

Quadrats Online: Teacher Notes



Elsbeth Swan ©

Quadrat sampling

Overview

Background notes:

- Develop skills in sampling vegetation using quadrats.
 - Recognise and select various types of quadrat sampling.
-

Target audience

Levels 3, 4, 6 & 9

What is a quadrat?

A quadrat is a tool used to record the abundance or density of a particular species in a study area. In some instances it may be possible to simply count the number of organisms of a particular species in an area. However, in most cases counting all of the organisms would not be practical and other sampling methods are necessary. Quadrats are often square, circular or rectangular areas, of appropriate sizes that are placed at random in the study area. Presence or absence of species, numbers of organisms, or the percentage cover of each species is generally calculated within the quadrat. Quadrats are used to sample plants and may be used to sample some slow moving animals.

Shape of quadrats

The shape of a quadrat can vary depending on what is being sampled and where, as long as the same shape is used throughout the study.

Edge effects: When an animal or plant is at the edge of a quadrat, a decision has to be made as to whether it should be counted. More often than not it tends to be counted. This may lead to overestimation of the population size. The ratio of edge length to inner area changes as follows: circle < square < rectangle.

Using a circle will minimize edge effects but the area of a circle is more difficult to calculate than the area of a square.

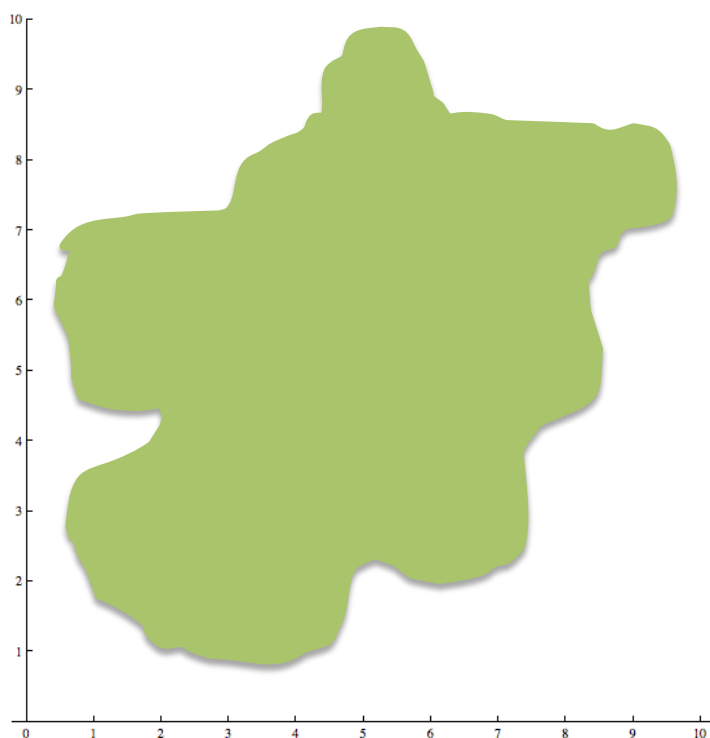
On some occasions a long, thin rectangle is used to maintain habitat homogeneity, meaning to ensure that the habitat type within the quadrat remains constant.

Sometimes a certain shape will be used because historically that is the shape and size that has been used in previous studies. This then allows comparisons to be made.

