

## Key Stage 5 Worksheet

# Earth LIVE Lessons: Exploring the Wilder Side of Cities



### What is it about?

In this video, conservationist, nature-lover, and biodiversity officer for Kingston Council, London, Elliot Newton talks about:

- The biodiversity of London and the Thames - London has enough wildlife to go on an urban safari!
- Some of Elliot's favorite species that you can find in London.
- Nature can be found anywhere.

Watch the video here:  
[youtu.be/sUxDJ2Mf1H0](https://youtu.be/sUxDJ2Mf1H0)

Open the file in your  
web browser to click on  
the links.

### Some key facts:

- In the 1950s, the Thames was declared a 'biological wasteland'. Now you can find seals and even seahorses – you just need to know where to look.
- According to the London Bird Atlas (of the **London Natural History Society**), there are 188 bird species recorded in London.
- White-tailed **sea-eagles**, reintroduced to the **Isle of Wight** last year, recently flew over London.



White-tailed sea-eagle.

## Some key facts:

- **Peregrine** - the world's fastest aerial hunters with incredible eyesight. They dive down in a stoop, looking for pigeons. The peregrine's nictitating membrane, or third eyelid, enables the predator to keep its eyes open while hunting at speed. In the 1960s, peregrines were on the brink of extinction, now they are coming back. In 2014, there were 1,505 breeding pairs in the UK (**British Trust for Ornithology**). Peregrines are doing well in urban areas where there is abundant prey (pigeons), tall city structures, and lack of persecution.
- **Stag beetles** – SW London is the best place to see Stag beetles. They spend most of their lives in deadwood and form part of the saprotrophic (dead or decaying organic matter) communities. When they come out, they are looking to mate. Antler-like structures are used to combat other males - the one that stays on the log will mate with the female. They have a sacrificial jaw that is not harmful. You can put deadwood out to provide habitat for stag beetles.
- **Water voles** - the fastest declining wild mammals in the UK. They are herbivores and can eat over 200 types of plant. Of the four species of vole in the UK, three of them are found in London. They are prey to heron and other river-dwelling animals, so they support the base of the food web. When they spot a predator, they jump into the river and make a splash – a plop, warning all the other voles in the area. It is a good sign if you hear lots of plops as you are walking along a river as it could be water voles. The Last water vole in Elliot's region was spotted in 2014. It is locally extinct, but he is working to bring them back with **Citizen Zoo**.
- **Kingfishers** - adapted to London rivers and nest in the bank. They have an electric blue feather colouration, even though their individual feathers are transparent. The blue colour is produced by the way the light refracts through their feathers. Kingfishers have orange breasts which are used to attract mates. They have to eat their weight in fish every day.
- **Bats** – the only true flying mammals. There are 17 species of breeding bats and 11 of these are found in **London**. Daubenton's bats have evolved to live along watercourses (channels for flowing bodies of water). They have a back foot that is cast out like a fishing net to catch small flies. All bats in the UK are insectivores, they can eat up to 3000 bugs in one night. Bats evolved a long time ago and have a long lifespan for an animal of their size. The longest-living bats can reach up to 42 years old.

## Find out more

- **Kingston Peregrine Live feed.**
- **Berrylands Nature Reserve.**
- Link to the London National Park City: <http://www.nationalparkcity.london/>
- Link to the Hogsmill River video: <https://www.youtube.com/watch?v=YNiRI...>
- Twitter: @ElliotNewton90.

## Questions

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Interactive: Click on box to start typing

Elliot talked about community-led conservation at the grassroots level, empowering people to do conservation in their local area.



What is meant by the term, 'think globally, act locally'? Use examples to help you answer, for example, what could you do in your local area that could help solve a global issue?

