

# Biodiversity Activity

Note: The following research idea is a draft activity excerpted from an upcoming book to be put out by Earth Partnership staff. If you try it, let us know how it went by sending a note to [epp@mhub.facstaff.wisc.edu](mailto:epp@mhub.facstaff.wisc.edu).

## What's Green and Grows All Over? Studying Ecosystem Biodiversity

ACTIVITY TIME: 45 minutes to one hour

MATERIALS NEEDED: Each student group will need one hula hoop or set of four equal-length sticks\* or other device to mark off quadrats, and two accessible "ecosystems" for comparison—one natural or restored and one cultivated, such as lawn.

\* The four sticks can be of any, equal length. A stick about 30 cm makes a easily managable square.

SEASON: late spring, summer, early fall

OBJECTIVES: Students will:

understand issues related to species biodiversity and distribution

collect and interpret data to answer a question

graph data and extract, interpret and use information presented in the graph

explore and determine best data collection procedures

SUMMARY: Students compare the biodiversity of a natural or restored ecosystem with a lawn or other cultivated "ecosystem."

## SPECIFIC BACKGROUND

This activity provides students with an opportunity to sample and compare the plant biodiversity of different sites. For this exercise, the plant biodiversity is defined as the number of different plant species on a site. Sites that would provide interesting comparisons include a lawn, an old field, a one-year restoration, an older restoration or a remnant.

The most direct way to inventory the number of different plant species on a site is to count them. However, usually one cannot count all species in an ecosystem and therefore must be content to sample a small portion of the system and use this sample to estimate the total. These sampling areas or quadrats can be of

any known size or shape but need to be randomly distributed and sufficiently numerous so that the number of species found within the quadrats is representative of the entire population.

In many cases, a single prairie quadrat will have fewer different species than will a quadrat taken from a lawn. However this is not due to a lower biodiversity in a prairie but rather the fact that prairie species tend to clump together whereas in a lawn species are distributed in a more homogeneous pattern. Therefore, a single quadrat may "capture" most of the lawn species but only a few of the species in the prairie. Subsequent quadrats in the lawn will reveal few new species while subsequent prairie quadrats will contain numerous new species.

The Species Area Curve helps examine this situation. A sample species-area curve is shown below. The graph plots the cumulative number of species encountered versus the number of quadrats. The graph levels off when additional quadrats encounter no new species. Note that after several quadrat samples the total number of species found in the prairie exceeds that of the lawn.

In addition to being used to compare ecosystems, the Species Area Curve is a useful tool in determining whether students have sampled enough quadrats to determine the diversity of the ecosystem adequately. The number of sampling quadrats needed depends in part on the nature of the vegetation being sampled (in particular, its diversity and spatial distribution). As long as the graph continues to rise, students are still finding new species, and more quadrats are needed to inventory the ecosystem completely. At the point when the Species Area Curve levels off, a sufficient number of quadrats will have been taken to accurately assess the species diversity in an area.

## ACTIVITY DESCRIPTION

Divide into research teams. Each team should take an index card with a large loop of tape on it and a hula hoop (or four sticks of equal length for a square quadrat). Randomly choose a spot in the prairie for the quadrat by throwing the hoop or a stick over your shoulder. If you are doing an annual survey of your restoration, you may have permanent sampling plots set up.

Count the number of different species of plants in your quadrat. If the plants are very small, place a small leaf of each species on the tape (generally appropriate for spring studies). If the plants are large, sketch the leaf and note any other identifying traits. Identification of the plant is not necessary. Repeat the process in a lawn.

Rejoin the class and examine the cards and sketches. As a class, plot the number of species found in one group's quadrat on a Species Area Curve. A second group should then examine their data to see if they found additional species that the previous group did not mention. Plot the second data point by

taking the number of species found by the previous group and add to that the number of additional species found by the second group. For example in the curve below, Group 1 found six species on the prairie. Group 2 found three species the group 1 did not find. A dot was then recorded at nine for Group 2 to represent the total number of species found by both groups. Group 2 need not have found all of the original six identified by Group 1.

Plot the number of additional species this second group has found. Continue plotting the number of new species found by each group in the class. Create separate curves for each ecosystem sampled. Determine the average number of species per plot and the total number of species by the class.

What is the difference in species distribution between the two ecosystems sampled?

How could misleading results arise from improper sampling methods?

## EXTENSIONS

Record the number of insects, spiders and larger animals in each quadrat. Become a sleuth and find as many traces of animals as possible. Traces of animals can include decayed leaf matter, a litter layer in the soil, a gnawed leaf, a spotted or slightly diseased leaf, a spider's web, and so on.

Repeat this study each year in a restoration to monitor the change in the restoration as it matures.

Instead of randomly selecting the quadrat spot, sample a spot that you consider to be representative of the prairie. How does this change the results?

For Older Students: Identify the plants in your plot. Identification of plants prior to blooming is very difficult but a good key should allow identification of all blooming plants

## ADDITIONAL RESOURCES

Any basic ecology text should have further discussion on Species Area Curves.