Exercise 8

Successional Changes in Vegetation

Objectives

1. Define these terms in writing.
   a. succession
   b. pioneer species
   c. climax community
   d. ecosystem
   e. niche
2. List five differences between an old field and a temperate deciduous forest.
3. Describe five changes that occur to the plant life as an area changes from an old field community to a temperate deciduous forest community.
4. State several ways in which the plant life of an area influences the animal life of that area.

Introduction

The analysis of communities of organisms is a rather difficult task. One should be able to identify all the kinds of plants and animals, describe the relationships among different organisms, and measure the sizes of populations. We are not that expert, so we will use artificial designations to identify types of plants and not worry about their true names. In this exercise, we will need to estimate the size of some populations but not try to characterize all the kinds of organism interactions.

The various plant and animal populations interacting in an area receive their energy from the sun and constitute an **ecosystem.** Each particular organism has a **niche**—a job to perform—in the ecosystem. **Succession** is a predictable pattern of change that occurs within ecosystems. **Pioneer plants** are the first type to become established in a barren area. These plants shade the soil and lower the soil temperature, reduce the wind velocity at the soil surface, add organic material to the soil, and support various types of animals. Thus the presence of the pioneer plants changes the environment of an area. A second group of plant types can become established in the area. These new varieties of plants eliminate the pioneer species. The new varieties, in turn, also change the environment of the area. A third group of plant types then grows and replaces the second group of plants. This constant change in the environment and the resulting changes in the plant and animal populations are succession. Eventually a plant community becomes established that is able to maintain its species; new types do not invade the area. This last stage of succession is the climax stage. It may require several hundred years to undergo succession from pioneer plants to the **climax community.**

Procedure

Your instructor will have stretched out 100 m of string in a line so that approximately 50 m is in one stage of succession and 50 m is in a different stage of succession.

This string will have a knot every 10 m. These knots denote places where you will collect information (sampling stations). There are eleven sampling stations.

The class will be divided into groups. Each group will have a specific job to do. The groups will collect data and record them on the data sheet provided.

Group 1 (Small Plants)

1. You will need the following equipment:
   a. Wire hoop
   b. Meterstick
   c. Data sheet
   d. Pencil
2. At each of the knots on the string, place the hoop on the ground and count the number of plants in each of the following categories:
   a. Narrow-leaved plants, grass, and so on
   b. Herbs under 50 cm tall
   c. Herbs over 50 cm tall
3. If there are a lot of plants, try to make an accurate estimate.
4. Record this information on your data sheet.

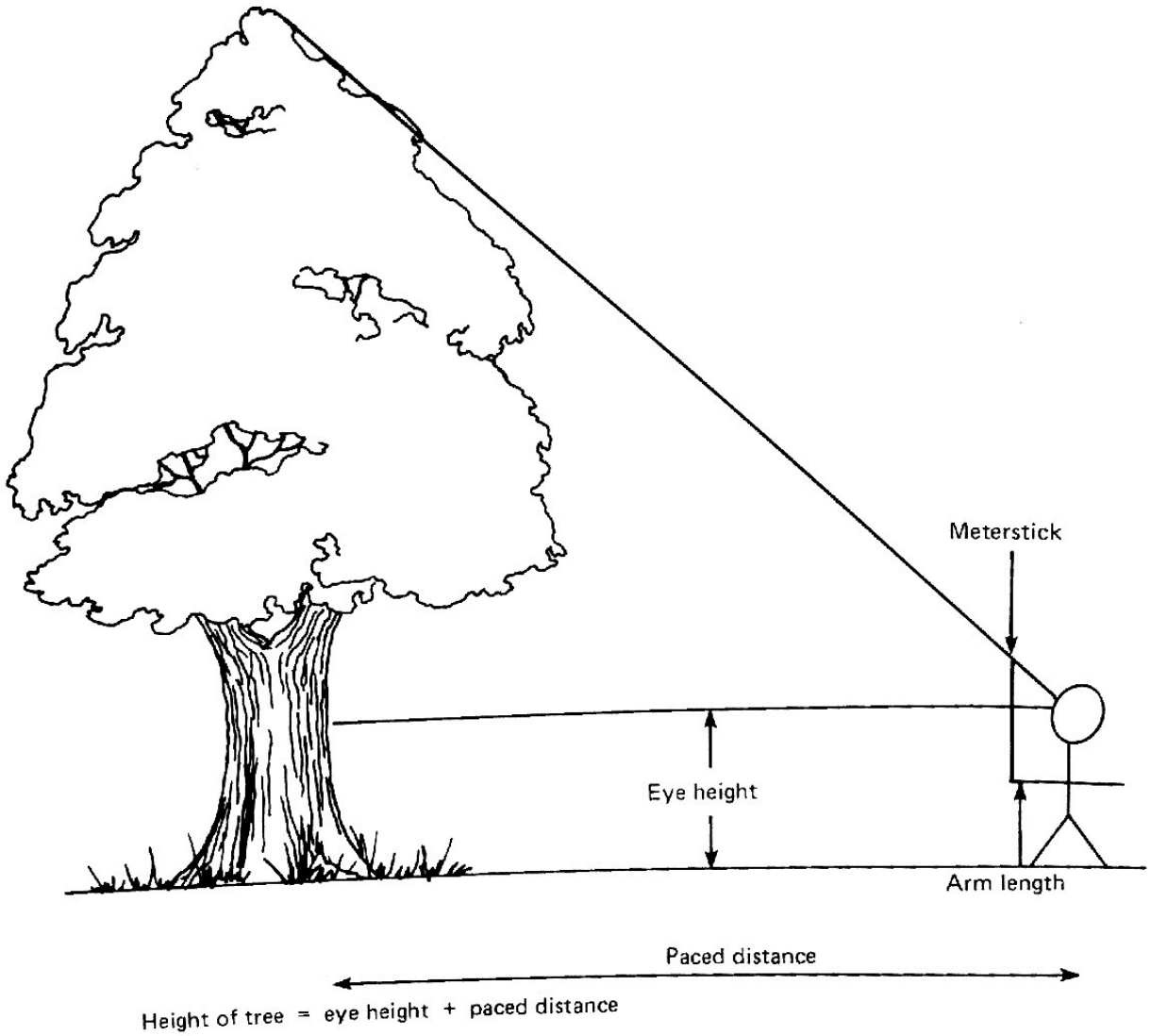
Group 2 (Large Plants)