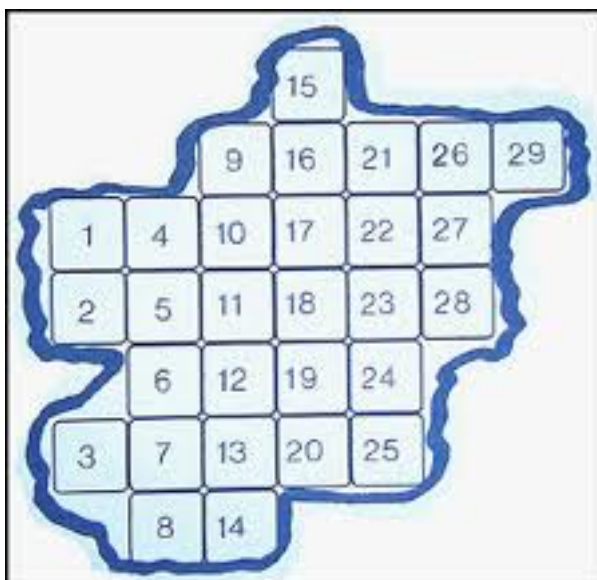
Placement of quadrats in the study area

It is important that quadrats are positioned at random in the study area. This means that every potential point in the study area has an equal chance of being selected for the sample. There are a variety of ways in which this can be achieved.

1. The simplest way to do this is to randomly throw the quadrat into the sample area. However, this may involve some bias depending on who is throwing the quadrat, and the size and density of the vegetation at the site.
2. Place a tape measure along the length and breadth of the study area and consider every point along each tape as a point in a pair of Cartesian coordinates. Use a computer generated set of random numbers to correspond to each of the points in the Cartesian pairs in order to select quadrat sites (see diagram below).



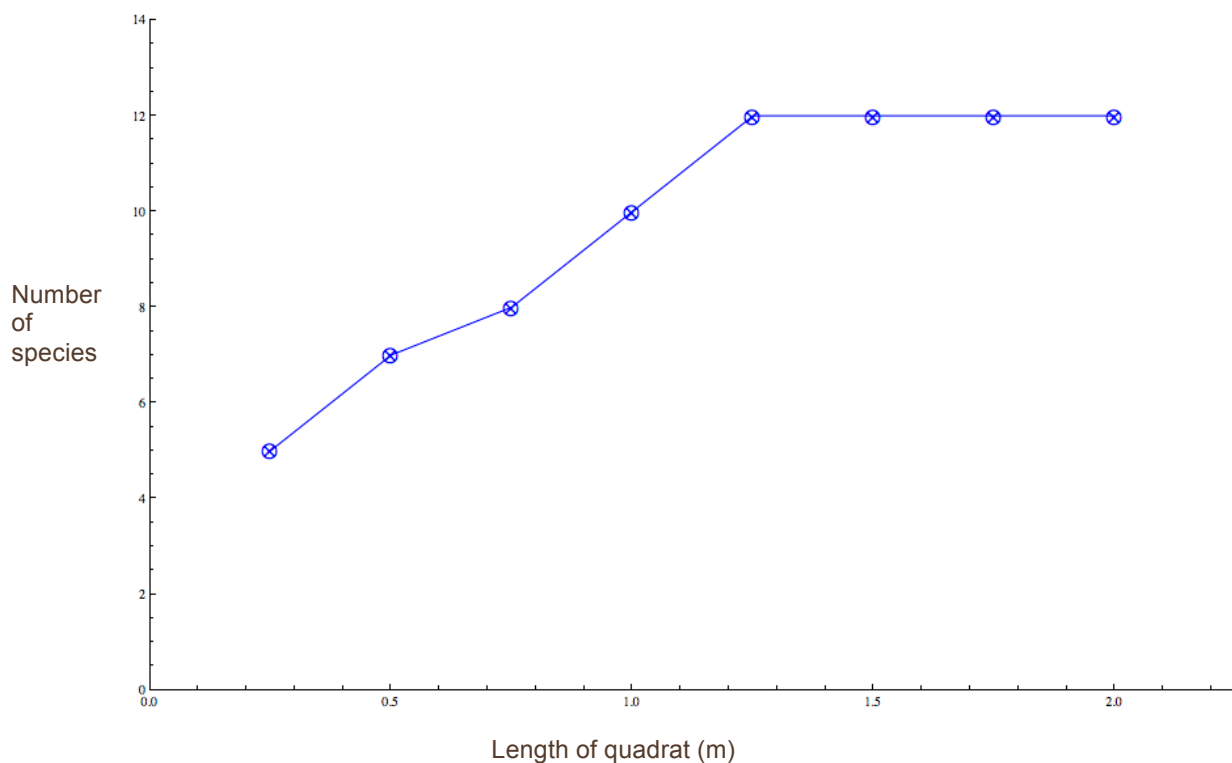
3. Map the study site and divide it into numbered squares. A computer generated random number list is then used to select which squares will be used for the quadrats.



