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Activity 4:1 Plants as Indicators of Soil

Protocol Part One

Select two or more uncultivated sites near school that obviously support different plant communities. While you work in one of these sites, other students will be working in other sites that support different plant communities. It is important that you do not select sites that have been planted and nurtured by man (cultivated). Select a section somewhere inside the plot where you intend to take your measurements. This study plot should be representative of the overall plant community you selected to study. Its size will be determined by the size of the plants within it. If it consists of at least some trees you should select an area 10 meters square or larger. If it consists of small plants such as grasses, a one square meter plot will be adequate. If the site you are studying is not large enough for all groups to establish plots of sufficient size, it is permissible to allow your plot to overlap with those of other students. Take some time to inventory what grows there. How many plant species do you see? If you can identify these by name, so much the better, otherwise call them species A, B, etc.

Carefully note anything else you observe about the site. Are plants growing in full sun or is it partially shaded? Is there evidence of disturbance? For example, do you see evidence of an old road or, perhaps, a ditch? Study the ground, what evidence do you see that man might have passed this way? How about other animals? Do you see tracks? Take time to note these and to identify them if possible. Sketches of all you see will be helpful later.

Protocol Part Two

Determine the direction and steepness of slope within your study plot. To do this, hold your compass in front of you and face downhill. Record the direction you are facing as a number of degrees. For example, if you are facing directly east, your compass will read 90 degrees. Directly south will be 180 degrees. Southeast will be somewhere around 135 degrees.

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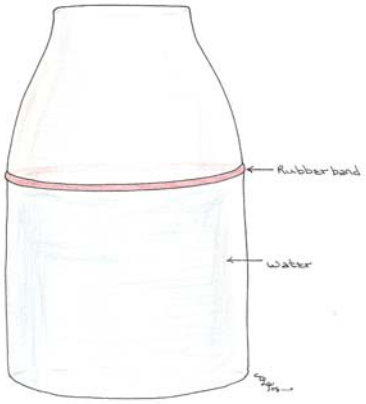
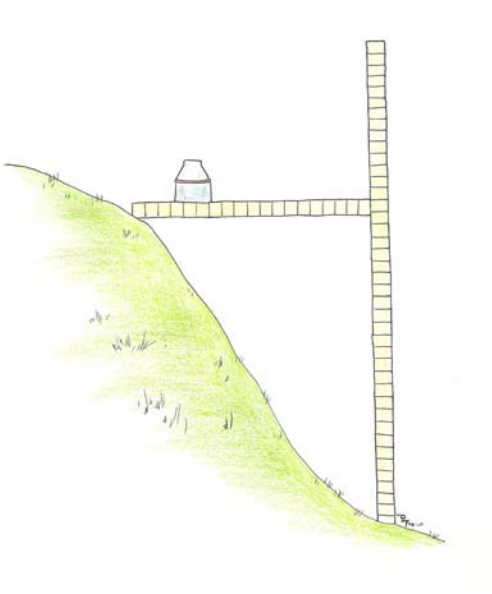


Before you go on you will need a level. You can either use a carpenter's level or you can construct one. To construct a level you will need a small jar half filled with water. While the jar is sitting on a level surface put a rubber band around it at the top of the water. Make sure the rubber band is exactly at the top of the water's surface all the way around the jar.

Now determine steepness of slope. Your answer will be recorded as a percentage. To do this place a meter stick so that one end touches the ground on its uphill side. Position the meter stick so that it is perfectly level. If you are on a hillside, the downhill side of the meter stick will be off the ground. The steeper the slope, the higher off the ground will be the downhill end of the meter stick. Use your level to make sure the meter stick is perfectly level. While you do this have your partner use a second meter stick to measure how many centimeters the downhill end of your meter stick is off the ground. Since this is how many centimeters the slope falls for each 100 cm of downhill run, you can convert this number directly into your percentage of slope. For example, if the ground is perfectly flat, your slope will be 0%. If you are doing this on a slope that is so steep that it is 100 cm from the downhill end of your horizontal meter stick to the ground, you are measuring a 100% slope.



Record the incidence (direction) and steepness of the slope where you are working.

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Procedure Three

You will now measure soil compaction. Some plants require loose soils while others tolerate soils that have been tightly compacted. To accomplish this, you will need a soup can from which both ends have been removed. Press the can into the soil a couple millimeters. Set a stopwatch or keep an eye the second hand on your wristwatch. While your partner holds the can into the surface of the soil, quickly fill it with water. Time how long it takes for the water to completely drain out of the can and into the soil. The more compacted the soil, the longer it will take for the can to drain.

Procedure Four

Depending on how much time you have, you can either test your soil at the site or collect a sample to test back at school. Carefully follow the directions in your soil testing kit to test for as many chemical characteristics as possible. Most soil test kits allow you to test for pH, nitrogen, potassium, and other important nutrients.

Lab Report

Exchange observations and data with a team that studied a site that was obviously different from yours. You will need both sets of data to write your lab report.

Your lab report will include:

- drawings you made in the field
- data you collected compiled into a table. This will include percent and incidence of slope, results of your compaction test, and results from the chemical soil analysis you did.
- answers to the following questions

1. Identify the dominant plants that you found in both sites. Name them if possible and include drawings you made in the field.

Try to encourage students to identify plants by name. Common names are acceptable.

If this is not possible, they should name the species as A, B, etc.

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2. In what major ways do these two plant communities differ?

Students should talk about exposure (incidence and steepness of slope), soil compaction, light conditions, and soil type. It should begin to occur to them that different plant communities have different requirements.

3. From the experience you gained doing this lab, describe how botanists use plants as indicators.

Since different plant communities have different requirements, it is safe to assume these requirements have been met where we find them growing. When one finds plants growing in a certain locality, he can assume they are growing in soils and under conditions required by those plants. Students might also note that different animals live in different plant communities so one can predict the animal life by noting the makeup of the plant community.