OIMB GK12 CURRICULUM

3rd Grade One 90 or Two 45 minute sessions

SOIL EXPERIMENTS I AND II

Oregon Science Content Standards:
3.1 Structure and Function: Living and non-living things vary in their characteristics and properties.
3.3 Scientific Inquiry: Scientific inquiry is a process used to explore the natural world using evidence from observations and investigations.

Goals:

- To use the scientific method to investigate the physical properties of different soils found in estuaries.
- To practice making observations and represent those observations with pictures and words.

Concepts:

- Wetlands are made up of a variety of soils with different particle sizes.
- Physical properties of soil, such as particle size, determine the speed water runs through it.
- Plants need soil that can hold water and nutrients.

Materials:

- Gravel, marsh soil and sand (enough to fill 2L bottles to half-way line, with extra for observations)
- Small dishes to hold samples of gravel, soil and sand (enough for one each per group)
- Magnifying lenses (to share within groups)
- Optional: brock scopes
- 3 2L soda bottles with holes in the bottom and the top cut off and a marked line half way
- 3 pitchers or containers to hold and pour water
- Clean water
- 1 bucket of dark, muddy water
- 3 stopwatches
- 3 plastic tubs to collect water
- Worksheets (one set per student)

OIMB GK12 CURRICULUM

Lesson Plan:

1. Introduce that estuaries are made up of many habitats. Have students make a list on the board including:
    - Sandy beaches
    - Mudflats
    - Rocky/gravely areas
    - Salt marshes
2. Talk about the ground cover/substrate at each of these habitats
    - Sand
    - Mud
    - Rocks/gravel
3. Explain that today we are going to look closely at 3 types of ground (sand, muddy soil, gravel) and find out some reasons why they support different types of plants and animals.
4. Ask what things plants need in order to grow, and make a list on the board. Go over why they need these things. (Plants need nutrients, water, protection or anchorage.)
5. Explain that later we are going to conduct experiments to characterize the ability of three types of ground to hold water and nutrients.
6. First, let's make some observations. Pages 1 and 2 of the worksheet have space for drawings and word descriptions of the ground types. Have the students make observations and fill out the worksheet. Hand out small dishes with the 3 substrates (sand, muddy soil, gravel) and hand lenses. Remind them to share and that they can draw while others are looking at the samples. Use brock scopes if available.
7. Ask students to share their observations. Discuss which ground type is made up of the largest pieces and which is made up of the smallest pieces (gravel to sand to soil).

Note: This is often a good place to stop for the day if time is limited.

8. If starting a second session, remind them of their observations from the first session.
9. Introduce the first question to test: What type of ground holds water the best? Explain the experiment. (They will pour the same amount of water into containers each holding the same amount of a different type of ground, and use stopwatches to measure how long it takes the water to drain.) Discuss with the students why it is important to use the same amount of water and substrate.
10. Remind them that we need to make predictions or hypotheses about what we think will happen before we begin the experiment. Have students look at the 3rd page of the worksheet and make predictions about which type of ground will drain the fastest.
11. Assign roles (pourers, timers and recorders). All students are observers.

12. In front of class, set up the two-liter bottles with sand, gravel and soil. Have student helpers use timers to record the amount of time that it takes for a cup of water to drain to the bottom. Have other student helpers pour the water. Have recorders write down the times and put them in order from slowest to fastest draining types. Everyone observes and calls out when timers should stop. Everyone records the results on their worksheet.
13. Introduce the second question: What type of ground holds nutrients the best? Explain that the set up is similar, but this time they will pour the same amount of muddy water into each container and observe what color the water is before and after it has drained through the ground samples. Explain that the mud represents nutrients (plant food). The clearer the water after running through the substrate, the more nutrients held in the ground.
14. Have the students again make predictions and fill out page 4 of the worksheet.
15. Run the second experiment.

Note: Depending on time, you can run two separate experiments, one with clear water to answer the first question, and another with muddy water to answer the second question, or combine the two into one experiment by pouring only muddy water through the substrates and measuring both time and color. The points come across more clearly with two experiments, but if time is an issue the two experiments can be combined.

