Sampling Square Habitat Analysis

Introduction

What types of organisms live in your local fields and streams? What are the populations of these organisms? Use a sampling square to find out!

Concepts

- Sampling methods
- Population density
- Habitats

Background

What types of organisms are in a particular habitat? It would be impossible to count each and every organism in a large area in order to determine the overall number and types of species. Populations however can be reliably estimated by simply taking a number of small samples from an individual habitat and extrapolating the data.

The most common unit used in ecological population sampling is a 1 m^2 quadrat. A *quadrat* is a set sample area where organisms within that area are counted. The purpose of using a quadrat is to enable comparable samples to be obtained from areas of consistent size and shape. Square quadrats are the easiest to use and give data that can be easily graphed and analyzed. The area of sample quadrat or sampling square that will be used in this activity is 0.25 m^2.

There are three main types of ecological sampling: random sampling, systematic sampling, and stratified sampling. *Random sampling* is carried out when the area of study is fairly uniform or very large. When using random sampling a large number of samples are usually taken from different areas within the habitat. One of the problems with random samples is that they may not cover all areas of a habitat equally. This is where stratified sampling comes into play. *Stratified sampling* is used to take into account drastically different areas within a habitat. For example, if a habitat contains 100 m^2 of grassland and 25 m^2 of swamp, then 75% of the samplings should be from the grassland and 25% should be from the swamp. This provides a better overall count of the organisms in that area. *Systematic sampling* is when samples are taken at fixed intervals, usually along a line. This normally involves doing line transects, where a sampling line is set up across areas having clear environmental gradients. A transect line may be used to show the changes of a species from a grassland area to a woodland area or another area where there is some kind of continuous variation along a line. Only the organisms that actually touch the
transect line are recorded.

Further information about ecological sampling techniques and population studies may be found in general ecology textbooks.

Materials

Sampling square, 0.25 m^2

Observation area

Safety Precautions

Follow all laboratory safety guidelines.

Procedure

1. Obtain an assembled sampling square.
2. Determine the location to be sampled from your instructor.
3. Lay the sampling square on this location.
4. Classify and count the number of target organisms (plants, insects, etc) within the 0.25 m^2 area of the sampling square in this sampling location.

5 Convert the count of organisms to the density per 1 m^2 by multiplying the 0.25 m^2 value by 4. Record all information on a separate sheet of paper.

6. Choose two additional sampling locations within the sampling area.

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7. Repeat steps 3–5 for each additional location and record all information on a separate sheet of paper.
8. Determine the average density for each of the species found by your group. Do this by adding the results of each species for each of the sampling plots and divide by the number of overall plots (see Equation 1.) Record the average species density values as (numbers of species)/m^2.

$$\text{Average species density} = \frac{[(\text{density of plot 1}) + (\text{density of plot 2}) + (\text{density of plot 3}) + ...]}{\text{The total number of plots}} \quad \textit{Equation 1}$$

9. Repeat step 8 with the data from the plots gathered by every student group in the class.
10. Determine the number of target organisms found in a 1 m^2 sampling location.

Disposal

Please consult your current *Flinn Scientific Catalog/Reference Manual* for general guidelines and specific procedures, and review all federal, state and local regulations that may apply, before proceeding. Sampling squares can be saved for future use.

Connecting to the National Standards

This laboratory activity relates to the following National Science Education Standards (1996):

Unifying Concepts and Processes: Grades K–12
Systems, order, and organization
Evidence, models, and explanation
Constancy, change, and measurement

Content Standards: Grades 5–8
Content Standard A: Science as Inquiry
Content Standard C: Life Science, structure and function in living systems, reproduction and heredity, regulation and behavior, populations and ecosystems, diversity and adaptations of organisms

Content Standards: Grades 9–12
Content Standard A: Science as Inquiry
Content Standard C: Life Science, the cell, molecular basis of heredity, biological evolution, interdependence of organisms; matter, energy, and organization in living systems, behavior of organisms

Tips

- This activity is available from Flinn Scientific as a student laboratory kit, *Sampling Square* (Catalog No. AP6834).
- Before taking students into the field, assess the schoolyard, field, empty lot, etc. for an appropriate sampling area. In an urban setting, the grassy area between a sidewalk and street offers a surprisingly high amount of diversity.
- Record data for every group on the classroom blackboard or whiteboard for easy comparison.
- Students may wish to gather data from two different sampling habitats and compare and contrast similarities and differences.

Materials for *Sampling Square Habitat* Analysis are available from Flinn Scientific, Inc.

Catalog No.	Description
AP6833	Sampling Square
AP6834	Sampling Square, Set of 8

Consult your *Flinn Scientific Catalog/Reference Manual* for current prices.