

## Rain Garden Soil Considerations

**ESTIMATED TIME:** 45 minutes

### OBJECTIVES:

Students will be able to:

- Understand the different soil types
- Determine soil texture type by using the ribbon test
- Understand soil infiltration
- Explain how water passes through different types of soil

### MATERIALS:

- ASLA's "Leveraging the Landscape to Manage Water" video
- Laptop and projector to show ASLA video
- "Design Your Rain Garden" Poster
- Six (6) Plastic Table Cloths or Newspapers (enough to cover desks/working areas)
- Three (3) Plastic Containers filled with different soil types (i.e., clay, silt, and sand)
- Six (6) Soil Ribbon Test Handouts (one per group)
- Six (6) Soil Detective Activity Handouts (one per group)
- Twelve (12) Latex-free Gloves (two pairs of gloves per group)
- Ten (10) Coffee Filters
- Ten (10) White Styrofoam Cups
- Ten (10) Clear Plastic Cups
- Six (6) Magnifying Glasses (one per group)
- Ten (10) 20 oz. plastic bottles, half full with tap water
- Ten (10) 8.5" x 11" Color Google Earth™ Aerial Photographs of school grounds
- Six (6) small containers (to be used to fill with materials for the group activity)
- Six (6) plastic bags, each filled with a soil sample from the school grounds
- Permanent marker
- Ball-point pen
- Scissors

### PROCEDURE:

#### ***Part 1: Pre-Test***

***Estimated Time:*** 10 minutes

#### ***Preparation:***

1. Prepare the Stormwater Management in Your Schoolyard journal for each student to complete for this module (Before Lesson and After Lesson).

**Directions:**

1. Distribute a pencil and a Stormwater Management in Your Schoolyard journal to each student.
2. Read the questions on the "Before Lesson" page and have the students complete.
3. Have the students hold onto their pencil and Stormwater Management in Your Schoolyard journal until the end of the module.

**Part 2: Soil Types and Soil Infiltration**

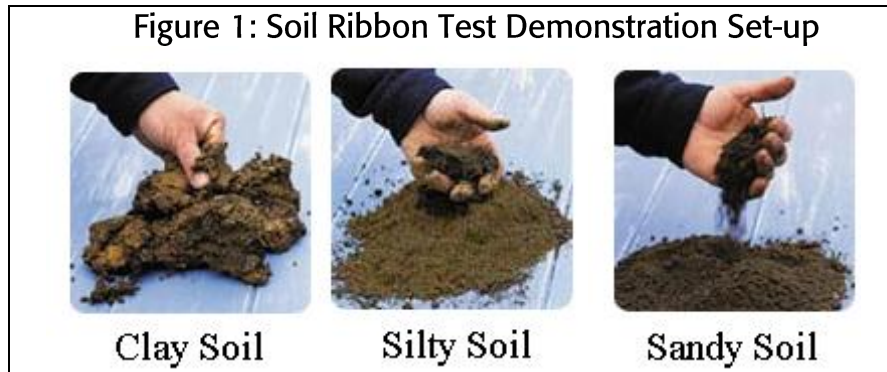
**Estimated Time:** 25 minutes

**Preparation:**

1. Prepare laptop and projector to show ASLA video.
2. Hang up the "Design Your Rain Garden" poster.
3. Prepare student work areas by covering tables with plastic table cloths or newspapers to contain all the materials needed to complete the activity.
4. Prepare "mystery bags of soil" for each group by doing the following:
  - Using a permanent marker, number (from 1 to 6) each bag of soil samples
5. Prepare Styrofoam cup to be used as a funnel by cutting it in half using scissors and punching nine (9) holes in the bottom using a ball-point pen. Make sure that you punch the holes not only from the outside of the cup, but also from inside of the cup (this ensures that water can pass through the holes).
6. Prepare a small container for each group by doing the following:
  - Using a permanent marker, number (from 1 to 6) each container
  - Fill each box with the following materials:
    - One (1) Soil Ribbon Test Handout
    - One (1) Group Activity Questions Handout
    - Two pairs of Latex-free Gloves
    - One (1) Coffee Filter
    - One (1) White Styrofoam Cup (with holes already punched)
    - One (1) Clear Plastic Cups
    - One (1) Magnifying Glass
    - One (1) 20 oz. plastic bottle, half full with tap water
    - One (1) 8.5" x 11" Color Google Earth™ Aerial Photograph of school grounds
    - One (1) "mystery bag of soil" (make sure the number on the mystery bag matches the number on the box)

**Directions:**

1. Set-up for soil demonstrations:
  - a. Set-up for the Soil Ribbon Test demonstration: Figure 1 demonstrates how your soil should be showcased in the three (3) plastic containers filled with different soil types (i.e., clay, silt, and sand).



