

# ECOLOGY

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## **6.1 ECOSYSTEMS**

## ***Objectives***

- *Define community as all of the populations of different species in an ecosystem*
- *Define ecosystem as a unit containing the community of organisms and their environment, interacting together, e.g. a decomposing log, or a lake*
- *Define population as a group of organisms of one species, living in the same area, at the same time*
- *Define habitat*
- *Describe the use of quadrats for sampling \* ( no need to explain Chi squares at this level )*

## ***Resources***

***Book pages 126.127.128***

<https://quizlet.com/103588528/unit-6-ecology-definitions-flash-cards/>

**Ecology** is the study of relationships between living organisms, and between organisms and their environment.

**An ecosystem** is a community of living organisms interacting with the non-living things in their environment. Nutrients are recycled in an ecosystem, unlike energy which must be continuously supplied due to its loss. The greenhouse effect is due to the greenhouse gases present in the atmosphere.

*The theory of evolution and natural selection discusses how species change over geographical time.*

**Classification** is the process by which living organisms are sorted out into different groups based on their similarities.

An ecosystem is a community of living organisms interacting with the non-living things in their environment. It could be as small as a tree or as large as a desert.

An ecosystem could be natural such as a lake, or artificial such as an aquarium.

### Components of an ecosystem

An ecosystem consists of:

- **Abiotic factors**, which are the non-living things such as soil, atmosphere, heat, sunlight and water
- **Biotic factors**, which are the different living organisms interacting with those abiotic factors.

An ecosystem includes different species.

**Species** are groups of individuals that have the potential to interbreed and produce fertile offspring. If members of two closely related species interbreed and produce offspring, the hybrids will likely be sterile (infertile).

<https://www.youtube.com/watch?v=GlnFylwdYH4>

*Mules are the offspring of a female horse and a male donkey, which are two different species with a different number of chromosomes.*

The area in which species live is called a **habitat**.

The different species living together in the same area at the same time are called **populations**.

The different populations make up a **community**.

# Measuring population size

Quadrat sampling is one method that can be used to measure the size of different populations within an ecosystem. The results obtained from the sampled area can then be used to estimate the size of the population.

## Practical skills: Quadrat sampling

Quadrats are used to estimate the size of a population in an ecosystem. A quadrat is a square made of a wire that is usually 1 m and may include smaller squares inside (figure 2). Some may include 25 squares (5 × 5) or 100 squares (10 × 10). Quadrats are usually used for sessile (non-moving) organisms such as plants or slow-moving organisms such as snails.

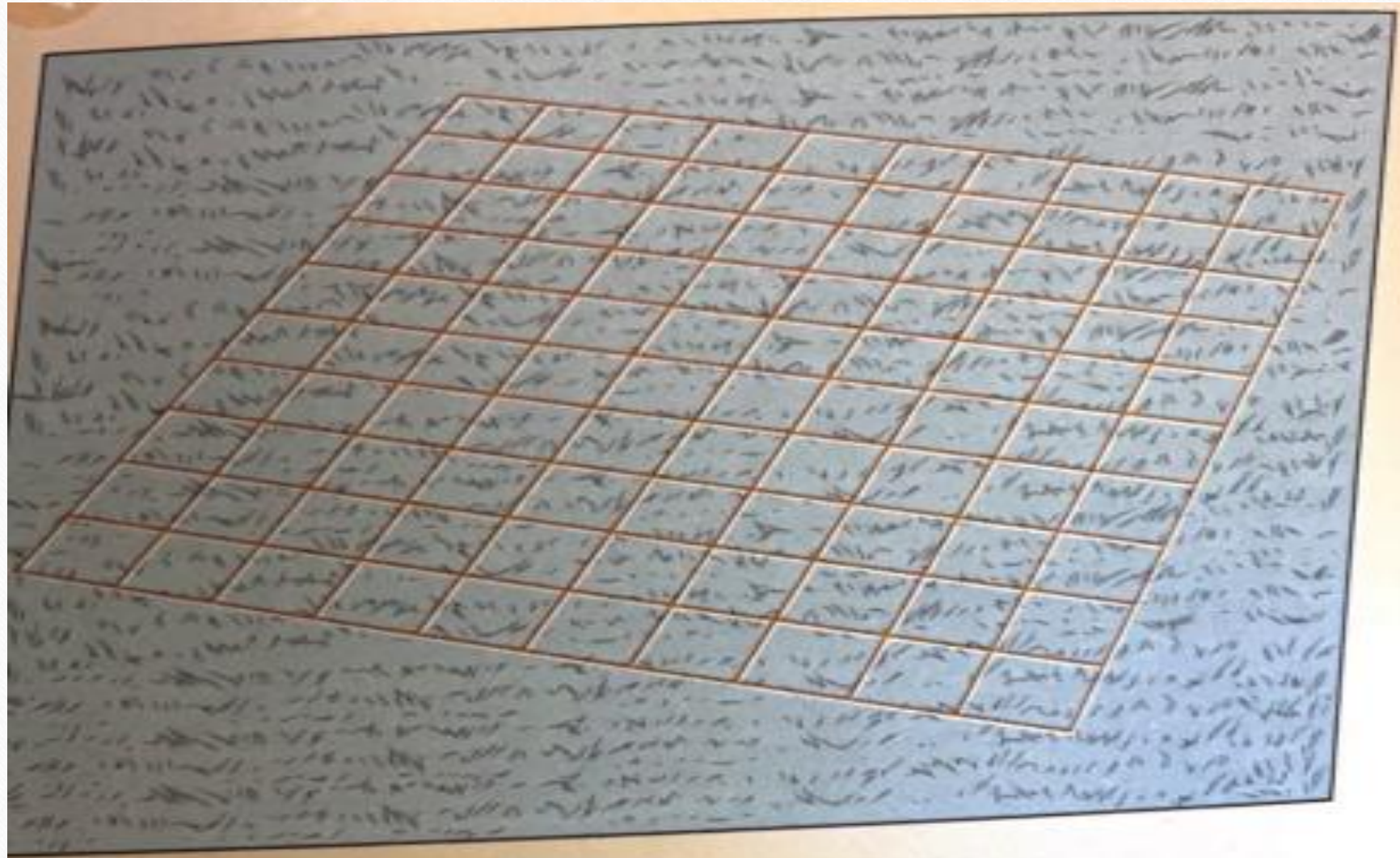


Figure 2. A quadrat

# How to use quadrats

- a) Mark out the area to be sampled.
- b) Place the quadrat randomly on the ground within the area identified.
- c) Count the number of individual organisms (for example snails or dandelions) inside each quadrat.
- d) The data collected can be used to estimate the population size within the habitat as follows:
  - Calculate the average number of organisms per quadrat.
  - Calculate the whole field area.

Calculate the estimated population size of dandelions in the field.

The greater the number of different quadrat samples used, the more reliable and valid the results are.



## Worked example: Calculations involving quadrats

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2. Calculate the estimated population size of snails in a field of an area  $100 \text{ m}^2$ , using a  $1 \text{ m}^2$  quadrat, knowing that the number of snails counted for 10 quadrats was as follows:

3, 2, 4, 1, 0, 0, 2, 1, 2, 0

### *Solution*

Calculate the average number of snails per quadrat:

$$\frac{\text{Sum of the number of snails}}{\text{Number of quadrats}} = \frac{15}{10} = 1.5 \text{ per } 1 \text{ m}^2 \text{ quadrat}$$

$$\begin{aligned} \text{Estimated population size of snails in } 100 \text{ m}^2 &= 1.5 \times 100 \\ &= 150 \text{ snails per } 100 \text{ m}^2 \end{aligned}$$