The Simpson Diversity Index

It is sometimes useful to have an overall measure of species richness in an ecosystem. It is commonly thought that the the more diverse an ecosystem is the more resistant it will be to environmental insult. The Simpson Diversity Index is one of the most commonly used measures of species diversity. Diversity is often considered to be a function of both the number of different species present and the number of individuals of each species. **A higher index indicates a higher species diversity; a lower number indicates a lower diversity.**

Part A. Method
a.   Use a random sampling technique to search for organisms in the ecosystem.
b.   Identify each of the organisms found.
c.   Count the total number of individuals of each species.
d.   Calculate the index (D).

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

N = total number of organisms
n = number of individuals of different species

The following table shows the numbers of each species of organism that were caught in a stream in Sweden in 1992 and in 2001. A new factory was built beside the stream in 1994. Calculate the Simpson index for each year and determine whether the factory affected the diversity of the stream.

Species	1992 numbers (n)	1992 n(n-1)	2001 numbers (n)	2001 n(n-1)
Mayfly	8		16	
Dragonfly	5		0	
Caddis fly	4		0	
Stonefly	4		0	
Pond skater	3		13	
Water louse	2		8	
Water mite	1		0	
Flatworm	4		0	
Roundworm	3		0	
Leech	1		0	
Annelid	2		0	
Snail	4		2	
Mussel	1		0	
Water beetle	0		3	
Stickleback	0		8	
Water boatman	0		7	
Damsel fly	0		6	
Totals	N=	$\sum n(n-1) =$	N=	$\sum n(n-1) =$

1. What is the Simpson's Diversity index for the stream in 1992? (Show work!)

2. What is the Simpson's Diversity index for the stream in 2001? (Show work!)

Part B. In our next activity we will use the Simpson Index to compare the species diversity (different manufacturers of cars) of two ecosystems (Sheldon vs. Heritage Village Apartments parking spaces).

Before you do the survey:

Predict which parking lot (Sheldon or apartments) you expect to be most diverse and explain why.

Your prediction and explanation:

Procedure:

1. Organize your team so that you collect your data as quickly as possible. Count at least 40 cars in each lot. Record the model (i.e. "BMW" or "Buick")

2. Calculate the Simpson Diversity Index for both the Sheldon lot and the Apartment lot.

Biology B

Data Table – Sheldon Lot

Automobile Manufacturer	Number (n)	n(n-1)
TOTAL (N)		

Data Table – Apartment Lot

Automobile Manufacturer	Number (n)	n(n-1)
TOTAL (N)		

Discussion Questions:

1. Identify the parking lot that was the most diverse. Based on your observations during the lab, explain why your prediction was supported or not supported.

2. List the single most abundant species in each set of data. Why might this species be the most abundant?

3. If you conducted this survey at a mall parking lot, would the Diversity Index be high or low?

4. Determine the maximum and minimum values for the Simpson Diversity Index in the parking lot you surveyed.

5. If you conducted this lab at a new car dealership, predict whether the Simpson Diversity Index would be high or low, and how it would compare to the school and apartment parking lots?