

## ACTIVITY 5

# Which trees have the highest biodiversity?

### Introduction

Gordon and Woburn Squares are home to over 140 trees, consisting of more than 20 different species. The tree species can be crudely divided into two groups; **native** (those which arrived via land bridges) and **introductions** (those brought by humans to this country) (Fig. 22). It has been found that native trees support a greater number of invertebrates and birds when compared to non-native species. This greater biodiversity is due in part to the time necessary for animals to adapt to newly introduced food sources. Where fewer primary consumers have adapted to 'new' food sources a reduced number of secondary consumers are found.



Figure 21. Woburn Square during redevelopment in summer 2006, showing the plane trees growing around the edge.

Native	Introductions
Hornbeam	Plane
Cherry	Willow-leaved pear
Lime	Golden chain
Ash	Purple beech
Birch	Bay
Rowan	Sycamore
Weeping Wych Elm	Cherry plum

Figure 22. Native and introduced tree species found in Woburn and Gordon Square

### Learning outcomes

*Through this activity pupils will:*

- investigate if there are more kinds of invertebrates on native trees, than on introduced trees
- construct a pyramid of numbers to represent the data
- evaluate the method use

## Resources

### Worksheets

- 1. Recording your results
- 2. Analysis of results
- 3. Evaluation of results

### Apparatus needed

Large white sheets  
OR beating tray  
Disinfectant for pooter mouthpieces  
Bug boxes (with magnification lids)

### Accompanying CD

- PowerPoint 'Sense of Place'
- All photos from this section

Plastic teaspoons  
Pooters  
Clipboard, pens, pencils  
*Tree Name Trail* fold-out chart  
*Bugs on Bushes* fold-out chart

## Lesson sequence

### 1. Before fieldwork

Pupils will have learnt about feeding relationships at KS2 and 3. This study will allow pupils to collect data to see 'real feeding chains' and grasp the idea of population numbers at differing trophic levels. The data from two different types of tree species will enable pupils to consider the environmental consequences when non-native species are introduced. An introduction to the area and an outline of the history of the squares should precede the visit to the site. Consideration should be given to how squares are managed, and on what bases plants may have been chosen in the past and how this practice may vary today.

### Site Position

Fig. 22 lists the species of native and non-native trees found in the Squares. These can be compared when studying invertebrate populations. Use the *Tree Name Trail* fold-out chart for help with tree identification. There is a plan to aid tree location in Sheet 4.

### Points for discussion during planning

What factors are changing at each sample (dependent variables) and which are remaining constant (independent variables)? How many samples are needed from each tree species? Should branches from the same tree but facing different aspects be sampled, or one branch from different trees of the same species? How can the method be standardised so it can be repeated suitably at each site? Some animals will be too fast to count, how can they be recorded?

## 2. Fieldwork

One possible method is described beneath to collect data on feeding relationships. If pupils are provided with knowledge of the basic techniques – choosing their sample trees, tree beating and collection, the detailed planning to the investigation could be left to them. This would allow for a variety of methods to be discussed and evaluated later.

### Collecting data

Trees with lower branches need to be chosen to sample. A beating tray (or large white sheet) is held high under the branch. The branch should be tapped twice with a large stick, thus knocking invertebrates off the tree without harming them. The animals in the beating tray should be sorted and identified. The *Bugs on Bushes* key can be used to help with identification.

Large, slow moving animals can be picked up with a plastic teaspoon and put into bug pots. Animals that are small and active can be picked up using a pooter. This apparatus has two tubes. One should be placed over the animal the other, with the protective mesh at one end, should be sucked through. The animals caught should be transferred to bug pots.

Record the frequency of the animals on Sheet 1. Once recorded carefully release the animals in the same place. Measure and record the girth of the tree if different trees of the same species are being sampled, so that age can be assessed. These data will be useful when considering the reliability of the method. A compass should be used if branches at differing aspects are being sampled.

### 3. After fieldwork

#### (a) Analysing data

On returning to the classroom the pupils need to ascertain the trophic level for the invertebrates found and calculate the average number from the samples. The analysis prompt sheet guides the pupils to consider how the data could be displayed so that comparisons can be made between native and non-native species. Methods may include bar charts for each tree species comparing the total number of invertebrate species found at each trophic level; two pyramids of numbers representing the total number of species at each trophic level (the number of leaves (primary producers) would have to be estimated). The prompt sheet guides the pupils to describe and explain these results, enabling them to consider what future implications their findings may have on the management of the squares.

