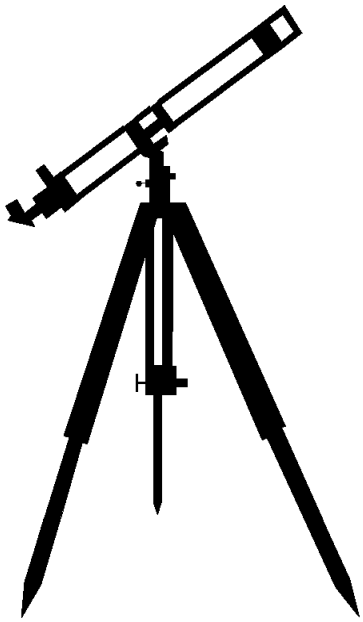
Universe Cycle

The Search for Our Beginnings

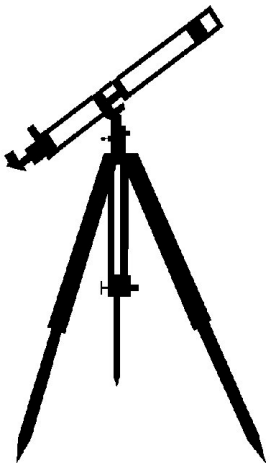
FOURTH GRADE

GEOGRAPHY



1 WEEK
LESSON PLANS AND
ACTIVITIES

UNIVERSE CYCLE
OVERVIEW OF FOURTH GRADE



UNIVERSE

WEEK 1.
PRE: *Comparing astrology and astronomy.*
LAB: *Contrasting the different types of galaxies.*
POST: *Exploring how galaxies evolve.*

SOLAR SYSTEM

WEEK 2.
PRE: *Plotting the relative distances of planets from the Sun.*
LAB: *Observing craters on the surface of planets and moons.*
POST: *Discovering new facts about the Solar System.*

EARTH

WEEK 3.
PRE: *Comparing the surface of the Earth and Moon.*
LAB: *Exploring the Earth/Moon system.*
POST: *Comparing the landscapes of the Earth and Moon.*

GEOGRAPHY

WEEK 4.
PRE: *Exploring the importance of soil on Earth.*
LAB: *Plotting data of soil locations.*
POST: *Deriving information from maps.*

UNIVERSE CYCLE - GEOGRAPHY (4)

Students use the internet to locate soil types.

PRE LAB

OBJECTIVE:

1. Exploring the importance of soil on the Earth.
2. Comparing different types of soil.

VOCABULARY:

erosion
laterite
pedalfer
pedocal
soil
temperate



California



New Jersey



Oklahoma



Puerto Rico

MATERIALS:

U.S. Placemats
Internet

BACKGROUND:

Students have compared the difference between the Moon and the Earth. A major difference between the surface is the presence of soil on the Earth. Soil is a mixture of organic material and very small mineral and rock particles that can support rooted plant life.

The formation of soils is complex. Weathering of rock at the Earth's surface breaks down rocks into pieces, and chemically dissolves them into different components. These weathering products form the inorganic ingredients of soil. The organic ingredients of soil, such as plant debris and animal waste, accumulate on the Earth's surface.

Inorganic and organic components of soil mixed together in a variety of ways. As water sinks through the ground, it transports decayed organic material downward, where

it mixes with weathered rock. Animals, like earthworms and moles, help to mix these materials as they dig tunnels.

Soils are a unique consequence of life on Earth. Other planets, particularly Mars, may have layers of weathered rock at their surfaces, but only the Earth has soils. Soils are present everywhere on the Earth where life is present or was present in the past. The specific type of soil that forms in a given area depends on three main factors. These include: 1) the type of rock available to be weathered, 2) the types of life in the area, and 3) the climate (temperature and rainfall).

Soil can be described and classified into different groups by soil scientists. Some classification are based on soil structure, color, organic content, and climate setting. We use a very simplified classification based on precipitation, to help students quickly identify and then plot the information. We use only three basic groups including pedalfers, pedocals, and laterites.

