

Ages: 10 years and up

Biodiversity Index *

Time: 20-30 minutes

Learn how assess the diversity of an ecosystem.

SUPPLIES NEEDED

- Small bottles, envelopes or boxes, one per participant
- A variety of small things to represent different species (beans, seeds, candies, paper shapes or stamped paper)
- Baskets or bowls for the various species if youth are to establish the biodiversity of their ecosystem (optional)
- Labels for the bottles or boxes, and pens to label them
- Calculators (optional)



Background information

When scientists speak of the variety of organisms (and their genes) in an ecosystem, they refer to it as biodiversity. A biologically diverse ecosystem, such as an old growth forest or tropical rain forest, is healthy, complex and stable. Nature tends to increase diversity through the process of succession. The opposite of biodiversity is referred to as monoculture, or the growing of one species of organism, such as a lawn, a wheat field or corn field. Because all of the species are identical, there are few complex food webs and disease can spread quickly. Monoculture is like a banquet table for disease organisms. Monoculture often requires extensive use of pesticides and herbicides (to fight nature's tendency to diversify communities) and is very labor and energy intensive (fighting nature is tough). Humans often try to reduce diversity because it is easier to harvest a crop (whether it is wheat, corn, a lawn or a secondary forest) if it all contains the same species, but this obviously creates serious problems.

The activity illustrates how to use math to calculate the diversity index of a selected habitat. The closer the diversity index is to 1, the more diverse and healthy it is. This is a very simplified version of diversity index. The more accurate versions are called the Simpson and Shannon Indexes.

Instructions

1. Set up a bottle, with species and a label for each participant.
2. You may pre-establish the biodiversity (see table that follows for average biodiversity in key ecosystems; vary slightly from these figures so participants have different experiences and understand that there is not one correct number of species in an ecosystem). You may

also allow the participants to “gather species” to populate their ecosystem (including make-believe ecosystems).

Ecosystem	# species	# each	Total Organisms	Diversity Index
Tropical Rain forest	15	1 each of 10 species, 2 each of 5 species	20	$15/20=.75$
Coniferous forest	12	2	24	$12/24=.50$
Deciduous forest	12	2	24	$12/24=.50$
Desert	7	3	21	$7/21=.33$
Grassland	7	3	21	$7/21=.33$
Lawn	2	100 of 1 species, 5 of another species	105	$2/105=.019$
Agricultural field	2	100 of 1 species, 5 of another species	105	$2/105=.019$

3. Each participant will then determine the number of species in their ecosystem (e.g., the number of different types of beans or paper shapes in their bottle), the number of organisms in each species, and the total number of organisms.
4. Then each participant will determine a simplified version of the “Biodiversity index” for their ecosystem. This is the total number of species divided by the total number of organisms.
5. Explain that the closer the Biodiversity Index is to 1, the more diverse the ecosystem is.
6. Reflection Questions:
 - What does biological diversity mean?
 - Species “richness” refers to the number of species present in an ecosystem; which ecosystems are richest? Is this important to consider in describing an ecosystem?
 - Species evenness is the relative abundance or proportion of individuals among the species. Which ecosystem has the greatest evenness? Is this important to consider in describing an ecosystem?
 - Why should we measure biodiversity? Why is this concept important?
 - What other fields use the concept of a diversity index?

** This activity was slightly adapted from a learning activity developed by Kathy Paris for the Access Excellence @ the National Museum of Health, entitled: **Biodiversity Activities #1** and can be found at: <http://www.accessexcellence.org/AE/ATG/data/released/0534-KathyParis/>*

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