Mulch and Evaporation

An Experiment to Explore the Role of Mulch in a Forest

In this experiment about water evaporation, students compare soil covered with mulch to soil that is bare, testing changes in soil moisture over several days. This activity is done ideally in full sun, during a warm and dry week. Plan on two short sessions spaced several days apart.

GRADES 3-12 | SCIENCE | EXPERIMENT | TOOLS REQUIRED

Materials

- Moisture meters with a scale of 1-10
- Mulch materials, such as wood chips
- A container of water such as a watering can
- Craft sticks
- Science journals or data sheets prepared in advance
- OPTIONAL ALTERNATIVE: 1-gallon plant pots filled with soil
- **Timing:** Ideally, choose a warm, dry week for this experiment.

Instructions

Step 1: Choose Two Study Areas or Prepare Two Containers of Soil

Choose two areas of bare soil on the schoolyard, in a sunny location, that are at least 1 foot by 1 foot in size. These are called Area 1 and Area 2 in the rest of this activity. Test the soil in advance with a moisture meter to make sure it is not too compacted/hard for moisture meters to probe and for water to infiltrate. This activity will NOT provide accurate results if the soil is unable to absorb water. If this is the case, try another area or use the alternative.

Alternative: Conduct this experiment in two 1-gallon pots filled with potting soil. This will ensure that the soil in each pot also has the same drainage qualities and will avoid problems with soil compaction issues in heavily walked-upon areas of the schoolyard.

Variables: The only variable being manipulated will be the addition of mulch. To keep all controlled variables as similar as possible, both Area 1/Pot 1 and Area 2/Pot 2 should be:

- the same size
- similar soil types
- in the sun for a large portion of the day
- near each other so they get similar sun and wind exposure all day
- similar distances from trees and other plants
- flat or on the same gradient

Step 2: Mark Test Locations within Area 1 and Area 2

Mark the center of each area with a craft stick, twig, or any other means.

Step 3: Water the Soil

Water both areas with similar volumes of water until the soil is wet at least 4 to 5 inches down. (This could take a day or two if the soil is hydrophobic, so plan ahead.) Use the moisture meter to ensure that moisture levels are the same in both study areas. It should have a reading of 7 or higher, at an equivalent depth in both areas. Decide on a standard depth when pushing in the moisture meter.

Step 4: Record Initial Moisture Readings

Students record these initial moisture readings.

Step 5: Place Mulch on Area 2/Pot 2

Leave Area 1 uncovered. Cover Area 2 with 2 to 4 inches of mulch, such as wood chips, straw, or shredded newspaper.

Step 6: Record Predictions

Ask students to make predictions about what they think will happen in a day or two. Will soil moisture levels change over time? Will moisture levels remain the same in the two areas or be different? Why?

Step 7: Measure and Record Second Moisture Readings

Return within a few days and use the moisture meters to measure the moisture in the center/test locations in both Area 1 and Area 2. Push the moisture meter to the same soil depth as used for the original reading to avoid false results. Note: Do not include the mulch depth when measuring depth. Students record results.

Step 8: Analyze and Discuss Results with Students

Discussion questions can include: “Was there a difference over time in the two areas? Why was there a difference in moisture levels? Where did the water go? What could we try next? How can we apply what we learned to our school forest? How would it affect the trees?”


Brian Montez

Extensions

1. Repeat measurements at several intervals, such as after 1, 3, and/or 7 days.
2. Conduct the same experiment in a heavily shaded area of the schoolyard.
3. Include thermometers to study differences in soil temperature in mulched versus unmulched areas.

Sample Format for Data Table

Date	Time	Area 1 Moisture	Area 2 Moisture

NEXT GENERATION SCIENCE STANDARDS

Disciplinary Core Ideas

- Ecosystems: Interactions, Energy, and Dynamics
- Earth's Systems
- Earth and Human Activity

Crosscutting Concepts

- Cause and Effect
- Patterns

Science and Engineering Practices

- Planning and Carrying Out Investigations
- Developing and Using Models
- Analyzing and Interpreting Data
- Obtaining, Evaluating, and Communicating Information

NATIONAL SCHOOLYARD FOREST SYSTEM

The National Schoolyard Forest System℠ seeks to create schoolyard forests on PreK-12 public school grounds across the country to directly shade and protect students from extreme heat and rising temperatures due to climate change. This initiative was founded by Green Schoolyards America, and launched with California as the first state in partnership with the California Department of Education, the California Department of Forestry and Fire Protection, and Ten Strands.

For more information, visit:
greenschoolyards.org/schoolyard-forest-system

National Schoolyard Forest System℠

green schoolyards america

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