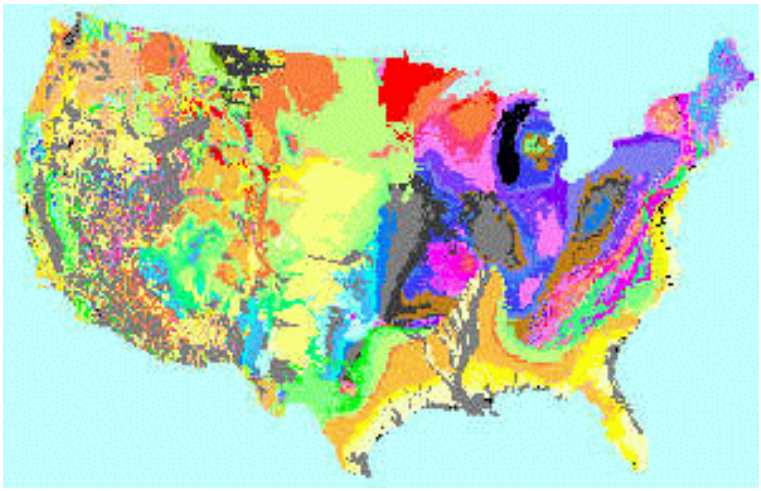
PEDALFERS - These soils are usually found in temperate areas that receive more than 60 centimeters of rain each year. They are very fertile, containing an abundance of aluminum and iron, and are a brown-black color. Pedalfers are present in much of the eastern half of the United States and most of Canada.

PEDOCALS - These soils are usually found in dry, warm climates such as those of the western United States, that get less than 60 centimeters of rain per year. The contain abundant calcium carbonate and many sulfate minerals. They are characteristically a light gray-brown color.

LATERITES - Laterites occur in warm, tropical areas that get more than 120 centimeters of rain per year. They have a distinctive deep red color, and contain much aluminum oxide and iron oxide. Oxidized iron gives laterite its red color.

PROCEDURE:

This activity will have students discuss soil and how we can plot the type of soil on a map to see if there are any reasons for the pattern.



Different color represent different types of rocks.

1. Ask the students to define soil. Many of them will just say “dirt.” Give them an accurate explanation of what soil is, and how it forms. Make sure they realize that soil is a unique consequence of life and rock on the Earth, and that it is present throughout the world.

2. Have the students locate themselves on the U.S. Placemats. Explain that there are different rocks throughout the United States. You may wish to point out areas of

metamorphic, igneous, and sedimentary rock. Impress on the students that since there are many rocks on the surface of the United States (and the world) that there will be many different soils as well.

Consult the following website for more information on rock types throughout the United States.

http://ncgmp.cr.usgs.gov/ncgmp/gmna/gmna.htm#top

3. Define pedalfer, pedocal, and laterite soils for the students. Use the simplified definition in the background information.

4. Use the following website to show students the different types of soil throughout the United States. You can look at the soils that are characteristic to each state.

http://www.statlab.iastate.edu/soils/nssc/

5. Here are some other websites on soil for more information.

http://www.nhq.nrcs.usda.gov/CCS/squirm/skworm.html - A cartoon based site at USDA, which introduces the basics of soil science. Very good for children.

http://quarles.unbc.ca/nres/soc/ggroup/ggroups.html - The “Soils of Canada” website. Good pictures of soils in cross-section. Very detailed technical information.

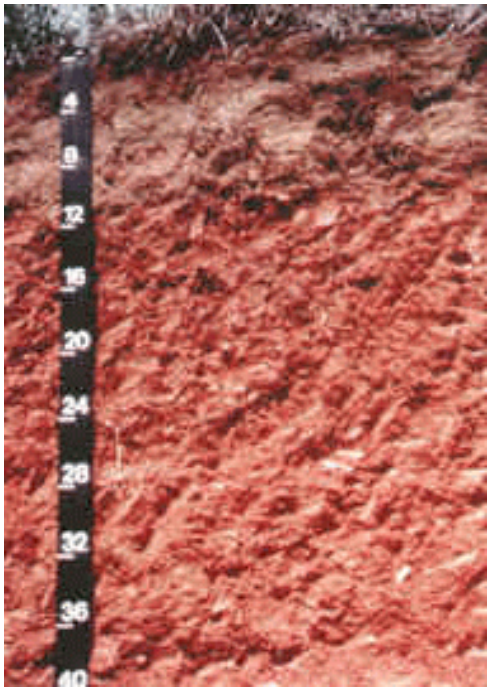
UNIVERSE CYCLE - GEOGRAPHY (4)

LAB

Students look at soil types and plot their locations on a map.

OBJECTIVE:

1. Classifying soil.
2. Plotting data of soil locations.



Soil from North Carolina

VOCABULARY:

laterite
pedalfer
pedocal
soil

MATERIALS:

Universe Cycle - Geography (4) (or collect your own soil sets)
worksheets
red and blue coloring pencils
NOTE: It is ideal to customize this lab to your local area.

