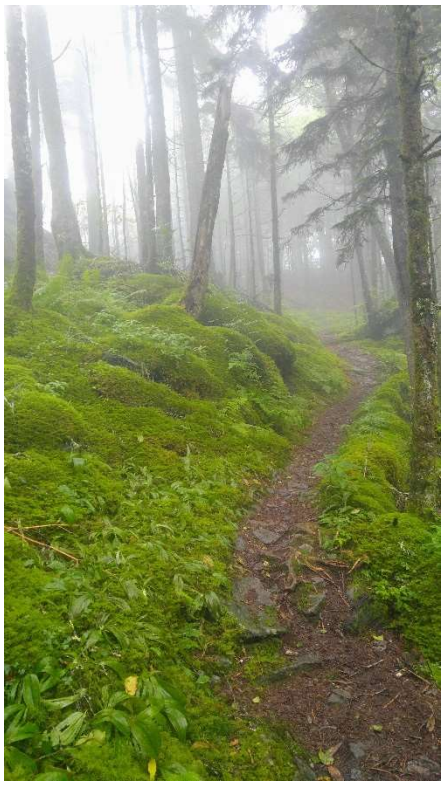
Backyard STEM for Tennessee 4-H



The Power of Plants!

Learning Objectives

Students will be able to:

1. Set up an experiment with two variables.
2. Make observations and record time variable data.
3. Create a graph from recorded data.
4. Interpret data and draw conclusions from an experiment.

Setting the Stage

Heating and cooling systems help keep our houses at a nice temperature regardless of the cold or hot weather outside, but what keeps the good temperature air in? What lies in the walls of buildings that helps keep that good temperature? If you said insulation, then you are right! The insulation in walls and ceilings keep the good temperature air from mixing with the hot or cold air outside. Does the earth have Just as a house's insulation can regulate (or keep about the same) the air temperature the same over different seasons, soil temperatures are regulated by the presence of plants. As plants grow, they produce biomass that falls to the ground and develops a layer on top of the soil. This layer of biomass acts like insulation for the land, helping to protect the soil and everything that lives in it against the extreme temperatures that the weather above may bring. In this activity, we will set up an experiment to collect data to show the power of plant biomass at insulating soils and show how plants may be a critical in the face of a warming global climate.

Activity

<u>Steps:</u>

Day 1:

1. Using the small shovel and bucket, collect enough local soil to fill all pie tins. Remove as much organic material from topsoil as possible and break up clumps until it is as homogenous as possible.
2. Lay out soil in sunny spot for about 24 hrs so it will dry. This may also be done in a large foil tin in the over set at 105 F.

Day 2:

3. Use ruler to measure and mark 1 inch from the top of the pie tin.
4. Fill each pie tin with dried soil to the mark. A scale may be used to measure out the same amount of soil in each tin.
5. Slowly at ½ cup of water to each tray and cover with lid or plastic bag overnight.

Day 3:

6. Remove trash bags from trays and inspect soil to ensure it is consistently moist throughout. If needed, carefully tip the tray sideways to allow excess water to drain out.
7. Insert thermometer into each soil tray so the measuring tip is about midway in the soil. Check to see that all thermometers are reading the same temperature.
8. Place about 1 inch of mulch over the entire soil surface of two of the four tins.
9. Using masking tape, label the tins according to variables: North/Mulch, North/Bare, South/Mulch, South/Bare
10. Place one set of two tins (mulch and bare) outside on the north side (or shady) of the building. Place the other two tins on the south side (or sunny) of the building.
11. Ask students to access a weather forecast for the next week. Discuss the variations in high and low daily temperatures forecasted. This activity is best done when there is wide variation (more than 15 degrees) throughout the day. A gloomy winter day will not have much different in the high and low temperature, so there will not be much change available to observe.
12. Hypothesize about the results. Will the soil temperatures be the same in each tin? Will the tins on the north and south sides of the building have similar temperatures? Will one be warmer than the other? How will the tins with mulch compare to the bare soil tins?

Days 4-11:

13. Record the daily high and low air temperature for your area (could use a school thermometer, local paper, or local news). Record these in the observations chart.
14. For each tin, record the minimum and maximum temperature each day on the observations chart. Reset thermometers each day so they record the 24-hour (or daily) max and min.
15. Compare results with the hypothesis. What are the reasons for the differences observed between the tins. Which side of the building (north or south) experienced the highest temperatures? Did mulch insulate the soil and regulate the soil temperature against the air temperature extremes?

Use the south tins as an example of a warming climate and highlight how plant biomass (mulch) helped protect the soil and its inhabitants against extreme temperatures.