# Forty Minute Fieldwork: Biodiversity

| Key topic areas | Equipment and resources required |
|---|---|
| • Ecosystems<br>• Carbon cycle<br>• Water cycle<br>• Environmental quality<br>• Pollution and waste | Gridded quadrat<br>Species ID guide<br>Vegetation survey recording sheet |

## Context

Biodiversity is under threat in the UK. A number of human and physical process is are combining to create a 'perfect storm' of variables that endanger the future of many species.

Some species face an uncertain future as a result of habitat loss. Wilderness areas are being developed on and wetlands drained to make way for new housing, industry and agriculture. While many farmers and land managers work in harmony with nature, others rely on chemical applications such as fertilizers and pesticides to maximise profits and prevent crop loss. While fertilizers promote the growth of particular crops, they do so by compromising the ability of other plants to grow. Pesticides are often indiscriminate in their function: while killing off insects which will directly affect crop growth, they will also kill other pollinators and insects that are necessary to the wider functioning of the ecosystem. The problem is one of even greater spatial significance when one considers the effect of wind blown pesticide and fertilizer from the point of application.

Biodiversity is also under threat from climate change. Flora and fauna species will often grow and reproduce in particular climatic conditions (known as their ecological niche) . In the UK, as winter temperatures rise and as rainfall patterns become less predictable, many species are unable to access their ecological niches and survive.

## Classroom set up

Introduce students to the idea that there are varying degrees of land management present in the landscapes they might know locally. Give students a number of images of different landscapes such as arable farmland, wild meadows, grazed downland, a local park or football pitch, plantation woodlands and ornamental gardens and ask them to say whether they are natural, or managed landscapes. Many students will be surprised to see how many areas that are labelled green space are in fact completely unnatural when one considers how they are managed. Students might like to guess how much of the UK is classed as 'developed' (6%) compared to 'farmed' (55%) and this map from the University of Sheffield is a good illustration of the idea too.

Students can try to list ways in which land might be managed. Some students will quickly recognise that adding chemicals to land in the form of pesticides, herbicide and fertilizers is a form of management but they may not understand that actions such as timber felling or even weed removal from a garden are still creating managed areas of land.

Discuss how some of the land management practices in the box (right) might affect biodiversity in terms of both flora and fauna. Students may recognise that some management practices may increase biodiversity but not necessarily with species that are found naturally in the wild in these environments. Students might like to place these land management practices in order from what they believe are the most to least destructive of wilderness areas in the UK.

| Examples of land management practices |
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| Chemical application |
| Sowing / planting |
| Harvesting / Mowing |
| Protecting |
| Draining |
| Grazing |
| Weeding |
| Hard landscaping |
| Ploughing |
| Conserving |

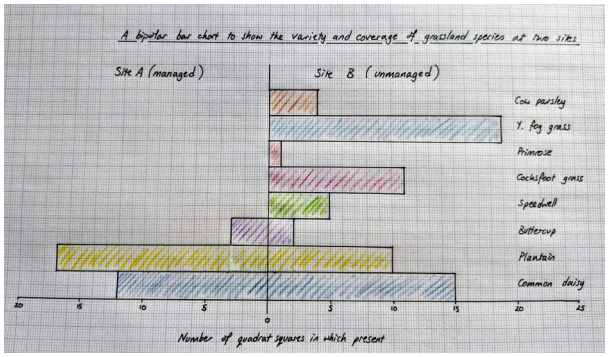
## In the field

Identify two grassland areas either locally or within the school grounds: one where there is a lot of evidence of human management (such as a sports pitch) and another where there is little to no management (such as a wilderness area or meadow). Students should place a gridded quadrat on the sports pitch and identify the grassland species present as best they can using an ID key. If this is too challenging, students can simply devise a species number system without referring to the species themselves by name (species 1, species 2, species 3 etc...). For each species they have identified, students should count the number of square within the quadrat grid in which that species is present and record that value. Students should then repeat this method at their second, wild grassland site.

If the two sites are adjacent to each other in the same parcel of land, it may be possible to include a third site which covers the margin between the managed and unmanaged grassland sites.

## Suggested data presentation

Students might like to try and draw a bipolar bar chart which allows them to compare species diversity across their two sites. The x-axis for this graph can either be a direct count of the number of squares within the gridded quadrat in which that species was found, or students can calculate the percentage of the quadrat that each species covered and use those values.




Students might also like to map more precisely where their quadrats fell within the field site. This can take into account the multiple quadrat records taken by lots of students in the class.

The number of different species recorded in each quadrat can be represented on the map as a proportional circle. This will then allow the students to see if there is a distinct difference in the number of species found in a quadrat in a managed section of grassland compared to an unmanaged section. It will also allow students to see if there is a gradation of change from managed to unmanaged or whether the ecological margin between the two is as sharp as its geographical boundary.

## Key questions for reflection and analysis

- In which area was there the greatest diversity of species?
- Are there any surprising results? Were there any species that were equally abundant in both areas?
- What type of management practices can you see or imagine in the managed area of the field site?
- What impact might the less diverse of the two field sites have on wider ecological processes?
- Was there any evidence that the less diverse site for flora was also less diverse in fauna such as insects?
- How easy was it to identify the different species? Did this have an impact on the results?
- Was enough of each area surveyed? What impact would increasing the size of the sample have on the results?
- Would this type of survey work well in other habitat types? What adjustments might be needed?
- How might the time of year have an impact on the results and conclusions made from this survey?

## Taking it further

Students might like to analyse the data they record using a statistical test. The Simpson's Diversity Index is a simple calculation that examines the diversity of a sample recorded from primary data against a population. It looks at the number of one kind of individuals against the total number of individuals within the sample area and gives an index value on a scale between 0 (absolute uniformity) and 1 (absolute diversity). Students who lack confidence in maths might like to use a spreadsheet calculator designed for this purpose.