c. If a nail makes a scratch on your mineral, it has a hardness of 5 ½ or less.

How hard is your mineral? _____

5. Use the chart to solve the mystery. What mineral do you think you have?

STATION BLUE ACTIVITY SHEET

Soil Activity

OUR SOIL

Instructions: Soil is made from ground up rocks and organic (once living) things, such as, old leaves. Look at some soil with a magnifying glass. It is made up of tiny particles of 3 main kinds:

1. HUMUS:

a. How does it feel? _____

b. What does it look like? _____

2. CLAY:

a. How does it feel? _____

b. What does it look like? _____

3. SAND:

a. How does it feel? _____

b. What does it look like? _____

Which particle is smallest? _____ Which is largest? _____

Testing Soil

Sandy vs. Clay

Observe: When you shake up soil in a jar of water, sand sinks to the bottom ... can you think why? Silt will make the second layer and clay is the third layer. Organic matter will float to the top.

Try this at home or school:

1. Put a half cup of soil in a jar with a lid.
2. Fill the jar with 2/3 full of water.
3. Put the lid on tightly and shake it well.
4. Then let it settle overnight.
5. The next day observe the layers in the jar:
 - a. If the sand layer is bigger than the clay layer, you have sandy soil.
 - b. If the clay layer is bigger, you have clay soil.

STATION GREEN ACTIVITY SHEET

Soil Activity

Drying Soil Experiment

Instructions: Consider which soil type (clay or sand) will dry out faster than the other and write it down next to my hypothesis. Then write down the reason for why you think this way. Then set up your experiment with the two types of soils and record your data for the next five days.

Question: Which soil dries out sooner and needs water more often?

My Hypothesis: I think _____.
Reason: Why I think this _____.

MY DATA	SANDY SOIL	CLAY SOIL
DAY 1		
DAY 2		
DAY 3		
DAY 4		
My Conclusions:		

Question: With enough water which type of soil will grow the best roots?

My Hypothesis: I think _____.
Reason: Why I think this _____.

MY DATA	SANDY SOIL	CLAY SOIL
DAY 1		
DAY 2		
DAY 3		
DAY 4		
My Conclusions:		

Appendix A

Post Activities

These activities are suggested to complete the visit of the mobile greenhouse and nature center – “The Caterpillar” to your school

- 1. Finish the soil experiment for which is drier and can grow roots.**
- 2. Do the soil testing experiment by having students bring in their own jar and lid and a collection of the soil from their yard to test.**
- 3. Let the “fossils” dry and then discuss them.**
- 4. Additional activities are included in the back of the folder to pursue as time and interest permits.**

Appendix B

Resources

Background Material:

1. There is additional information on geology, rock identification, and soil types included in the front pocket of your grade level folder.

Additional Resources:

Books:

1. Introduction to Minerals and Rocks: Joseph Cepeda; Prentice-Hall, 1993. ISBN: 023204524.
2. Essentials of Physical Geography: R. Gabler, R. Sager, and D. Wise; Harcourt, 1997. ISBN: 003022909X.
3. Modern Physical Geology – 92nd Ed.; G. R. Thompson and J. Turk; Saunders College Publishing, 1993. ISBN: 0030969107.
4. Geology: An Introduction to Familiar Rocks, Minerals, Gemstones, and Fossils; J. Kavanaugh and R. Leung.; Waterford Press LTD, 2001.

Websites:

1. U.S. Geological Survey Minerals Resource: www.minerals.er.usgs.gov
2. U.S. Geological Survey Fossils Resource: www.geology.er.usgs.gov
3. Museum of Paleontology, Univ. of California at Berkeley: www.ucmp.Berkeley.edu
4. Mineral and Gemstone Kingdom: www.minerals.net
5. University of British Columbia: www.science.ubc.ca/~geol202/petrology/rock.htm

Local Area:

1. Rogue Gem and Geology Club
2. Crater Rock Museum

Appendix C

Glossary

Earth's Layers:

Inner Core: an iron ball at the heart of the earth. It has a diameter that is approximately 870 miles. The core temperature is approximately 11,000 ° F.

Outer Core: Primarily made up of liquid iron, and has a diameter approximately of 1240 miles.

Mantle: A layer of rock approximately 1800 miles thick. A thick hot soup of solid rock and molten rock.

Crust: A thin layer of rock on the surface of the earth. It is approximately 4 miles thick under the ocean and 40 + miles thick under the continents.

Rock Cycle:

Igneous rock which is made from metamorphic rock heated to magma. This rock erupts from volcanic rocks and weathered by climate. The weathered rock turns to a "sand" mixture with mineral deposits and plant/animal remains to form layers. These layers are called **Sedimentary Rock Layer**. **Sedimentary Rock Layer** is caused by the water and climatic pressures.

Igneous rocks and/or sedimentary rocks "changed" under great heat (magma) or pressure (the earth's plate shifting) to form **Metamorphic Rock**.

Fossil: A plant or animal which has died and left its "print" in a rock.

Mineral: A basic inorganic building block from which rocks are made; their properties remain standard rocks. They can be made of different combinations of minerals and organic (once living) material.

Rocks can be made in three different ways:

1. **Igneous:** erupted from a volcano.
2. **Metamorphic:** Igneous or sedimentary rock changed under great pressure and/or heat.
3. **Sedimentary:** Rocks weathered to sand, minerals and organic material held together in layers.

Soil Particles:

1. **Clay:** The finest particle; will settle above silt, below organic matter.
2. **Silt:** Finer than sand, coarser than clay; will settle to a layer above sand but below clay.

3. **Sand: The coarsest particle; will sink to the bottom layer when shaken in water.**
4. **Humus: Organic matter.**