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IN THE CANOPY: BIODIVERSITY AND CLIMATE

Biodiversity Measurement Methods

Biodiversity allows humans to survive and thrive on earth. Benefits of biodiversity to humans include food products, fuel, pharmaceuticals, climate regulation, fresh water, soil formation, and the value of beauty, just to name a few. Biodiversity is essential for the economic and cultural future of humans and millions of other species. For this reason, the value of measuring, monitoring, and protecting biodiversity is enormous.

Biodiversity within an ecosystem or biome is not evenly distributed. Climate, altitude, soil, pollution, human intervention, and the presence of other species can all affect biodiversity. Tropical regions surrounding the equator tend to have higher amounts of biodiversity, while regions at the poles have the least. Below are several methods that can be used to monitor the biodiversity of an area. These are only a few of the dozens procedures used by scientists, who are continually refining and developing methods based on the individual needs of their studies.

- **Transect** – This common method utilizes a line (referred to as a transect) of a pre-determined length which is placed within an ecosystem or habitat. While there are many different ways to sample a transect, one of the most popular is to place quadrats (square frames that are subdivided into smaller squares) at designated distances along the transect. Species within the quadrats can be counted two ways – the absolute abundance (the number of species X found in the quadrat) and the relative abundance (the number of squares that contains any portion of species X).
- **Random Quadrat** – This method requires that quadrats be placed randomly within a specified area. Absolute abundance and relative abundance are calculated in the same fashion as transects.
- **Mark-Recapture –** The above methods are often used for plants, mark-recapture is a method commonly used for animals. Animals are caught by hand or in traps, marked with a unique number tag, and released. This procedure is repeated over and over again until marked individuals are recaptured. Even though every animal in the population is not caught, a formula can be used to estimate the size of the population based on the number of marked animals that are recaptured.
- **Point Observations –** This method is commonly used for animals, especially birds. An observer stands in a single location for a fixed amount of time and counts the number and identity of the animals s/he sees as they pass by the location.

Whatever method is used, it's critical that it follow some general guidelines laid out by the *Handbook of Biodiversity Methods,* including: 1) the method should be quantitative, replicable, and based on the biology of the organisms being studied, 2) the results should be explainable to everyone interested, and 3) time and money available should be considered in the planning.

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Questions to answer:

1) Why is biodiversity difficult, yet important, to measure?

2) Which of the above methods might be useful for measuring species richness? If you don't think any of the above methods are appropriate, explain a process of your own that would be more effective.

3) Which of the above methods might be useful for measuring functional biodiversity? If you don't think any of the above methods are appropriate, explain a process of your own that would be more effective.

4) Which of the above methods might be useful for measuring species evenness? If you don't think any of the above methods are appropriate, explain a process of your own that would be more effective.

5) Which of the above methods might be useful for measuring species density? If you don't think any of the above methods are appropriate, explain a process of your own that would be more effective.

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IN THE CANOPY: BIODIVERSITY AND CLIMATE
Biodiversity Data

Based on the class decision, will you be using *Natural Views* of canopy panoramas #1-3, or still photographs?

Scientific Question
Does epiphyte biodiversity in the canopy differ across a climate gradient?

Hypothesis
Based on your observations, write a hypothesis for the scientific question. Remember to use the form "I predict…..because….".

Procedure
Explain the procedure that your class has decided to use in order to measure biodiversity.

1)

2)

3)

4)

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Observations

Make some scientific observations about each of the panoramas:

- Panorama #1 ~ Low Elevation (Dry) →

- Panorama #2 ~ Mid Elevation (Wetter)→

- Panorama #3 ~ High Elevation (Wet)→

Data Table

Record your data below. Be sure to contribute your data to the class chart and copy the data of other groups.

BIODIVERSITY WITHIN THE CLOUD FOREST			
Group Name	**Canopy Panorama #1 ~ Low Elevation (Dry)**	**Canopy Panorama #2 ~ Mid Elevation (Wetter)**	**Canopy Panorama #3 ~ High Elevation (Wet)**
Group A			
Group B			
Group C			
Group D			
Group E			
Average			

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IN THE CANOPY: BIODIVERSITY AND CLIMATE
Biodiversity Wrap-Up

Directions: 1) On graph paper, create a graph to represent the biodiversity data collected by your class. Attach the graph to this paper.

2) Write a conclusion for your biodiversity study that includes the following:

- Discuss the meaning of biodiversity and its importance.
- Discuss the potential methods for measuring biodiversity and the challenges inherent in these methods.
- Include the hypothesis written for the scientific question addressed in this study.
- Explain how the class data collected and additional *Canopy In The Clouds* media supported or negated your hypothesis.
- Include any conclusions drawn from the biodiversity activity and your proposed answer to the scientific question.

RUBRIC

Graph Creation:
- 2 pts → graph is constructed accurately and professionally
- 1 pt → graph is constructed, but includes some errors
- 0 pts → graph not included

Biodiversity meaning and importance:
- 2 pts → meaning and importance of biodiversity discussed thoroughly and accurately
- 1 pt → meaning of biodiversity not included OR importance of biodiversity not included
- 0 pts → meaning of biodiversity not included AND importance of biodiversity not included

Methods for measuring biodiversity:
- 2 pts → methods and challenges discussed thoroughly and accurately
- 1 pt → methods not discussed OR challenges not discussed
- 0 pts → methods not discussed AND challenges not discussed

Hypothesis & Data:
- 2 pts → hypothesis written in the correct form and explanation of data included
- 1 pt → hypothesis written in the wrong form OR explanation of data not included
- 0 pts → hypothesis written in the wrong form AND explanation of data not included

Conclusions:
- 2 pts → accurate conclusions drawn, based on scientific question and data
- 1 pt → accurate conclusions drawn, but not based on scientific question or data
- 0 pts → inaccurate conclusions drawn

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IN THE CANOPY: BIODIVERSITY AND CLIMATE
Panorama Photographs

Low Elevation Forest

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Mid Elevation Forest

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High Elevation Forest