BACKGROUND:

Maps present us with information about subjects ranging from soil composition to population. Sometimes simplified maps do not fully explain the information they present. However, a simplified map is easier to understand, and conveys accurate general patterns. Detailed maps may contain comprehensive information, but may be harder to interpret. In this lab students will first look at a generalized soil map and then plot data for a detailed area. The lab is based on the San Francisco Bay area, but any location could be used, if soil samples are available.

PROCEDURE:

1. You may want to show students different types of maps that are included in your module. Ask them if more detailed maps have more detailed information. They should answer yes. Ask them what happens when you want to generalize or make a simple map; ask them if this causes a loss of information. Again, they should answer yes. You may want to introduce the two maps used in the lab, and demonstrate how the San Francisco area map is a detailed version of the United States map.

We highly suggest you customize this lab to your local area. Replace the maps appropriately.

2. Review the characteristics of laterites, pedocal and pedalfers.

3. In Exercise 1, the students examine a generalized map of the United States. They should conclude that there are mainly pedocals in the west and pedalfers in the east. In Exercise 2, the students first examine 10 bags of soil from the San Francisco Bay area to determine whether they are pedalfers or pedocals. To help them decide, emphasize that pedalfers are dark and pedocals are lighter color (sometimes grayish). The students may have difficulty classifying some samples, depending on how they visualize light and dark. Remind them that the point of the lab is for them to learn about plotting information on maps, and finding patterns from the information.

The students will next plot each soil by composition on the San Francisco Bay area map. You may wish to have them to describe the soil on the lab sheet. The students do not have to take the soil out of the bag. You might want to have magnifying glasses available so they can record "other" objects in the soil. These answers are somewhat subjective. The key objective for this activity, is to plot and interpret data.

4. After the students plot the information on the map, discuss why the map of the San Francisco Bay area has pedocal and pedalfer soil. According to the general map of the United States there should only be pedocals. The answer is that the larger map cannot show detail, only the soil type that is most abundant. Hopefully, the students will see that there are more pedocals than pedalfers on the detailed map. This indicates the general map is basically accurate, but not precise.

UNIVERSE CYCLE - GEOGRAPHY (4)LAB

PROBLEM: How do you plot and use data on a map?
PREDICTION:_____
PROCEDURE: Using the maps and soil samples, answer the questions in the following two exercises.
EXERCISE 1: There are many soil types on the Earth. The generalized map of the United States on a following page shows two types of soil pedalfers and pedocal.
1. Define pedalfer, pedocal, and laterite. [Clue: al=aluminum; fe=iron; cal=calcium]
pedalfer _____
pedocal _____
laterite _____
2. Look at the general soil map of the United States. What is the soil type in each of the following areas?

