

# SIMPSON DIVERSITY INDEX Biodiversity Sampling Exercise

## Materials Needed (per group):

- tennis ball
- tape measure
- 4 flags
- notebook
- calculator
- field guides (optional)

## Duration:

This exercise will require 5 days to complete. Three habitats will be sampled, each requiring one class period to sample completely. The 5<sup>th</sup> day will be used for calculation of biodiversity indexes, answering questions, and discussion. If you are working from home, choose 3 different habitats close by.

## Instructions:

### 1) Making hypotheses

- You will choose 3 habitats to sample
  - Record the identities of the 3 habitats in your notebook
  - Make a hypothesis about which habitat will have the most biodiversity and which will have the least. Record your hypotheses in your notebook and provide justification

### 2) Selecting a sampling location

- These steps are to be followed at each habitat
- Throw the tennis ball over your right shoulder without looking at the target
  - \*\*\* the purpose of using the tennis ball is to find a random location to do your sampling- we want to eliminate potential bias, so it is important you do this step without "trying" to hit a good spot*
  - if your tennis ball lands outside of the intended habitat, rethrow it*
- Find where the tennis ball landed, and use the tape measure to make a 1m square that surrounds the ball
- Remove the tennis ball

### 3) Sampling biodiversity

- Select the types of organisms you will be sampling (plants only, insects, all organisms, etc.), be sure to make a note of this in your notebook
- Count how many individuals there are of every species in the plot
  - \*\*\* you may use the field guides to try to identify each species, but you can also simply categorize species and name them yourself (for example: Species A, Species B, blue flower, thorny bush, etc.)*
- Record the data in your notebook. See example table below.

Table 1.

Species Name	Number of Individuals
Species A	25
Species B	10

### 4) Calculating a Biodiversity Score

- a. We will use 2 different methods to estimate biodiversity in your sample area
- b. **Method 1 – Basic Biodiversity Index**
- i. This method is very simple. First, count the total number of species you found in your plot
  - ii. Now, divide this number by the total number of individuals of all species found in your plot
  - iii. This is your *basic biodiversity index*, record this value in your field notebook
  - iv. Share your data with all other groups in your class, and calculate the average basic biodiversity index for this habitat
- c. **Method 2 – Simpson Index of Diversity**
- i. This method is a little more complicated than method 1- we will be solving this equation:

$$D = 1 - \left( \frac{\sum n(n-1)}{N(N-1)} \right)$$

- D is the index we are calculating
- n is the number of individuals of a given species
- N is the total number of individuals present in your sample
- It is helpful to construct a table to aid you in calculating this index- on the next page is a sample table that gives an example of how to perform the calculation

**Table 2.**

Species	n (number of individuals)	n(n-1)
Species A	2	2
Species B	8	56
Species C	1	0
Total N (add up next column)	11	
Total n(n-1)		58

In this example, to calculate the index, plug in the numbers, and you should get the following result:

$$D = 1 - (58/110) = 0.473$$

This index ranges from 0 (no diversity) to 1 (maximum diversity).

- ii. Using the above example as a guide, calculate the Simpson biodiversity index for your own data
- iii. Record this number in your lab notebook as the “Simpson Diversity Index”
- iv. Share your data with all other groups in your class, and calculate the average basic biodiversity index for this habitat

## 5) Comparing among habitats

- a. Once you have visited all 3 sites, calculated your biodiversity indexes for all 3 sites (separately), and shared data with other groups, calculate an average biodiversity for each habitat
- b. You will have 2 different average indexes for each habitat, the “basic biodiversity index,” and the “Simpson biodiversity index”
- c. Compare the results for the 3 habitats and try to explain the differences in Biodiversity of the sites you chose.

- 6) Predict the differences in macroinvertebrates you may find in two different streams. Hypothesis the difference (or lack of) diversity in a forest stream compared with a rural lowland stream. Add your results in the table below and work out the Simpson's Diversity Index for each stream. Explain your results.

Taxa	Forest Stream	Rural Lowland Stream
Stonefly Nymph	5	0
Mayfly Nymph	30	10
Dobsonfly Nymph	2	0
Cased Caddis	50	20
Free living Caddis	5	1
Amphipods	0	20
Ostracods	0	20
Snails	5	0
Flatworms	2	3
Round worms	0	1
Fish	5	0
Freshwater	3	0
TOTAL		

**LOOK BACK AT TABLE 2.**

**GOOD LUCK!**