Outdoor Classroom: Gillespie Museum

Why is the Ground in Florida Sandhills So Dry?

Big Picture
Florida is a rainy state, with an average rainfall of between 50 and 60 inches per year. Yet Florida sandhills are always very dry. Why do sandhills stay so dry even with consistent rainfall?

Core Science:
Students will determine the water holding and draining capacities of different soils, and will investigate how sand contributes to dry conditions for plants and animals.

Levels 1-2

- Observe Nature: Watch water filter at different speeds through different soils.
- Collect Information: Time and record how long it takes water to travel through different soil profiles.
- Explanations of our world: Explore why sandhills are so dry, in comparison to landscapes with humus, organic matter, clay or silt.

Levels 3-5

- Observe Nature: Watch water filter at different speeds through different soils
- Collect Information: Time and record how long it takes water to percolate
- Develop Theories: Predict which type of soil will drain the fastest and discuss why that matters to Sandhill ecosystems.

Background: *Sand, silt,* and *clay* are **inorganic materials**, which include particles of rocks and minerals. Sand is made up of larger particles which can be seen with the naked eye; it has a coarse feel. Silt particles are too small to see with the naked eye; silt is often found in places that have flooded and dried out again. Clay is made up of very tiny particles, which fit together very closely.

Soil also contains **organic materials**, including dead plants, animals, bacteria and fungi. Humus is thoroughly decomposed organic matter.

Materials:

Clear cups
Scalpel
Sharpie
Stopwatch
Rocks of various sizes
Sand
Soils with clay, silt and/or organics
Water and water bottles
Graduated cylinder(s)
Bins (5)

A white board or poster paper for recording times is a useful addition. (See the attached comparison graph.)

Preparation/Set Up:
Use the scalpel to poke 5 small holes in the bottom of the cups. Make sure the holes are all roughly the same size and in the same places on the cups. Mark the cups with a straight line ¾ of the way up, and label it "Soil Level."

Before performing the activity, fill one bin with rocks, gravel, sand, and soil with some mixture of organic matter, silt and/or clay (as available). Leave the fifth bin empty.

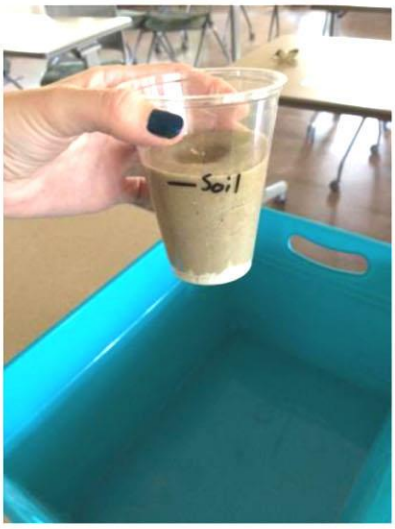
In water bottles (or graduated cylinders), measure out 70mL of water for each student, group, or demonstration.

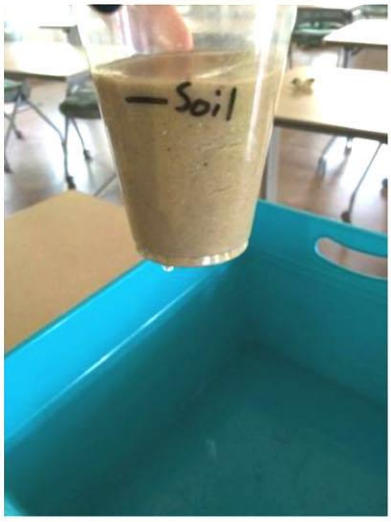
Activity
Give each student a plastic cup to create individual soil profiles: ask each student or group to fill with the rocks, gravel, sand and other soils-- up to the line labelled "soil level." Create at least one profile with sand only, for comparison.

Once students have completed individual profiles, give each student or group the measured container of water and have a student hold the cup over the empty bin.

Start the stopwatch as the water is poured into the cup. Stop the clock when water begins to percolate, or drip down from the holes in the bottom of the cup. On a clipboard or poster/whiteboard, record the times and a very brief description of the contents (e.g. 'sand'; 'mostly rocks'; 'half rocks, half sand').

Note: The contents can then be dumped in the bin to be cleaned and used in another round. Be sure to test many different types of soil combinations in order to see the differences between them.



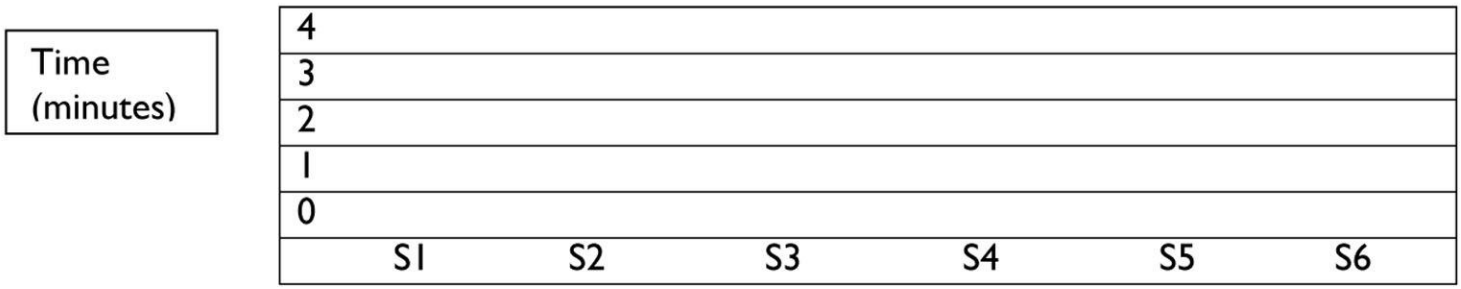


Left photo shows water moving through sand. Right photo shows water beginning to fall out of saturated soil.

Take Away

The soils of sandhill ecosystems remain dry even during rainy periods because the water moves quickly through its sandy composition. A demonstration of how quickly water travels should be clearest in cups with lots of big rocks or gravel because their large size prevents them from fitting closely together, creating large gaps through which water can travel. Cups with lots of organic matter, silt or clay will show water to move the slowest, because their very small particles fit tightly together leaving little space for water movement. In examples with mostly sand, the water flows through gaps that are smaller than those between rocks, but bigger than those between the tiny particles of silt and clay. The sand may turn a darker color and look as though it is absorbing water, as with the top layer of a sandhill, but the water drains out quickly, sometimes faster than it can be taken up by plant roots.

Comparison Chart and Discussion Questions:



Which sample do you think had the most sand? _____

Which sample had the most rocks? _____

Which sample had the most organic matter, clay, or silt? _____

(*Hint: Compare the amount of water collected, the speed of percolation, and the visual evidence.)*