NEW YORK	
CALIFORNIA	
NORTH CAROLINA	
ARIZONA	

EXERCISE 2:
MATERIALS: soil samples, magnifying glass

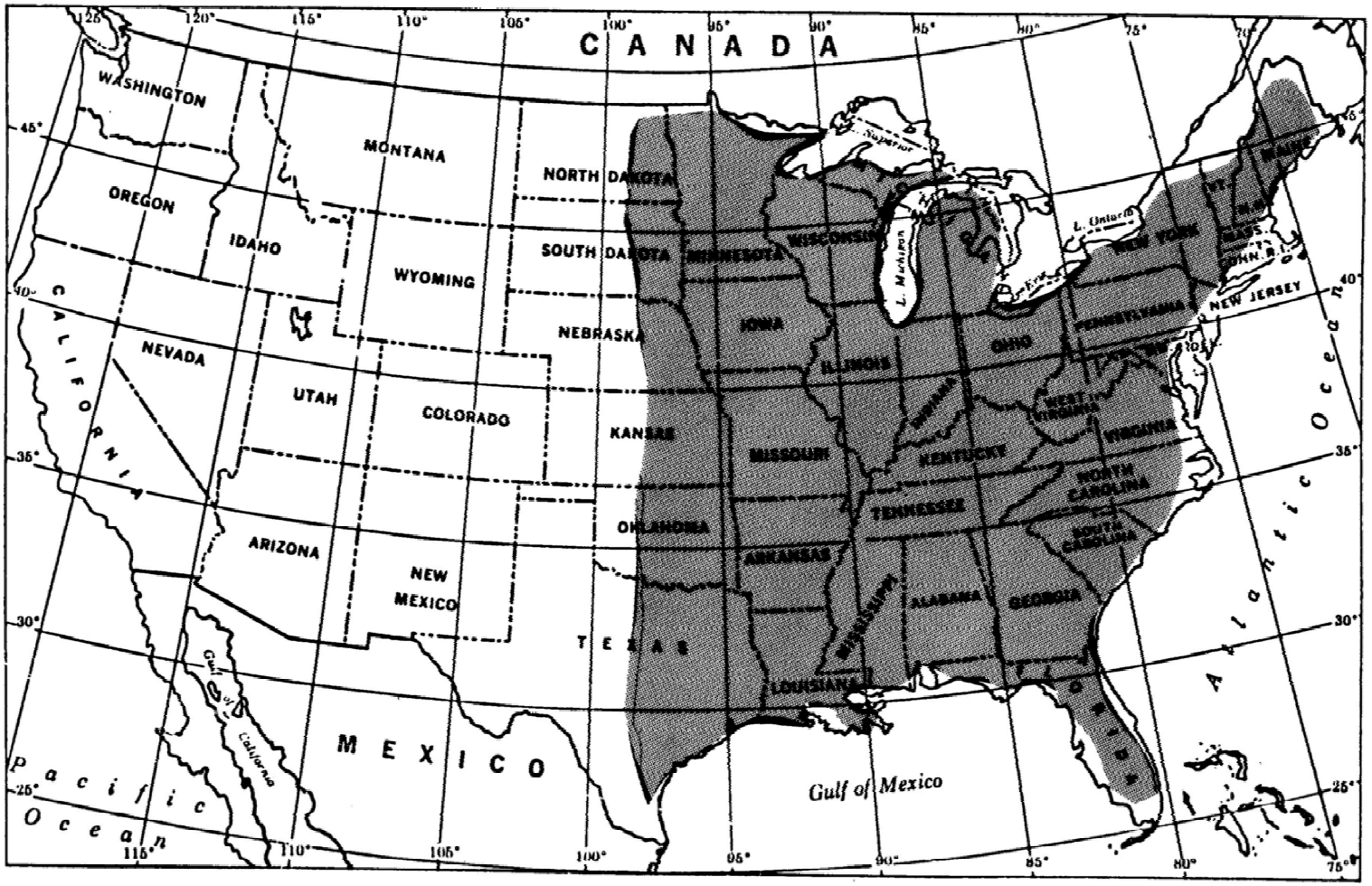
1. Classify each soil sample by color. Call dark soil pedalfers and light soil pedocals. Record the location of each sample, as labeled on the bag.

soil location	pedocal or pedalfer	description

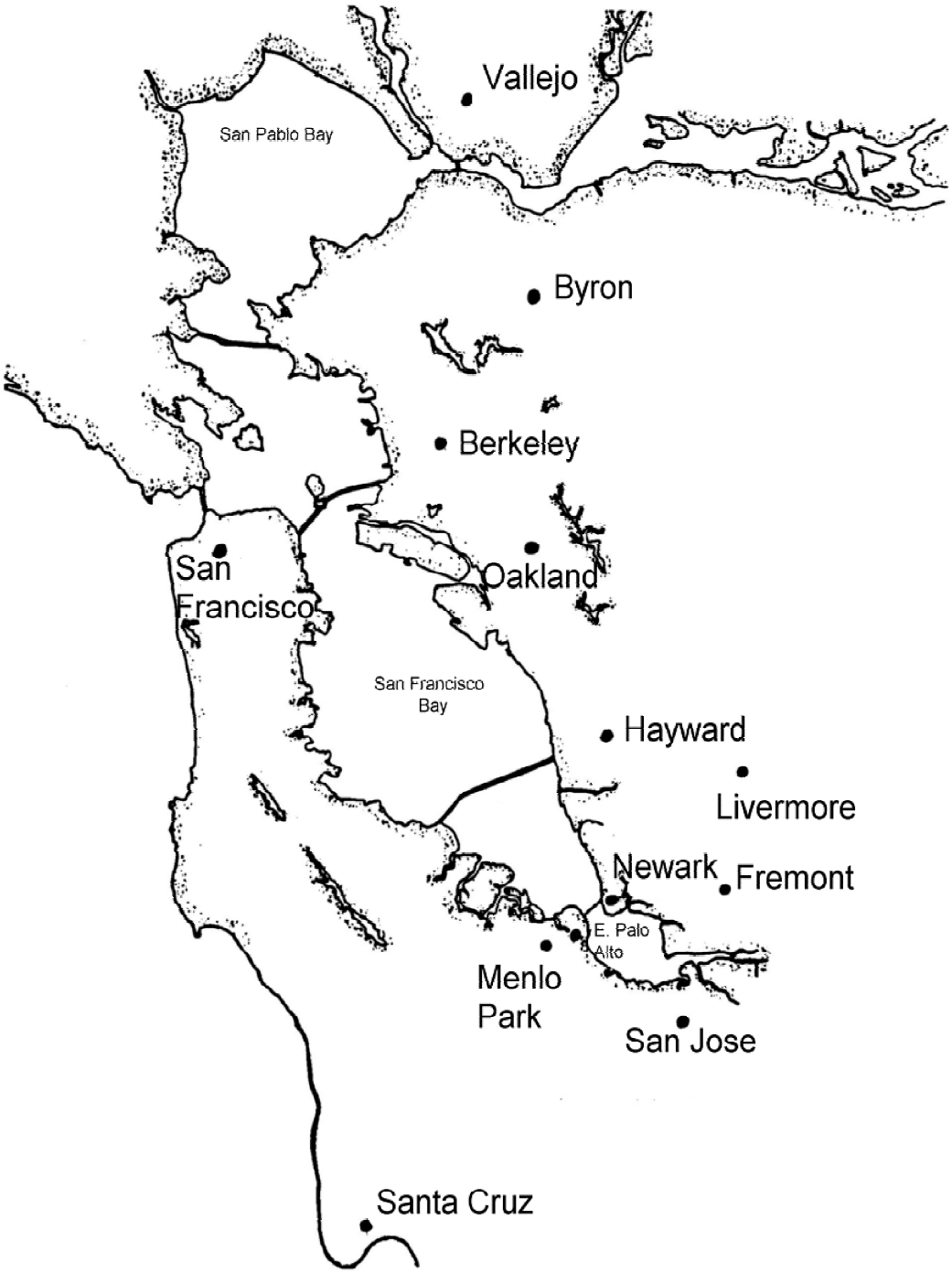
2. Color the pedocal samples blue and the pedalfers red on the detailed map of San Francisco Bay area.

