

Lab: Species Diversity and the Shannon Diversity Index MAKEUP ASSIGNMENT

Remember: As per GHHS Policy, you have two days for each day absent to makeup assignments.

Background: The richness of an ecosystem refers to the number of unique species present. Evenness is the relative balance of their populations. These calculations can be used to assess the stability and resiliency of an ecosystem. In an ecological study designed to measure species diversity, a wildlife biologist might count the number of individuals of all species present in an area and calculate the diversity index for the area. Comparison of this diversity index to that of other areas or observing an area over time will provide insight into the health of an ecosystem. The diversity index used in this lab is called the Shannon Diversity Index and is calculated as follows:

$$p_i = n_i/N$$

n_i = number of individuals of species "i"

p_i = relative abundance of species "i"

$$H' = - \sum p_i[\ln(p_i)]$$

N = total number of individuals of all species

H' = Shannon Diversity Index

Prelab Questions:

1. Why is species richness an important calculation when studying ecosystems?
2. Why is the Shannon Diversity Index more useful than simply counting the number of species present?
3. Practice calculating Shannon Diversity Index using the data table below.

| species | i | n_i | p_i | $\ln(p_i)$ | $p_i[\ln(p_i)]$ |
|-------------------------|---|-------|-------|------------|-----------------|
| <i>caddisfly larvae</i> | 1 | 3 | | | |
| <i>dragonfly nymph</i> | 2 | 6 | | | |
| <i>pond crayfish</i> | 3 | 5 | | | |
| <i>pouch snail</i> | 4 | 8 | | | |
| <i>water strider</i> | 5 | 2 | | | |
| TOTAL | | | | | |

4. To calculate the Shannon Diversity Index, total the $p_i[\ln(p_i)]$ column and multiply by -1. A higher value indicates a more diverse ecosystem. The Index of this ecosystem would be _____. This could then be used to compare this ecosystem to another or to track changes in diversity over time.
5. For this lab we will be comparing the diversity of cars in the student parking lot versus the faculty parking lot. Which lot do you think will be more diverse and why?

What We Did in Class: Students counted the number of cars in the student parking lot and the faculty parking lot. They then calculated the Shannon Diversity Index for each lot. Use the data below to answer the questions that follow. (FYI - H' =Shannon Diversity Index, R =Richness, N =Total Abundance)

| | | | |
|--------------------|-------------|----------|-----------|
| Student Lot | $H' = 2.75$ | $R = 30$ | $N = 364$ |
| Faculty Lot | $H' = 2.63$ | $R = 25$ | $N = 172$ |

Postlab Questions:

7. Which lot was more diverse? Why do you think this is?
8. Compare and Contrast the Shannon Diversity Index for the Green Hope parking lots to what you would expect for Southpoint Shopping Mall. Support your answer.
9. Compare and Contrast the Shannon Diversity Index for the Green Hope parking lots to what you would expect for Crossroads Ford Car Dealership. Support your answer.
10. Using the Shannon Diversity Index, you can also calculate species evenness by using the formula
$$E = H/\ln(R)$$

E = evenness, H = Shannon Diversity Index, R = richness (# of species)

E student lot = _____ E faculty lot = _____
11. Evenness is a measure of how similar the abundance of different species are. Explain differences you see in evenness for the student and faculty parking lots.
12. Compare and Contrast the Evenness for the Green Hope parking lots to what you would expect for Southpoint Shopping Mall. Support your answer.
13. Compare and Contrast the Evenness for the Green Hope parking lots to what you would expect for Crossroads Ford Car Dealership. Support your answer.
14. Describe the changes in diversity and evenness that you would expect to see as successional changes occur in an ecosystem.
15. Name three events that would alter the rate at which succession progresses, thus changing the richness and evenness of an ecosystem.
16. What have you learned from this makeup lab?