How-To-Do-It

Would You Trust a Bryophyte for Directions?

A Field Exercise for Determining the Distribution of Moss on Trees

Lissa M. Leege

Every introductory biology course preaches the importance of scientific method, but often students do not have the opportunity to develop and test scientific questions in those very courses. For example, published lab manuals for the traditional "survey of the kingdoms" course rarely recommend little more than that students observe live and preserved materials and prepared slides in the lab. I designed the following field exercise both to illustrate the ecological requirements of a group of organisms (the mosses) and to allow students to test a hypothesis so popular that it has made its way into folklore: "Moss only grows on the north side of trees."

The bryophytes, plants such as mosses and liverworts that lack vascular tissue and depend upon water for fertilization, are an excellent subject for study in the field because they are abundant and they are present yearround. One might predict that mosses would be more abundant in moist, shady locations than in dry, sunny habitats because they are tied to water for survival and reproduction. The physiological dependence of mosses on water, coupled with the inclination of the sun in the northern hemisphere underlies the biological explanation for the folklore belief that moss grows only on the north side of trees. In the northern hemisphere, solar radiation strikes south-facing objects directly, while the north-facing objects melt to the best windows for house plants (south facing because the sun shines on them all day). Does aspect (north or south-facing) also dictate the distribution of moss on trees? In other words, would you trust a bryophyte for directions?

Once students have been introduced to key characteristics of a particular group of organisms, it becomes possible to develop hypotheses about the ecological consequences of these characteristics. With rare exceptions, the distribution of a species in nature is inextricably tied to its physiological limitations. In order to train good scientists, we must teach our students to ask research questions and give them practice testing those questions and analyzing the results.

In this field exercise, students are challenged to test the hypothesis that moss grows preferentially on the north side of trees. The exercise clearly accomplishes two goals:

1. It involves students in the process of science: students ask a scientific question and test a hypothesis by collecting and analyzing data.
2. It illustrates how the key morphological and physiological characteristics of mosses result in ecological consequences that predict their distribution in the field.

For the university level introductory majors' course, I give the students the following information.

Background

Folk wisdom indicates that moss grows only on the north side of trees. Native Americans and North American pioneers are said to have found their way through deep forests by using the location of moss on tree trunks as a compass that pointed them north. In this exercise, we will be investigating this hypothesis using mosses growing on our campus.

How does the north side of a tree differ from the south side? What do you know about the environmental requirements of moss that would restrict its distribution to the north side of trees? If you were in the southern hemisphere would your prediction change? Why or why not? What is your hypothesis for this study? Your prediction?

Suggested Protocol

Test your hypothesis by recording the location and abundance of moss on trees on the campus.

1. Split up into teams of four students and spread out across the campus. Each team will need a COMPASS, TAPE MEASURE, GRID (a transparency marked with 100—1 cm x 1 cm squares), and DATA SHEET.
2. In a systematic manner, sample a series of 10 trees (or as many as time allows).
3. Fill out the data sheet for each tree, indicating the species of tree and the number of squares in each grid with moss present at 0.5 m above the ground on the tree trunk on north and south sides of the tree. Include notes on observations you make on any abnormalities for each sample.
4. Calculate the percent cover of moss for each sample (100 * # squares with moss/total # of squares in the grid). Determine