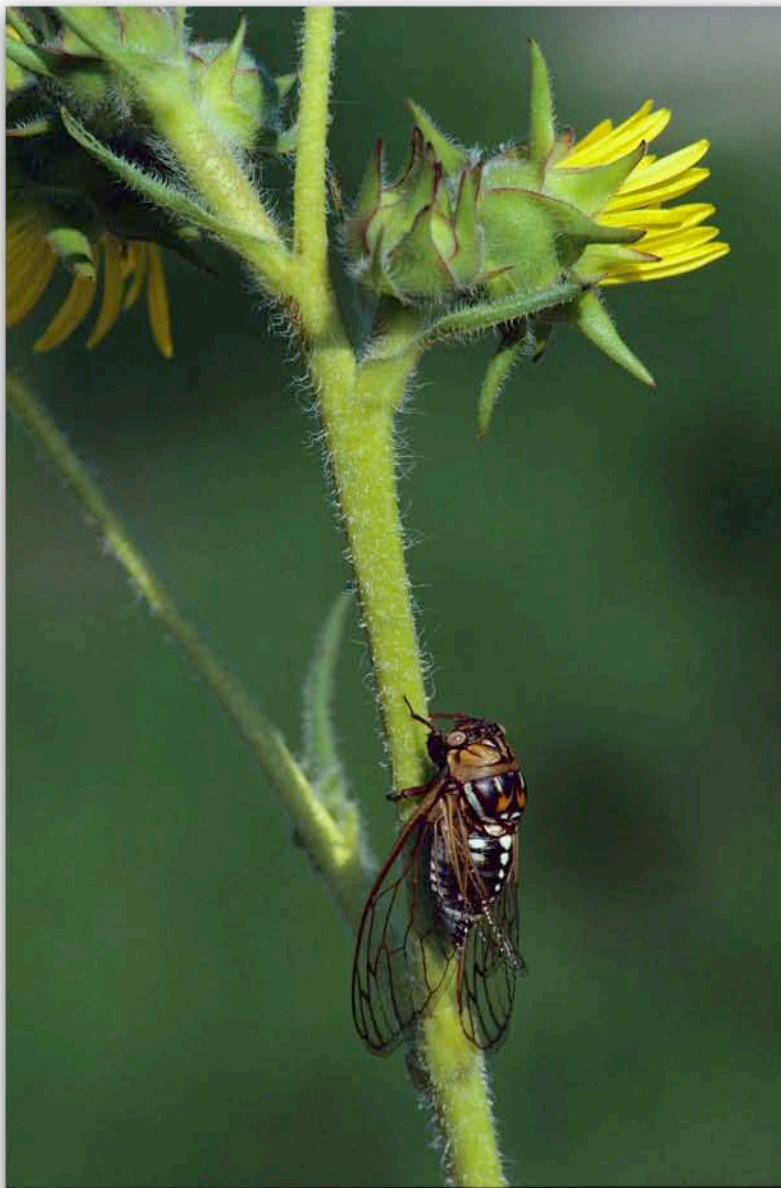


The Spice of Life: Assessing Species Diversity

Overview

Students will use a biodiversity index model to assign numerical values to the biodiversity of a given habitat.



Title

The Spice of Life: Assessing Species Diversity

Investigative Question

How can various habitats be categorized in terms of their biodiversity?

Overview

Students will use a biodiversity index model to assign numerical values to the biodiversity of a given habitat.

Objective

To familiarize students with a technique used to measure biodiversity.

Materials

Per individual: Student Pages 1, 2, and 3

Per group: a paper lunch bag (habitat bags), a bag of assorted dry beans, modeling items (cereal, candy, shells, beans), student handouts.

For field work: teams of three to four students, data sheets, clipboards for field work are recommended.

Per teacher: large box of animal crackers.

Time

One 50-minute class period.

Advance Preparation

Prepare and label habitat bags with predetermined bean percentages, such as 100% red beans, 50% lima beans, and so on.

Introducing the Lesson

Have students select an animal cracker from the animal cracker box. Record the first letter of each animal's name in a row on the chalkboard until all have been used. Be dramatic! Ask the students "what have we just done?" State that a random selection process just

occurred and the class has measured the "diversity" of the animal cracker "habitat" box. How? Now we will see!

Procedures

1. Distribute Student Pages 1, 2, and 3 and have students read each.
2. Discuss the techniques on the Student Pages and ask how the technique could be applied to the initial animal cracker activity.
3. As a class, calculate the diversity index for the animal cracker data.
4. Distribute the habitat bags and have pairs of students do a diversity index on the dry beans by randomly selecting 30 beans.
5. Discuss the questions found on Student Page 3.

Assessing the Lesson

Apply the same technique to an assortment of sea shells, jelly beans, or other items.

Extending the Lesson

Try using the diversity index to identify various plant species encountered on a transect line set up on a grassy plot outside your school or on a walk around the school property (count plants as they are encountered). Students need not identify each species, only recognize identical or dissimilar species. See Experiment 3 in this manual.

State Goals

6, 7, 8, 10, 11, 12 (Objectives, 11.4.01-04, 11.7.01)

Concept

Diversity can be described and quantified with a mathematical index.

Safety and Waste Disposal

None

Student Page #1–Background Information

Biological diversity refers to the variety of organisms in a habitat or ecosystem. It can be viewed at several different levels. For example, in ecosystem diversity, an area interspersed with croplands, grasslands, and woodlands will have more diversity than an area where the woodlands have all been converted to grasslands or croplands. In species diversity, a native grassland with 100 species of grasses, forbs, and shrubs has more diversity than the same area after heavy grazing has eliminated many of the perennial grass species. A less obvious level of diversity is genetic diversity within a species. If you were to examine two members of the same species from different parts of their ranges, you would find that they differ in certain ways. As an example, examine four of your classmates. Are they identical? What you see is genetic diversity within the species *Homo sapiens*. Much of this variation can be attributed to differences in the genes those individuals inherited from their parents. Generally, the concept of biological diversity is easiest to understand at the species level. Species diversity may simply be a measure of the number of species that inhabit a given area, but arriving at an accurate estimate of species in a natural habitat is not always simple. It should be remembered that when habitats are disturbed, the first factor that is affected is diversity. Thus, an “index of diversity” can be used to compare healthy and disturbed habitats or to determine the damage that has occurred in a habitat.

Student Page #2 – The Spice of Life - the Diversity of Species

The diversity index is a formula that has been developed to compare healthy and disturbed habitats. The index generates a number between 0 and 1. What does this diversity index number mean? The lower the number, the less diverse the area is. A healthy forested area in Illinois should have a diversity index of .7 or .8 while a crop field may have an index of >.01.

Part I - In a particular forest, five different species of trees can be found. A forester chooses an area and walks along a straight line (a transect) and identifies each tree. The results of this transect and identification are recorded on the forester’s data sheet like this:

CAEDEEEEDDDDDDAAAAABBBBEEEECCDDDD

Thirty-two trees have been identified in this TRANSECT.

Now, TO FIGURE THE NUMBER OF RUNS (when a different species is encountered than the previous one), DRAW A LINE ABOVE OR BELOW EACH IDENTICAL LETTER OR LETTERS AS SHOWN:

CAEEEEEEEDDDDDDDDDAAAAAABBBBBBBEEEEEECCDDDD

In this example there are 11 runs. Use the formula listed below to figure the diversity index:

$$DI = \frac{\# \text{ of Runs}}{\text{Total \# of Organisms}} \qquad \text{Example: } \frac{11}{32}$$

DI = _____

Part 2 - Animal Cracker Diversity (Your teacher might decide to use other materials.)

Refer to the letters representing the animal crackers you randomly selected at the beginning of class. Mark the runs as shown in the example and count the total number of runs and total number of individuals. Use the formula to find the DI of the animal crackers.

Student Page #3–Part 3

1. Your teacher will give you and your partner a paper lunch sack with dry beans. Do not open your bag.

2. As a class, agree on the letter symbols you will use to represent each possible bean type (teacher will show examples).

3. Record the number of your habitat bag below. Now begin removing beans from your habitat bag, randomly, one at a time. Using the letter symbols agreed on, record your results. Remove 30 beans.

4. Calculate the DI of your habitat bag and record the number.

5. Can you suggest what kind of habitat might be represented by the diversity index of your habitat bag?

Record Beans Here:

Diversity Index =