Rainforest Biodiversity

Introduction

The same high trees stood like a fortress along the forest's edge; the same profusion of birds and insects foraged through the canopy and understory in precise individual timetables. All this seemed timeless, immutable, and its very strength posed the question: How much force does it take to break the crucible of evolution?

—Edward O. Wilson, *The Diversity of Life*, New York: W. W. Norton and Co. 1992.

Biodiversity—in this case species diversity—is defined as the variety of distinct species inhabiting a given ecosystem, whether continent, island, forest, field or pond. Here is a simple and yet wonderfully illustrative activity to demonstrate this vital and topical concept.

Materials

Two shoe box lids (or like-sized trays) per student pair

Wide assortment of beans and seeds
(A good start is a package of *15 Bean Soup Mix*. Supplement this with other types of beans, peppercorns, coffee beans, barley, sunflower seeds, yellow and blue popcorn, cloves, chick peas, pumpkin seeds or anything similar that will not spoil or disintegrate. Try to gather 30 or so visually distinct varieties.)

Safety Precautions

This laboratory activity is generally considered nonhazardous. Once food-grade items are brought into the lab, they are considered chemicals and should not be consumed. Please follow all laboratory safety guidelines.

Procedure

1. For this activity you will need two bags of assorted beans/seeds. The first bag—representing a temperate forest—holds a mixture of three kinds of beans. Choose cheap beans available in bulk, such as lima, pinto, navy, red or black beans. The second bag—representing a tropical rainforest—should be as diverse an assortment as possible. See the *Materials* section for suggestions. Since most of these beans or seeds will be needed only in small amounts, you might have students bring items from home.
2. Students should work in pairs. Each pair should have two trays, one labeled "Temperate Forest" and the other labeled "Tropical Rainforest." Each student pair receives a scoop from each bean mixture, distributed into their respective trays.
3. The students should work with the beans in the "Temperate Forest" tray first. Instruct students to sort the beans into like piles and to count and record the number of beans in each pile. Results should be recorded as: A = 67, B = 74, C = 45 (arbitrarily assign letters to bean types).
4. After students have completed sorting the "Temperate Forest," have them sort the "Tropical Rainforest" following the same procedure described in step 3. Try to control the mixture so several types will be represented by as few as one bean/seed. It should be virtually impossible to get more than 20 of one type. Data for this mixture should look like A = 1, B = 3, C = 7 and so on—often through Z and beyond to AA, BB, CC, etc.

Discussion

The recorded results are similar to what a field researcher would encounter in surveying a plot of rainforest or temperate forest. Each bean/seed represents a tree species. In the U.S., a hectare of forest generally contains 5–10 tree species—many of each. A particularly diverse area may reach 15 species per hectare. In the Amazon basin, however, each tree encountered may be a new species, with nearly 300 species possible on a single hectare. The biologist may walk a mile before finding a second tree of the same species, as around two-thirds of the species recorded are represented by a single specimen, and many more will be represented by only two or three individuals.

Students can chart or plot their data on bar graphs and conduct statistical analyses depending on their age level and math background. Abundant information exists on rainforests and biodiversity for independent research—enabling students to

Publication No. 10097
020419

build on this activity and perhaps report their findings to the class.

Some questions to discuss:

- Which forest requires the greatest number of animal species to act as pollinators or seed dispersers? (In tropical forests many of these animals are specific to only a single tree/plant species; temperate forests contain more generalists.)
- Which forest would be more devastated by a disease or infestation that attacked a specific tree species? Why? How does diversity (and spatial proximity) offset such infestations?
- What benefits/obstacles does the diversity present to someone trying to live by sustainably harvesting products of the forest?

Student responses to these (and other) questions may take the form of a class discussion, short written responses or essays.

Some of the most diverse ecosystems known are among the most threatened. Roughly half of the recognized species of plants and animals are found in tropical rainforests. The role of these forests in the global carbon cycle—and the potential impact their destruction may have on climatic trends—are also grounds for concern. As these systems are depleted the potential losses to agriculture, medicine and pharmacology, and the health and well-being of our planet may be incalculable.

Connecting to the National Standards

This laboratory activity relates to the following National Science Education Standards (1996):

Disciplinary Core Ideas: Middle School
ML-LS2 Ecosystems: Interactions, Energy, and Dynamics
LS2.A: Interdependant Relationships in Ecosystems
LS2.C: Types of Interactions
MS-PS4 Waves and their Applications in Technologies for Information Transfer
LS2.C: Ecosystems, Dynamics, Functioning, and Resilience
PS3.C: Relationship between Energy and Forces

Disciplinary Core Ideas: High School
HS-LS2 Ecosystems: Interactions, Energy, and Dynamics
LS2.A: Interdependant Relationships in Ecosystems
LS2.C: Ecosystems, Dynamics, Functioning, and Resilience
HS-LS4 Biological Evolution: Unity and Diversity
LS4.D: Biodiversity and Humans

Science and Engineering Practices
Developing and using models
Analyzing and interpreting data

Crosscutting Concepts
Patterns
Scale, proportion and quantity
Systems and system models
Stability and change

Acknowledgments

This activity originated with the Missouri Botanical Garden and was adapted by Save the Rainforest. Thanks to these institutions and also to Maggie Eisenberger, Chesterfield Day School, Chesterfield, Missouri.

Materials for *Rainforest Biodiversity* are available from Flinn Scientific, Inc.

Catalog No.	Description
AB1441	Sunflower Seeds
AB1440	Soybean Seeds
AB1431	Mung Bean Seeds
AB1426	Barley Seeds

Consult your *Flinn Scientific Catalog/Reference Manual* for current prices.