# SOIL & WATER RESOURCE LEADER'S GUIDE

**OBJECTIVES:**

Students will be able to —

- Identify the three kinds of soil particles (clay, silt and sand) and their physical properties.
- Understand the importance of protecting soils from compaction and controlling erosion.
- Relate plant growth to the productivity of the soil.
- Consider how soil type affects suitability for various land uses.
- Describe the importance of riparian areas.

**GENERAL DIRECTIONS:**

This station has three parts. Soil Types & Productivity and Erosion & Compaction are listed under Station 1A and 1B in the workbook, and Observing a Pond or Stream Simulator • depending upon location • is station 2.

When the students arrive, divide them into three equal groups and have each group move to a station. They should rotate at about 15-minute intervals. Be sure they complete the questions on their worksheets for your sub-station.

## STATION 1A: SOIL TYPES, STRUCTURE & PRODUCTIVITY

This activity is designed to:

a) Introduce students to basic soil textures and structures
b) Demonstrate use of a soil map
c) Inventory what makes up soil
d) Introduce concepts of soil productivity

For the soil types and structure discussion:

- Have the students feel the samples of clay, silt and sand to gain a sense of structure.
- Have them perform a finger test to analyze a soil sample from the site and guess about the type most dominate here. ***(Gritty, not plastic = sand; smooth and slick or somewhat grit and sticky = silt, and smooth and plastic, very sticky = clay)***
- Encourage them to notice the soil's color and smell.
- Shake the soil jars and watch which particles settle first and last. Discuss why the heavy particles settle first and what they are. Have students label the layers on their worksheet.
- View a soil profile. Have students identify and record three non-mineral components in the soil.
- Show the students a soil map. Discuss how the soil has been typed and what uses are considered appropriate for the site.

1. Does the soil at this site have more sand, silt or clay? Have students record their assessment. Label the layers of soil in the jar or tube:
   ***Smallest particles = clay; mid-size particles = silt; largest particles = sand***

2. Why do they settle in this order?
   ***The larger, heavier particles sink fastest***

3. What is the name of the soil type at this site? Is this soil considered productive? Why?
   ***Have the students record the soil series name and productivity information.***

4. Name three non-mineral items you found in a soil sample.
   ***Roots, worms, insects, decaying plants, etc.***

## STATION 1B: EROSION & COMPACTION PROTECTION

This activity is designed to:

a) Demonstrate concerns relating to compaction and erosion.
b) Discuss how to protect soil from such damage

### FOR THE EROSION DEMONSTRATION:

Choose two areas of ground, one with bare soil and one with vegetation. Have two students sprinkle "rain" over each area and watch for the plants' affect on the water's speed, the run-off on each slope, the appearance of the run-off and the water's impact on the contour of each slop. Discuss student's observations, making sure they understand that erosion is on ongoing natural process.

Questions:

1. Why is vegetative cover important for soil?
   ***Protects soil against the pounding of raindrops and being moved by running water***

2. Name two ways to protect streams from erosion-caused siltation.
   ***Encourage vegetative cover on bare soil, leave harvesting buffers along streams, maintain roads regularly***

3. Which soil absorbed the water faster? Why?
   ***The non-compacted soil because it has more air spaces through which the water can travel***

4. Name two causes of compaction.
   ***Hiking; heavy equipment; animal use***

5. When might compacted soil be helpful?
   ***Road construction; under a house***

### FOR THE COMPACTION DISCUSSION:

Place a bottomless coffee can over an area that has been protected from soil disturbance. Compact a nearby spot by stomping on it. Discuss the types of management activities (hiking, trails, roads heavy equipment, etc.) that might cause compaction. Place a second coffee can over this spot. Fill the cans with water and time how long it takes for each to empty.

1. While timing, ask the students to think about the effects of compaction.
   • Changes soil structure by reducing air spaces
   • Restricts movement of water
   • Reduces productivity

2. Explore ideas on how to protect soil from compaction.
   • Designated skid trails
   • Having equipment operate over slash
   • Limiting hikers
   • Choosing correct equipment

3. Ask students if they can think of an example when compaction is helpful.
   • Building roads, beneath structures

## STATION 2A: OBSERVING A POND OR STREAM

**– OR –**

## STATION 2B: OBSERVING A STREAM SIMULATOR

In this activity, (depending upon site availability) students will learn to:

- Investigate the plants and animals found in and around a pond or stream.
- Make observations about the productivity of a pond or stream.
- Understand the importance of riparian areas for protection of water quality and fish habitat.

Have students gather around the stream simulator (or pond or stream) and walk them through the observation questions on page 5 of their field data sheets (if we have a pond or stream) page 6 if we're using the stream simulator. Be sure they record their observations. If time (and location) permits, have students dip their nets into the water and examine what they find.

Questions (from page 6 of their field data sheet):

1) What is a riparian area?
***A zone along a stream, ponds or lakes that provides a unique habitat for plants and animals.***

2) Why is it important to protect riparian areas? How do Oregon's forest protection laws provide riparian protection?
***Vegetation near a stream helps cool the water by providing shade; provides nutrients for aquatic animals and acts as a filter for soil to protect against erosion. The Forest Practice Act requires buffers along streams and special care when operating near water.***

Questions for stream or pond site (page 5):

3) Are the plants in a riparian area different from plants further from the water? Why?

4) Are animals present? How can you tell?

5) Does this area look like it would be good for fish? How could it be improved?

Using the stream simulator to investigate each suggested condition. Record the likely impacts on water quality and fish habitat.

a) Make the stream channel as straight as possible.
***How might this affect water quality?***
***How might this affect fish habitat?***

b) Place 'large logs" or "boulders" in the stream to change the flow.
***How might this affect water quality?***
***How might this affect fish habitat?***

c) Establish a riparian buffer of trees and other plants.
***How might this affect water quality?***
***How might this affect fish habitat?***

6) If this were a real stream, where might the water be coming from? Where would it likely be going?

7) Why is water quality so important for fish? For other animals? Your family?