Name: Period:

5 Populations

Estimating Populations with a Quadrat

Overview:

In this exercise, you will learn an estimation technique used by population ecologists: quadrat sampling for plants.

Objectives:

1. demonstrate quadrat sampling techniques for nonmotile populations
2. perform basic statistics on the data obtained
3. calculate the biomass based on your population estimate

Materials

4 m string tied in 1 m^2 loop	butter knife	4 pegs
40 cm string tied in .1 m^2 loop	scissors	

Pre-lab Discussion:

List several reasons why it may be important for a scientist to know the size of a population.

Name two limitations to determining the size of a population.

In this exercise, you will use an often employed technique of estimation: quadrat sampling for nonmotile animals and plants. The technique is based on random sampling statistical procedures; care must be taken to assure that randomness occurs when this technique is applied to an actual biological problem. Sampling plots must be randomly located and representative of the study areas. If randomness is not realized, the sampling procedure will lead to erroneous estimates. Sampling procedures repeated over time allow the investigator to determine whether a population is growing or declining.

Procedure:

1. You will be assigned a group number. Write it down in Data Table 1. Because the rest of the class is relying on your data, it is important that you accurately collect and record your data.

2. Take your strings and pegs to the study area. Randomly throw the sticks and string over your shoulder. The point where they land will become the upper right corner of your quadrat. Place a peg in this spot.

3. Using the larger loop of string and the other three pegs, stretch the string as a square (the area inside the string will be 1 m^2).

4. Count the number of nongrass plants (weeds) contained within your quadrat. Record your counts in Data Table 1.

5. If, by chance, you have a quadrat with thousands of weeds in it, you will not be able to accurately count them in the time provided. If this is the case, switch to the 40 cm string and lay out a smaller square around the center peg. Count the clover within this area and multiply by 100. This will be the number of clover plants in 1 m^2. Record the count in ***Data Table 1.***

6. To determine the density of grass in the lawn, use the 40 cm string to lay out the quadrat around the peg in the upper

right corner. Use a butter knife to cut out a chunk of soil the area of the .1 m^2 square. Trim the grass so that the leaves or stems are only ¼ of an inch above the soil. Carefully rake off the dead leaves and clippings. Now count and record the number of grass plants in this quadrat. Consider any above-ground stem to be a grass "plant" but realize they will be connected to other plants by underground stems called rhizomes. Record your counts in ***Data Table 1.*** To calculate the number of grass plants in a square meter, multiply by 100.

Data Table 1: Weeds and Grass Counts from Your Study Area

Group #	Weeds / m^2	Grasses / .1 m^2	Grasses / m^2 (x 100)

7. After you have completed your counts, you will share your data with the class. After all lab groups have reported, the data should be discussed to see if any should be rejected because of atypical localized situations such as chemical spills, trench excavation, or other isolated interferences. Combine the acceptable data and record it as a class summary in ***Data Table 2***.

Data Table 2: Class Summary for Weeds and Grass Populations

Group #	Weeds / m^2	Grasses / m^2
1		
2		
3		
4		
5		

6		
7		
8		
9		
10		
11		
12		
Totals		
Average		

Analysis of Results:

1. Statistical information, like the average, are often calculated for a given set of data. What does the average tell you about the data?

2. Using the class average for the grass population, calculate the total grass population for an area 100 meters by 100 meters. This amount of area is called a hectare in the metric system. It would be approximately the area of two football fields placed side by side. The English area of measurement is called an acre. It is approximately 2/3 of a football field.

3. The average mass of a grass plant is one tenth of a gram (0.1). This does not include the mass of the root system. Find the biomass of the grass plants in a one hectare area.

grams = kilograms = tons =

4. Why was it important to randomly pick your quadrat site?

5. Would this type or sampling technique be effective for motile populations, such as the number of fish in a river? Explain your answer.

6. Describe how you would calculate the number of ponderosa pine trees in the Lewis and Clark National Forest.

7. Discuss two limitations to the quadrat sampling technique you used in this activity.