Biodiversity in the Library Name _____

Purpose: To simulate the measurement of biological diversity

1. Determine the number or your assigned species (color) of book in the assigned section. Please remember to look for the predominant color on the spine of the book. Remember that members of the same species may come in various sizes.

Table 1	Team 1: Fiction	Team 2: 800 - 999	Team 3: Reference	Team 4: 000 to 799
Black				
Brown				
Purple				
Blue				
Green				
Red				
Orange				
Yellow				
White				
Total				

2. Which would you consider to show greater diversity, a small island with 100 lizards that belong to 5 species or a larger island that has 2500 lizards belonging to 5 species? Both islands have the same number of species, therefore that number alone cannot properly show biodiversity. For that reason, diversity is measured in different ways. Determine the diversity of lizards on the islands.

A simple method allows us to compare diversities from different sample sizes

$$D = (S-1)/(Log\ N)$$

Where S = number of species (5 – 1)and N = total number of individuals in the sample.

Small Island D	Large Island D
D = 4 / (Log 100)	D = 4 / (Log 2500)

3. Compare the diversity of the book data from the four teams. **D = 8 / (Log (Total # of books for your period)**

Team 1: D	Team 2: D	Team 3: D	Team 4: D

4. There is more to diversity than just the number of species in an environment. A community that has more or less equal numbers of individuals of seven different species will look more diverse than a community that is dominated by one species. Because of this, some measures of diversity include a way of counting the number of individuals of each species as well as the total number of species. One commonly used measure of species diversity that includes proportions of individuals is represented by the **Shannon-Weaver equation**, which is:

$$H = \Sigma\ pI\ \ln pI$$

pI is the proportion of the species I (number of species I / Total Number)
$\ln$ is the natural logarithm
The sum (Σ) is a practical measure of the biological diversity in the system.

The more species there are, the greater the diversity.
The diversity is largest when there are equal numbers of individuals of all the species.

Fill in table to find H for your team.

Table II	Column A # from Table 1	Column B pI = Column A/Total	Column C ln pI = ln ColumnB	Column H *pI ln pI*
Black				
Brown				
Blue				
Green				
Orange				
Purple				
Red				
White				
Yellow				
Total		(do not use this space)	Total of Column H = H	

Shared Data: Team 1 H = _____   Team 2 H = _____   Team 3 H = _____   Team 4 H = _____

Which Team had the greatest diversity? according to the simple method _____ and according to the S-W method _____

Did both methods agree? _____ Explain why the diversity is greatest in this section of the library and why there may be some differences between sections of library.

FOLLOW-UP QUESTIONS:

1. What does biological diversity mean?

2. a) If you cut down the variety of trees in a piece of forest you owned and replanted with one type of tree, what will happen to much of the wildlife that was adapted to the forest? (Hint: they cannot just move elsewhere. If other habitats are good, they will probably be near carrying capacity already.)

    b) Will this fate happen to all the wildlife? Explain.

3. Many species can only live/reproduce in 1 type of forest. The spotted owl is an example - it can only live and successfully reproduce in old growth forests (big, old cedars, hemlocks, etc.). If these old growth forests are cut down, it's unlikely this owl will survive. Environmentalists call it an "indicator species". What does this mean? Why be concerned about one species?

4. Growing one plant, as is the case of growing only Douglas Fir, is called monoculture. Give examples of monocultures a) in your home and b) in agriculture.

5. Why would you need to use more insecticides in monoculture? Is this good or bad?

6. If you wanted to help wildlife, what would you do with regards to the landscaping of your own home?

Conclusion:

Biodiversity in the Library Name _____

Purpose: To simulate the measurement of biological diversity

1. Determine the number or your assigned species (color) of book in the assigned section. *Please remember to look for the predominant color on the spine of the book.* Remember that members of the same species may come in various sizes.

Table 1	Counts for Your Team:	Total
Black		
Brown		
Purple		
Blue		
Green		
Red		
Orange		
Yellow		
White		
TRI+		
	Total	

2. Which would you consider to show greater diversity, a small island with 100 lizards that belong to 5 species or a larger island that has 2500 lizards belonging to 5 species? Both islands have the same number of species, therefore that number alone cannot properly show biodiversity. For that reason, diversity is measured in different ways. A simple method allows us to compare diversities from different sample sizes. Determine the diversity of lizards on the islands.

$$D = (S-1)/(Log\ N)$$

Where **S** = number of species $(5 - 1)$ and **N** = total number of individuals in the sample.

Small Island D	Large Island D		Your Team D
D = 4 / (Log 100)	D = 4 / (Log 2500)		D = (10-1) / (Log (Total # of your books)

3. 3. There is more to diversity than just the number of species in an environment. A community that has more or less equal numbers of individuals of seven different species will look more diverse than a community that is dominated by one species. Because of this, some measures of diversity include a way of counting the number of individuals of each species as well as the total number of species. One commonly used measure of species diversity that includes proportions of individuals is represented by the **Shannon-Weaver equation**, which is:

$$H = \Box \Sigma\ pI\ \ln\ pI$$

pI is the proportion of the species I (number of species I / Total Number)

ln is the natural logarithm

The sum (Σ) is a practical measure of the biological diversity in the system.

The more species there are, the greater the diversity.
The diversity is largest when there are equal numbers of individuals of all the species.

Fill in table to find H for your team from the **Shannon-Weaver equation, H =$\Box\Sigma pI \ln pI$**

Table II	Column A # from Table 1	Column B pI = Column A/Total	Column C ln pI = ln ColumnB	Column D $pI \ln pI$
Black				
Brown				
Purple				
Blue				
Green				
Orange				
Red				
Yellow				
White				
TRI+				
Total		(do not use this space)	Total of Column D = H	

4. Compare the "D" and "H" diversity of the books from the other teams..

Teams	D	H:
1. Encyclopedias (English + Spanish) 030-031		
2. Reference books scattered in shelves 000-999		
3. Text books behind Librarian counter		
4. Information, not Encyclopedias . 000-099		
5. Philosophy, Psych, Religion. 100-299		
6. Social Science 300-399		
7. Language 400-499		
8. 8Science and Technology 500-699		
9. Arts and Literature. 700-899		
10. History and Geography. 900-999		
11. Spanish		
12. Classics		
13. Short Stories		
14. Biographies		
15. Manga A/V		

Which Team had the greatest diversity? according to the simple method _____ and according to the S-W method _____

Which Team had the least diversity? according to the simple method _____ and according to the S-W method _____

Did both methods agree? _____

Write Conclusion and Discussion on separate paper: Explain why the diversity is greatest or least in these sections of the library and why there may not be some differences between certain sections of library.

FOLLOW-UP QUESTIONS:

1. What does biological diversity mean?

2. a) If you cut down the variety of trees in a piece of forest you owned and replanted with one type of tree, what will happen to much of the wildlife that was adapted to the forest? (Hint: they cannot just move elsewhere. If other habitats are good, they will probably be near carrying capacity already.)

   b) Will this fate happen to all the wildlife? Explain.

3. Many species can only live/reproduce in 1 type of forest. The spotted owl is an example - it can only live and successfully reproduce in old growth forests (big, old cedars, hemlocks, etc.). If these old growth forests are cut down, it's unlikely this owl will survive. Environmentalists call it an "indicator species". What does this mean? Why be concerned about one species?

4. Growing one plant, as is the case of growing only Douglas Fir, is called monoculture. Give examples of monocultures a) in your home and b) in agriculture.

5. Why would you need to use more insecticides in monoculture? Is this good or bad?

6. If you wanted to help wildlife, what would you do with regards to the landscaping of your own home?