16. Which type of ground is best for holding water? At holding nutrients? The muddy soil in a salt mash is best at both. Marsh soils act as sponges that soak up and hold water and nutrients. Because the marsh soil holds water and nutrients, many plants grow there. Not many plants can grow in sand or gravel.

Assessment: Worksheet and discussion

Source: adapted from Anderson, M., N. Field and K Stephenson. 1998. *The 'Land" in Wetlands*, pp. 8-9 in Leapfrogging through Wetlands. Discovering Nature Library.

GK12 Fellow: Tracey Smart

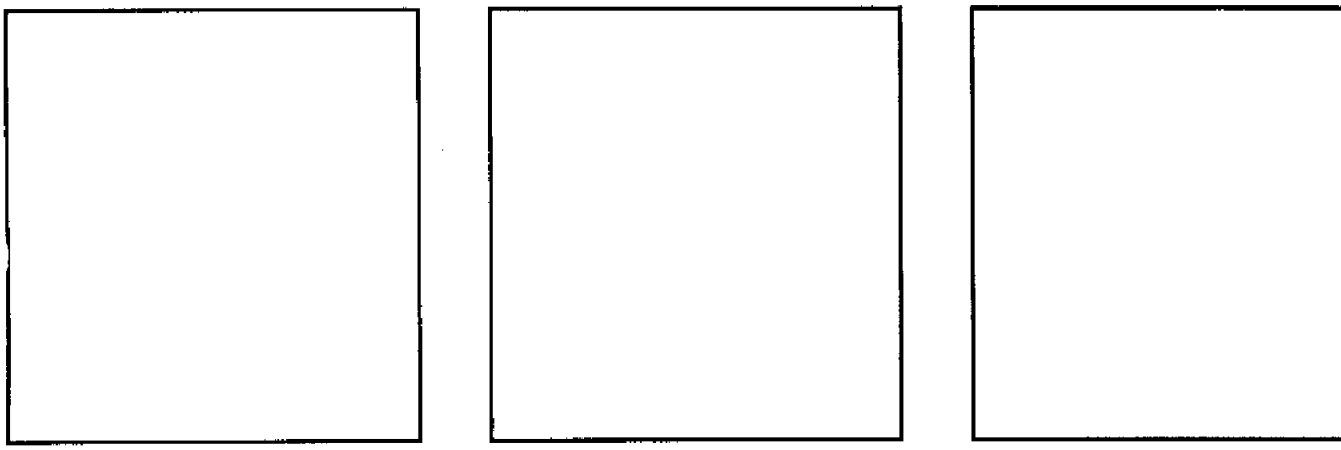
What Makes the Best Soil?

Observations, Predictions, and Results

Today we will **characterize** the types of soil that plants might grow in. We will answer two questions about how water goes through these types of soil.

First, make some observations about these three types of soil:

Draw a picture of what they look like:



Sand Gravel Dirt

Describe in words what they look like:

Sand

Gravel

Dirt

Which one is made of the smallest sizes?

Which one has parts of plants in it?

Which one is the softest?

Which one is the hardest?

Did any of them have any animal parts?

The first question we will answer by doing an experiment is:

What type of soil holds in water the best?

We will pour water into each of the types of soil and time how long it takes for the water to drain out.

Predictions:

I predict/ guess/ hypothesize that the water will drain out of the types of soil in this order:

1. fastest=

2. medium=

3. slowest=

Results:

The results of this experiment showed that the water drained out of the types of soil in this order and it took this long:

1. fastest=

2. medium=

3. slowest=

The second question we will answer by doing an experiment is:

What type of ground cleans water the best?

We will pour muddy water into each of the types of soil and see if it is clearer when it drains out. At the beginning of the experiment, the water is this color

Predictions:

I predict/ guess/ hypothesize that the water will be clearest after going through this type of soil (1), then this type (2), and then will be muddiest in this type (3):

Color:

1. clearest:
2. medium:
3. muddiest:

Results:

The results of this experiment showed that the water was clearest after going through this type of ground (1), then this type (2), but was muddiest in this type (3):

Color:

1. clearest:
2. medium:
3. muddiest: