

Smart Farming: Using data to make decisions

Aphid Population Field Sampling (III.A.i.)

Although density is usually an important population characteristic in ecological studies, it is often difficult to accurately measure. There have been many techniques designed for estimating population density, each with their own particular strengths and weaknesses. In this lab, we will examine quadrat sampling. This is most appropriately used for low mobility animal and sessile animal/plant populations.

Using quadrat techniques for plant populations, our job of estimating density is made somewhat easier. Here, we could simply count up the number of organisms within our known study area and directly calculate the actual population density. In practice, however, it is usually impractical to count an entire population, so we usually do counts in a number of replicated small areas known as quadrats and use the average density in these quadrats as our estimated (but not necessarily “real”) density. In deciding how to sample our population, we must make a couple of choices.

Specifically, we must decide:

1. the number of quadrats we will sample
2. the size of the quadrats used (e.g. 0.1 m^2 , 0.25 m^2 , 0.5 m^2 , etc.)
3. where we will put the quadrats

Before proceeding, answer the following questions:

1. What would be the advantage of increasing the number of quadrats sampled? What would be the disadvantage or cost of increasing this number?
2. What would be the advantage of increasing the size of quadrats sampled? What would be the disadvantage or cost of increasing the size?
3. How should you arrange your quadrats? What would be the best method for determining where they should be placed?

Materials

soybean field/plot
timer
meter sticks
magnifying glass
record sheet

Procedure

1. Randomly choose 24 different plants to study. (4 students per group in 6 different areas). For our purposes, one plant = one quadrat of $.25\text{m}^2$
2. Within each 0.25 m^2 section, count the number of aphids on each plant in each quadrat. As you count the aphids in each quadrat, keep track of the time it takes. Record your data in Table 1.

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Table 1

Plant quadrats in 0.25 m ² section	Total # of aphids per quadrat (plant)	Time spent per quadrat (plant)
Student 1		
Student 2		
Student 3		
Student 4		
	Average:	Total time:

1. Combine the data from all six areas of the field (24 quadrats (plants) of 0.25m² each. How many sq meters of area did the class cover?

2. Total the number of aphids found, then find the average for each area and the total field sampled.

If a field has an aphid population of 250 or more, it should be treated.

Do you need to treat the field you scouted?