- b. Set-up for the Soil Infiltration demonstration: Figure 2 demonstrates how your soil infiltration should be showcased in the Styrofoam and plastic cup set-up:



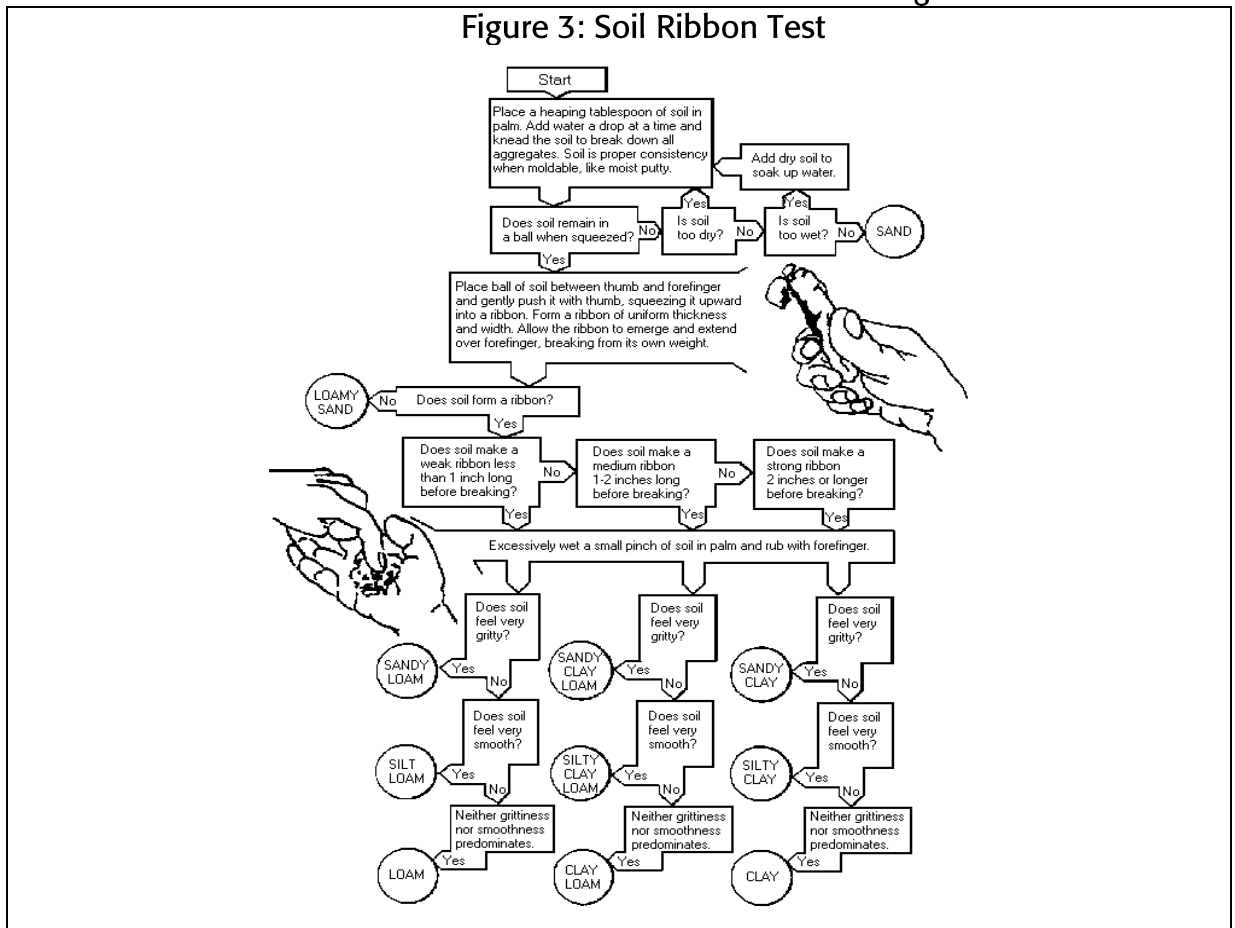
2. Rain garden introduction:
- Introduce the topic of rain gardens by showing ASLA's "Leveraging the Landscape to Manage Water" video:  
[http://www.asla.org/sustainablelandscapes/Vid\\_WaterManagement.html](http://www.asla.org/sustainablelandscapes/Vid_WaterManagement.html)
  - Tell students that a rain garden will be installed at their schoolyard this spring. Show the class the "Design Your Rain Garden" poster. While referring to the poster, show how a rain garden captures and filters stormwater runoff, and infiltrates the water into the groundwater. Explain to the students that a rain garden acts like a sponge by soaking up water and cleaning it. While pointing at the "Design Your Rain Garden" poster, explain how this is a cross section of a rain garden and how the rain garden collects the stormwater runoff from surfaces like rooftops or

driveways, parking lots, sidewalks, etc. through a sloped depression in the ground. Explain how the rain garden consists of plants and soil.

