

# GARDEN SPECIES AND SAMPLING

Younger  
children  
may enjoy this activity  
with some guidance  
from grown ups or  
older siblings.



Science, Numeracy, Mathematics & Statistics



12+ year olds



Initial set up – approximately 1-2 hours

This activity can be repeated and monitored daily or weekly (30 minutes-1 hour each session) indefinitely.

**At the National Memorial Arboretum, we are really proud of our diverse natural environment and all the species of plants and animals that call it their home.**

We would like to encourage you to take a scientific interest in the species that inhabit your own mini-environments: your gardens! This activity will teach you about the scientific concept of sampling through the use of a piece of equipment called a quadrat.

## Sampling

Your garden is a tiny sample of the world's outside natural environment. Scientists and environmentalists often use samples to make conclusions about larger areas. E.g. it would be impossible to count all of the dandelions or insects around the world, but we could count them in a small section of your garden and try to estimate how many there would be over a large area.

### Why Sample?



To monitor the populations of plants and animals



To monitor the effect of environmental change/differences on species



To assess the success of conservation projects



It would otherwise be impossible to count every single organism in a species



## Step 1: Measure your garden area

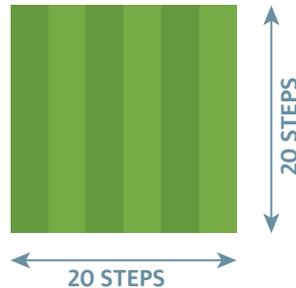
You are going to make a quadrat to take a sample of some of the organisms in your own garden. Over the course of the next few days, or even weeks, you will monitor the numbers of certain species in your garden by taking a sample count and then mathematically estimating the numbers for your whole garden.

Employ the help of a grown up or any brothers and sisters. You can use a tape measure or you can measure using your steps!

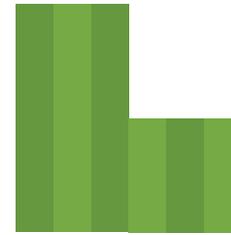
*It may be sensible to just measure your lawn area in large gardens.*

### Tips for measuring area:

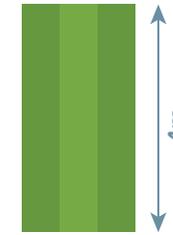
Rectangles and squares – multiply the length by the width e.g.



This square lawn measures  
20 steps x 20 steps  
400 steps<sup>2</sup>



This lawn needs to  
be split into 2 areas



A rectangle measuring  
 $1.5\text{m} \times 4\text{m} = 6\text{m}^2$



And a square measuring  
 $1.5\text{m} \times 1.5\text{m} = 2.25\text{m}^2$

So, the whole area  
is  $8.25\text{m}^2$

## Step 2: Make your quadrat

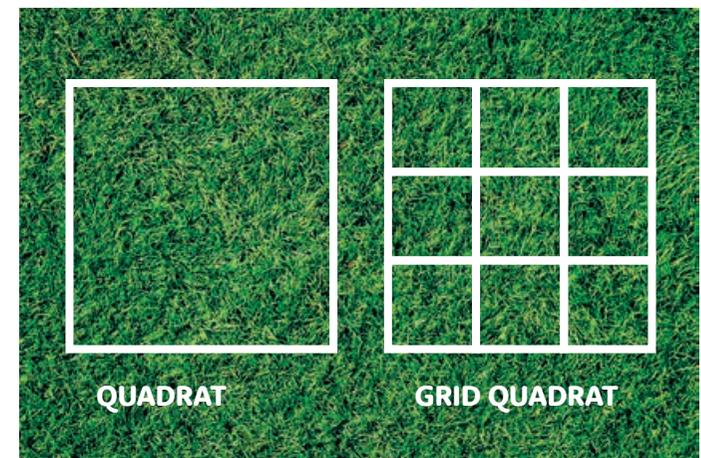
Decide how big you want your quadrat to be. If you have measured your garden in metres,  $0.25\text{m}^2$  ( $0.5\text{m} \times 0.5\text{m}$ ) would be a good size, although you could go even smaller if you wanted to.

As a rough guide, a piece of A4 paper is approximately  $0.06\text{m}^2$ .

If you measured your garden in steps, do the same for your quadrat.

You can make your quadrat by sellotaping pencils or other long items together, sewing together 4 strips of scrap fabric or by folding A4 paper in half and cutting out the middle, leaving a frame when you open it back out.

Your quadrat can be rectangular or square and could contain a grid.





## Step 4: Do the maths

Based on your sample findings, estimate the total number of each species in your measured garden.

Quadrat Number	1	2	3	4	5	6	7	8	9	10
Number of ants seen in 5 minutes	4	5	2	0	1	5	3	2	5	3

### Scaling up the results:

1. Calculate the mean number of ants per quadrat.

*To calculate the mean number of ants from the findings above add the number of ants in each quadrat together then divide by the total number of quadrats. For example,*

$$4 + 5 + 2 + 0 + 1 + 5 + 3 + 2 + 5 + 3 = 30$$

$$30 \div 10 = 3 \text{ ants per quadrat}$$

2. Take the total area of the quadrat.

*If the quadrat is 0.5m by 0.5 m, the area is  $0.5 \times 0.5 = 0.25\text{m}^2$*

3. Take the total area of the habitat being sampled.

*For example, if the garden measured 10m by 10m, then its total area is  $10\text{m} \times 10\text{m} = 100\text{m}^2$*

4. Divide the total area of the garden by the area of one quadrat.

*Answer = 400. This gives you the total number of quadrats that could fit into the habitat.*

5. Multiply the average number of ants per quadrat by the total number of quadrats that can fit into the habitat.

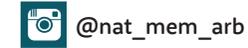
*$3 \times 400 = 1200$ . This gives you the estimated total number of ants in your garden. Just think how many more are lurking under the surface being really busy!*

## Step 4: Repeat the process

Repeat the activity every week to see how the number of each species changes with the weather and seasons.

## Step 5: Share

Share your photos and findings with us and become a contributor to wider environmental monitoring with the National Memorial Arboretum.



## Follow up work

Use the internet or books you may have at home to learn more about the species you are counting.

### For example:

How many different species of beetle have you found?

Can you email your findings to someone sampling in a different garden and compare your findings?

Can you produce a graph to show how the numbers change over time?

Could you correlate your sample numbers with changes in the weather by also monitoring the temperature/weather?

