Background

What Is Biodiversity?

The term biodiversity comes from the words biological and diversity, and it means "the variety of life on Earth". It includes all living things, including plants, animals and micro-organisms, and their unique characteristics.

Species diversity is the type of biodiversity most commonly talked about, but there are several, at different "levels":

- Ecosystem Diversity refers to the variety of habitats, living communities, and ecological processes.
- Species Diversity refers to the variety of species in a given area.
- Genetic Diversity refers to the diversity of the genetic characteristics within a species.

Why Is Biodiversity Important?

- Ecosystems depend on the combined contributions and interactions of the individual organisms within them. The loss of any species can prevent that ecosystem from operating optimally.
- An ecosystem with a high level of biodiversity is more resistant to environmental changes.
- Biodiversity provides us with food, materials and medicines.
- Biodiversity provides mechanisms that regulate the air we breathe, the quality of our water, and our climate.
- Biodiversity provides us with inspiration, beauty and wonder.
Biodiversity Index

At first sight, the concept of biodiversity is simple: the total variety of life on Earth—from the level of genes to ecosystems. The challenge comes in measuring such a broad concept in ways that are useful. Typically, it does not make sense to try to reduce this measure to a single number.

A biodiversity index is a particular way of measuring biodiversity. There are different ways—different biodiversity indices—that are used by scientists to measure diversity. No single one will always be appropriate for the question being posed. In fact, for some conservation questions, more than one measure may have to be used.

Species Richness

The most common type of biodiversity index is species richness, which refers to the number of species in a particular place. Using number of species as a measure of biodiversity makes sense because most people have an idea of what “species” means. Also, and there is somewhat less disagreement among scientists about species than there is about other levels in the taxonomic hierarchy. And, species keep their genes more or less to themselves, and so have their own unique history.

Species Evenness

Species evenness is another way to measure biodiversity. It refers to the extent to which individuals are distributed evenly among species. Put another way, it gives you information about the relative quantities or proportions of individuals belonging to the different species. For example, a site containing a thousand species may not seem particularly diverse if 99.9% of the individuals belong to the same species.
Simpson’s Index

Many diversity indices have been developed to combine different measures of biodiversity. One is called the Simpson’s Index. It combines measures of species richness and species evenness.

Activity 1: Biodiversity Discussion

1.1 What does biodiversity mean to you? Discuss in class.

Activity 2: Species Richness and Evenness

View the PowerPoint presentation Measuring Biodiversity, and then answer the following questions:

2.1 Which site has the highest species richness?

2.2 Which site is the most diverse according to the Simpson’s Index? (HINT: Has the lowest D).

2.3 Do any sites have both a low Simpson’s Index and high species richness? Which one(s)?
2.4 What is the best measure of biodiversity?

Is it
• the total number of species in an area
• the even distribution of species across that area
• whether or not rare species are present
• whether or not the species have different “functions” in the ecosystem?

2.5 Why do we want to preserve biodiversity?

2.6 How is conservation related to biodiversity?

2.7 Are rare species more important to conserve than common ones?

**Activity 3: Conservation**

This activity uses beans of different colours to look at these concepts and how they relate to biodiversity and conservation.

Imagine that each colour represents a species of animal, and each bean represents one individual of that species.

3.1 Without looking into the bag, reach in and pull out one bean from Bag A. Record its colour in column 1 of the following table. Put the bean back in the bag and pull out a new bean. Record the colour in column 2. Repeat eight more times, completing the row. Use single-letter abbreviations for the colours (red = R, black = B, etc.).

Do the same for Bag B.
Using the numbers from Table 1, add up the number of beans of each colour, for each bag, and record the totals in the following table. (Enter the colours of your beans at the head of the columns).

<table>
<thead>
<tr>
<th>Table 2</th>
<th>Colour 1</th>
<th>Colour 2</th>
<th>Colour 3</th>
<th>Colour 4</th>
<th>Colour 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bag A</td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>Bag B</td>
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</tbody>
</table>

3.2 How does the total number of each colour differ from Bag A to Bag B? (HINT: Does one bag seem to have more of any colour?)

3.3 Dump out all of the beans in Bag A and count them. How many beans of each colour are there in Bag A? Record the total number of each in the following table. (Enter the colours of your beans at the head of the columns).

Repeat for Bag B.
Table 3

<table>
<thead>
<tr>
<th></th>
<th>Colour 1</th>
<th>Colour 2</th>
<th>Colour 3</th>
<th>Colour 4</th>
<th>Colour 5</th>
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</thead>
<tbody>
<tr>
<td>Bag A</td>
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<tr>
<td>Bag B</td>
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</tbody>
</table>

3.5 If each colour of bean represents a species, and each bean represents one individual, how many species does each bag have? Does one bag have more than the other? Can you apply the terms “species richness” and “species evenness” to the bags?

3.6 Are some species rare? If yes, which species, and in which bag?

3.7 Does the amount of each species explain your results in Table 2? Explain.

3.8 Imagine that each bag represents a different site where bean biodiversity was sampled. The beans in each bag represent all of the individuals at each site. If there were some environmental change that led to the loss of a few individuals of colour #4, what would happen at each site?

3.9 If you had the money and resources to save only one of the sites (A or B), which would you save? Why?