1. You will need the following equipment:
   a. String, 2 m long with clamp on the end
   b. Pencil
   c. Data sheet
   d. Meterstick
2. At each knot on the string, attach your 2 m length of string. Travel around the knot, which denotes the center of your sample point, and count all the woody plants. If it is branched below 1 m, record it as a shrub. If it branches above 1 m, record it as a tree. If only a portion of a tree falls inside the circle, record the portion that does (i.e., 1/2, 1/8).
3. Record all data on the data sheet provided.

Group 3 (Estimate Average Height of Dominant Vegetation)

1. You will need a meterstick.
2. At each sampling station, estimate the average height of the dominant (most conspicuous) vegetation as indicated in the figure.
3. Record data on the data sheet provided.

In order to estimate the height of a tree, measure the distance from your eye to your hand held at eye level. Form a right triangle by holding the meterstick vertically with your hand at eye level. The distance from eye to hand and the distance the meterstick protrudes above your hand must be equal. Position yourself so that you can sight over the top of the meterstick to the top of the tree. The height of the tree is equal to the distance from where you are standing to the base of the tree plus the distance from the ground to your eye.



Group 4 (Physical Conditions)

1. You will need the following equipment:
   a. Two soil thermometers
   b. Two regular thermometers
   c. Air speed indicator
   d. Light meter
   e. Relative humidity apparatus
2. At each of the sampling stations, record the following information:
   a. Soil temperature (you must leave the thermometer in the ground for five minutes)
   b. Air temperature (hold the thermometer in such a way that the sun doesn't shine directly on it and the wind doesn't blow directly on it)
   c. Wind speed (hold wind speed indicator 1 m above the ground)
   d. Light reading (hold light meter 1 m above the ground)
   e. Relative humidity (the instructor will explain how to use the apparatus)
3. Record all data on the data sheet.

Name _____

Section _____

Successional Changes in Vegetation Data Sheet

	Station 1	Station 2	Station 3	Station 4	Station 5	Station 6	Station 7	Station 8	Station 9	Station 10	Station 11
Narrow-leaf plants, e.g., grass											
Herbs under 50 cm tall											
Herbs over 50 cm tall											
Shrubs (branches at 1 m or less)											
Trees (branches above 1 m)											
Average height of dominant vegetation											
Air temperature											
Soil temperature											
Wind speed											
Light meter reading											
Relative humidity											

1. Using the information gathered, describe the climate of the communities you visited.

2. Was there a difference in stages of succession in the various stations where you collected data? At which station was succession at its earliest; at which station was it closest to climax?

3. What human influences did you notice that have interfered with the normal process of succession? What is their effect?

4. Which station do you think showed the greatest variety of organisms and complexity? Why do you think this is true?