Source: <http://www.offwell.free-online.co.uk/howto-2.htm>

Size of quadrats

The size of a quadrat can vary from 0.25 cm x 0.25 cm up to 100 m x 100 m. This will depend on the size of the organisms to be sampled. The minimum size for each quadrat can be determined using the species-area-curve method. This involves beginning with a small quadrat and counting the number of different species within the quadrat. The size of the quadrat is slowly increased and the count repeated each time. A graph of quadrat size vs. species number is drawn and the point where the curve flattens out indicates the minimum quadrat size.



The graph levels off after 1.2 m so this is the minimum size of the quadrat to be used.

Number of quadrats

The number of quadrats used should ensure that approximately 2% of the total area of the study site is sampled

e.g. If the study site is 10 m x 10 m then the total area is 100 m².

If quadrat sizes are determined to be 0.5 m x 0.5 m, (area of 0.25 m²) and 2% of the total area is to be covered then

Number of quadrats = $2 / 0.25 = 8$ quadrats.

Collection of data

The following data should be collected for each quadrat where possible:

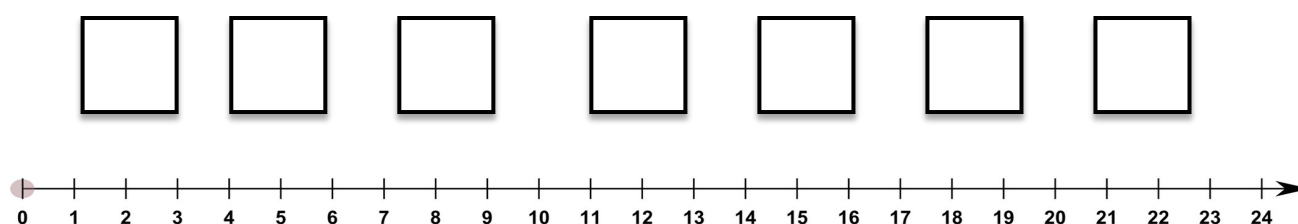
- Aspect – North/South/East/West
- Slope – steep, moderate or flat
- Elevation
- Position – latitude and longitude
- Soil characteristics
- Visible signs of disturbance from natural and human causes.

The following data can be recorded for each quadrat:

- Cover – this is the most common measure of plant abundance. It involves estimating the percentage of the quadrat that is covered by each plant type. Plants may overlap each other in layers therefore it is possible to get a total percentage cover that is greater than 100%.
- Species density – this involves counting the number of plant species within the quadrat. The average number for all quadrats is then calculated giving a total number of plant species per square metre (if the size of the quadrat used was 1 m²).
- Species frequency – this involves calculating the percentage of quadrats that contain each plant species.

Systematic sampling

Systematic sampling is useful when looking for a pattern in the vegetation e.g. a change in abundance or the effect of a change in the habitat. This involves laying out a tape and placing quadrats at regular intervals along the tape.



Permanent Quadrats

Permanent quadrats are quadrats placed in permanent positions. This allows repeated visits to re-sample the vegetation at different times of the day, during different seasons and sometimes over a number of years. This allows changes to be noted over time.

Safety precautions and behaviour at a study site

When carrying out fieldwork it is important to consider the following hazards:

- Exposure to the sun
- Water hazards
- Potential trip and fall injuries
- Snakes
- Pollution at the site

Correct footwear and clothing should be worn during fieldwork. It is important to ensure that the study site and any surrounding areas do not become trampled or damaged due to your investigations.