#### (b) Evaluation of the Method

To evaluate the methods used, a prompt sheet (Sheet 3) is available as a guide. This asks the pupils to consider how valid and reliable they feel the data are if they were to be used as evidence of current biodiversity in the squares. The pupils need to consider what other data are necessary for them to collect so that any claims can be supported.

### Further reading

Support website provided by the Natural History Museum

<http://internet.nhm.ac.uk/eb/twotrees.shtml>

# Which trees have the highest biodiversity?

## SHEET 1 - RECORDING YOUR RESULTS

Phylum	Class	Common name	How does it feed?	Native / non-native tree			
				Sample 1	Sample 2	Sample 3	TOTAL
Mollusca	Gastropoda	Snails					
		Slugs					
Arthropoda	Arachnida	Spiders					
		Harvestmen					
		Mites					
		Ticks					
	Crustacea	Woodlice					
		Centipedes					
		Millipedes					
	Insecta	Eggs					
		Springtails					
		Grasshoppers					
		Cockroaches					
		Earwigs					
		True bugs					
		Bark lice					
		Thrips					
		Lacewings					
		Snakeflies					
		Alderflies					
		Scorpion flies					
		Butterflies					
		Caddis flies					
		True flies					
		Sawflies					
		Bees					
		Wasps					
	Ants						
	Beetles						
Other							

# Which trees have the highest biodiversity?

## SHEET 2 - ANALYSIS OF RESULTS

1. Use the information from the *Bugs on Bushes* chart and the internet to complete your results table to show the feeding level for each animal.

Feeding level	Code to use in the table
Herbivore (primary consumer)	H
Primary carnivore (secondary consumer)	C1
Secondary carnivore (tertiary consumer)	C2
Decomposers and detritivores	D

Record more than one letter where animals feed at several trophic levels.

2. Each group sampled either a native or a non-native species of tree. Share your results with another group who sampled a different type of tree.

Using graph paper, draw EITHER two bar charts OR two pyramids of numbers of the number of animals at each feeding level for the two different types of tree.

3. Describe the data that you have illustrated. Remember to describe any similarities or differences seen between the two different tree species.

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4. Try to explain any trends in the data; what reasons can you give for these trends/ patterns?

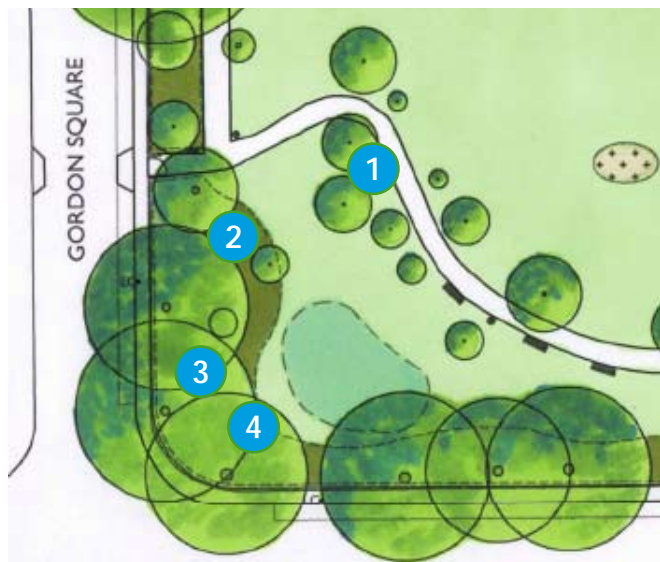
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The plan shows the north-west corner of Gordon Square.

The four trees numbered were removed in 2006.

Trees removed in 2006
1. Cherry plum
2. Cherry plum
3. Sycamore
4. Sycamore

5. If you were managing the Squares in a way to increase biodiversity, do the data you have collected support evidence for the removal of trees 1-4?

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6. Are there conflicts between the type of planting which may be desirable in a London square and an aim to manage the square to increase biodiversity? Use data to support your explanation.

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# Which trees have the highest biodiversity?

## SHEET 3 - EVALUATION OF RESULTS

1. Consider your method. List the difficulties that your group found. Suggest improvements that could be made so other groups will not encounter the same problems.

Difficulties Found	Improvement
<i>Counting all the animals that were very small, such as mites.</i>	<i>I used a hand lens. In the future I could estimate (sample) just one area of the sheet.</i>

2. All the partners who funded and were consulted on the re-development of the Squares would like feedback on the research that you have completed through a presentation. How confident are you in your data? Do you feel you have enough to discuss? What extra data would be useful?

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