- c. Explain to the students that before you put in a rain garden, you have to plan for your rain garden. Planning includes taking into consideration things like budget (money for plants and other materials), site selection (picking a rain garden location, conducting a utility mark-out, determining how much water the rain garden can handle, checking out the soil for the rain garden), and rain garden design (determining the size and depth of the rain garden, selecting the plants for the rain garden). Emphasize that the class will be helping plan the rain garden by checking the soil today.

3. Soil type and soil infiltration demonstrations:

- a. Emphasize that the class will be helping plan the rain garden by checking the soil today. The class will first determine what type of soil the school grounds have and then the class will determine how well water infiltrates through the soil.
- b. To demonstrate soil types, conduct the following Soil Ribbon Test demonstration for the class:
  - i. Using the soil from each of the three (3) plastic containers filled with different soil types (i.e., clay, silt, and sand), demonstrate the Soil Ribbon Test. Follow the Soil Ribbon Test in Figure 3 below.



- ii. Repeat the Soil Ribbon Test for each soil type.
- iii. Optional: Show a photograph of a soil profile and explain the different layers found within the soil profile. For example, the Downer Soils is considered New Jersey's state soil. For more information on Downer Soils and for a photograph, visit: <http://www.nj.nrcs.usda.gov/technical/soils/downer.html>
- c. To demonstrate soil infiltration, conduct the following Soil Infiltration demonstration for the class:
  - i. Discuss soil infiltration by adding the three (3) soil types into the coffee filters. Add water from the 20 oz. plastic bottle onto the soil and discuss the following questions with the students:
    - 1. What you see in the soil?
    - 2. Do you think water will be able to move quickly in clay soil? What about in sandy soil?
    - 3. What do you think is the best soil type to use in a rain garden?
    - 4. What is infiltration?
    - 5. What will happens with the flow of water to the soil if a light rain passes by?
    - 6. What will happens with the flow of water if a heavy rain passes by?
    - 7. Where do you think the cleanest water is found on the earth? Right when it hits the ground or at the top of the water table (after it has been filtered by the soil)?
  - ii. Mark the amount of water within each clear plastic cup a permanent marker. Discuss with the class why there are different amounts of water in each cup.
- 4. Soil Detective Group Activity:
  - a. Break the class into five (5) or six (6) groups, depending on the size of the class.
  - b. Distribute a numbered container filled with materials to each group.
  - c. Discuss the materials in the containers with the students. Demonstrate how to use the magnifiers and allow students to examine clothing, the handouts, or their fingers.
  - d. Discuss the "soil mystery bag" with the students. Tell them that they have to determine the soil type by doing the soil ribbon test and the soil infiltration tests.
    - i. Have students perform the soil ribbon and soil infiltration tests.
      - 1. Give each student the Soil Ribbon Test Handout.
    - ii. Have the students answer the questions on the Soil Detective Activity handout. Discuss the questions on the handout:
      - 1. What type of soil is in your mystery bag?
      - 2. How easily does water pass through this soil?

3. How might this soil affect the land uses within your schoolyard's watershed? Will there be more or less plants?
4. What would you do to make your soil better for a rain garden? What type of soil would you add to it to make it better for a rain garden?

**Part 3: Putting it All Together and Post-Test**

**Estimated Time:** 10 minutes

**Preparation:**

1. Prepare the Stormwater Management in Your Schoolyard journal for each student to complete for this module (Before Lesson and After Lesson).

**Directions:**

1. Moderate a brief class discussion to help pull the module content together. Ask the students the following questions:
  - a. What are the characteristics of clay soil? How does water infiltrate through this type of soil?
  - b. What are the characteristics of silty soil? How does water infiltrate through this type of soil?
  - c. What are the characteristics of sandy soil? How does water infiltrate through this type of soil?
  - d. How does soil infiltration affect the water cycle?
2. Ask the students to answer the prompt in their journal.