CONCLUSION: Do you see a pattern of pedocals and pedalfers on the San Francisco Bay area map?_____
What is the benefit of a more detailed soil map? Explain your answer
_____

Generalized Map of Soil Types in the United States
Pedocals and Pedalfers Only



Map of Soil Locations
San Francisco Bay Area, California



UNIVERSE CYCLE - GEOGRAPHY (4)

POST LAB

Students examine a variety of U. S. Geological Survey maps.

OBJECTIVE:

1. Comparing different types of maps.
2. Deriving information from maps.

VOCABULARY:

legend
map

MATERIALS:

different type of maps
Internet
worksheet

BACKGROUND:

Maps are important to our everyday life. We need to locate and plot data, even if it is just locating a house or store. Students love to look at different maps. However, they must learn how to read them. The students should be able to look for several key elements of a map. They should be able to find the year in which the map was made, especially if they want to find a street in a city that may be new. They should also look at the legend to find out what the different colors or symbols on the map may be used for, as well as to find the scale of the map. Since maps are smaller than the areas they portray, a scale relates map distance to real world distance. One type of scale is a bar scale, as small graphic in the legend that may show distances in feet, miles, or kilometers.

5 miles

1:100000

There are many different types of maps. You can look in any newspaper and find different maps providing different information. Below are just a few of the different types of maps you may want to show your students.

1. SURFICAL GEOLOGY MAP - shows the types of rocks exposed on the surface of a given area
2. PHYSIOGRAPHIC DIVISION MAP - shows how an area is divided into regions based on topography and climate
3. WEATHER MAP - shows the weather patterns for a given day
4. POPULATION MAP - displays different percentages of population in a given area

5. TECTONIC MAP - displays folds, faults, and other geologic features that indicate mountain building (tectonic activity) in a given area

PROCEDURE:

1. Discuss with students the importance of interpreting maps. We sometimes look at maps, but don't know how to use it properly. This activity will have students find a map (either on the internet or hard copy), and interpret the significance.

2. Before you give students this assignment, go over the example given on South America with the map on the next page.

a. What kind of information does this map provide? Information on countries and territories of South America and bodies of water.

b. How did you know this? Map index or legend.

c. What can this map be used for? As a base map to locate cities or rivers.

3. You may want students to find a map, print it out, and then write a paragraph on what that map can be used for. You can either provide them with a map, or have them search the internet. The following may help your students in their search.

http://fermi.jhuapl.edu/states/states.html
The Color Landform Atlas of the United States. Beautiful shaded 3D maps showing surface features.

http://www.ngdc.noaa.gov/mgg/
Good maps of the seafloor, from NOAA.

http://www-atlas.usgs.gov/
The National Atlas of the United States. A great abundance of geographic information, of all types.

http://130.166.124.2/library.html
The Digital Map Library at California State University, Northridge. Contains many cultural geographic maps for major urban areas in the United States.

UNIVERSE CYCLE - GEOGRAPHY (4) POST