
UNIT 6

Biotic and Abiotic Components of Local Ecosystems

Purpose

The purpose of this lab is to identify the biotic and abiotic elements of two local ecosystems, one disturbed and one undisturbed. Your instructor will take you to two different outdoor locations, where you will perform a survey of all the biotic and abiotic elements that make up each ecosystem. The first ecosystem you will survey will represent an undisturbed ecosystem. An undisturbed ecosystem is one that has not been exposed to intense human activity. The second survey will investigate a disturbed ecosystem that has been exposed to intense human activity. Make sure that both the undisturbed and the disturbed ecosystems are similar ecological systems. For example, if you have a forest nearby, choose a pristine section of the forest to represent the undisturbed ecosystem. Choose another section of the forest that has been exposed to human activity to represent the disturbed ecosystem. Forest ecosystems work best for this lab, although other ecosystem types may also be used.

Materials

- measuring tape
- vinyl ribbon tape
- field guides
- thermometer
- humidity sensor
- compass
- clinometer
- soil pH meter or test kit
- light meter
- small paper bags
- 2-liter plastic soda bottle
- watch glass
- isopropyl alcohol
- forceps
- coarse screen
- ring stand
- heat lamp
- dissecting microscope or hand lens

Procedure A

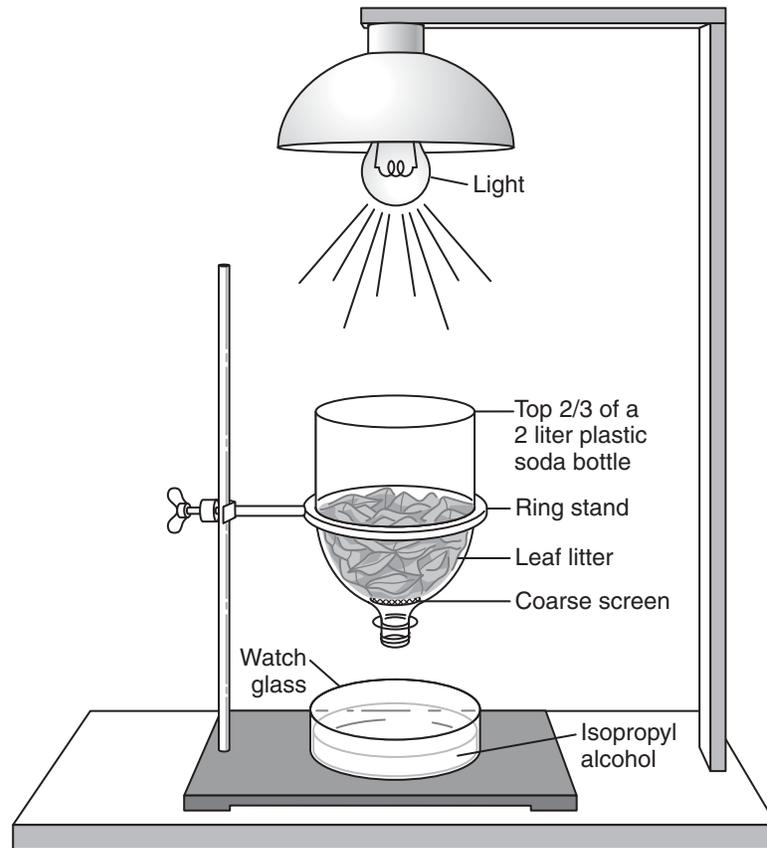
1. For each ecosystem, first identify the species of organisms you find within a 10-square meter plot. Have your instructor help you identify a good place for your survey. Once you have set up your perimeter, mark it with your vinyl ribbon tape. Use your field guides or ask your instructor to help you identify the biotic components within your perimeter. Make a list of all the species you have identified.
2. Next, count the number of each individual species you have identified within your study area. Try to be as accurate in your counting as possible.
3. After you have completed your biotic survey, identify and record some of the abiotic components in your study area. These will include the following: air temperature at 1 meter above the ground, soil temperature at a depth of 2 inches, humidity 1 meter above the ground, light level 1 meter above the ground, soil pH, slope of the study area, compass direction the study area faces, color of soil, and rock types if available.
4. Finally, take a sample of the leaf litter at the ground surface. Scoop up a large handful of organic debris at the soil surface, and place it in your paper bag. Make sure to label it so that you can tell the difference between the disturbed and undisturbed leaf litters.
5. Repeat the above procedures for both the disturbed and undisturbed ecosystems. It may take more than one day to complete both site surveys.
6. After your surveys are complete, return to the lab with your bags of leaf litter, and with help from your instructor, set up two Berlese-Tullgren funnels (see Figure 1), one for each ecosystem. This will help you identify the organisms that live within the leaf litter at the ground surface. Place your leaf litter into your funnel and turn on the lamp. The heat from the lamp will cause any organisms within the leaf litter to move down away from the light and heat, and they will then fall into the watch glass filled with alcohol. Leave the funnel set up for 24 hours.



SAFETY CONCERN

MAKE SURE THAT THE LIGHT IS NOT TOO CLOSE TO THE PLASTIC BOTTLE OR LEAF LITTER—THIS MAY RISK MELTING OR BURNING THE MATERIAL!

7. The next day, turn off the light and examine the watch glass for organisms using a dissecting microscope or hand lens. Identify the organisms present in the leaf litter and add them to your inventories. You may choose to just identify the organisms as either an insect, arthropod, or worm, and how many of each there are.



Caution: Make sure the light is not too close to the leaf litter or the plastic bottle, this may risk melting or burning the material!

FIGURE 1

Procedure B

1. For each ecosystem, calculate the biotic abundance for each species of organism you identified in your survey using the following formula:

$$\text{biotic abundance (\%)} = \frac{\text{number of species}}{\text{total \# of all organisms}} \times 100$$

For example, if you counted 10 white pine trees within your survey, and the total number of organisms within your plot was 100, the biotic abundance of white pine trees would be calculated as 10 percent.

2. Using the biotic abundance data for each ecosystem, create two bar graphs that shows the abundance for the disturbed and undisturbed ecosystems. The *x*-axis should be labeled "Organism," and the *y*-axis should be labeled "Percent Abundance."
3. Prepare a formal lab report that outlines all of the aspects of this lab exercise. Your formal lab report should include a title page, purpose, materials list, procedure, data gathered (tables and charts), and a conclusion.

Conclusions

1. What is the definition of an ecosystem?
2. Which of the two ecosystems you surveyed had the greatest amount of biological diversity (different number of species)?
3. Using the data on the biotic components of each ecosystem, which trophic level had the greatest abundance: the producers, consumers, or decomposers?
4. Describe the differences between the biotic or abiotic components you found in the disturbed and undisturbed ecosystems.
5. After performing this lab, what is the best way to identify whether an ecosystem has been disturbed by human activity?