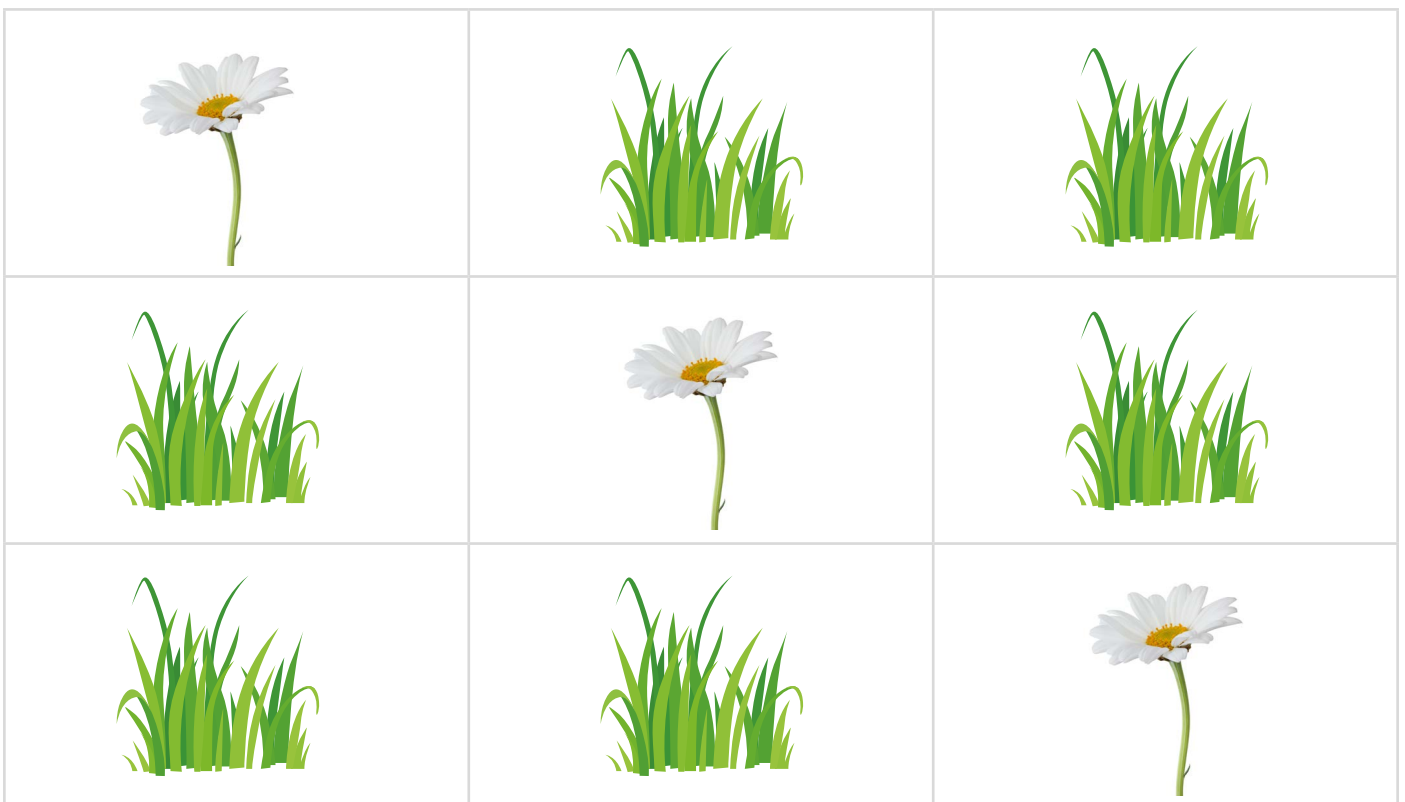
What would a food web look like for a nature reserve in Kingston, London? Draw a food web to include some of the species talked about here. Think about what would happen to your food web if another species were re-introduced, such as the **wild boar**.

Calculate the biodiversity of Kingston, London (or another urban area you know well).

**Biodiversity can be measured as the number and variety of organisms within a specified region.**

To measure biodiversity, we first need to count the number of species in the region. This is known as '**species richness**'. For example, the table below represents a 3 x 3 plot, randomly selected in a field and we can count the number of species in the plot. In this example, 3 of the squares have daisies and 6 of the squares have grass. The species richness is only 2, because there are **2 distinct species**. If you look closely enough you can find lots of species in a small area of grassland, including mosses, liverworts, wildflowers – not to mention the worms and other bugs - this example is overly simplified for ease of calculation.

'*Species evenness*' is the relative abundance of individuals of a species in an area. So, in the example below, there are 3 daisies and 6 grasses. It is not quite even – there is more grass than daisies. If we took all the daisies away, it might be even, but not very rich. If we find more daisies in another sample, we could find a higher evenness. Species evenness can also be calculated, but here we will focus on using the number of individuals to calculate diversity.



# The Simpson index for the biodiversity of communities

In ecology, a community is a group of species that are found in the same area and are commonly associated with each other. Often, ecologists want to compare the biodiversity of different areas or communities. To do this, we first need a measurement of biodiversity. A common method for calculating biodiversity of ecological communities is called the *Simpson's Index for Biodiversity*:

$$D = 1 - \left( \sum \left( \frac{n}{N} \right)^2 \right)$$

## Where:

D = diversity (what we want to find)

$\Sigma$  = sum

n = number of individuals

N = total number of organisms (of all species)

It produces a value from 0-1, where numbers closer to 1 are more biodiverse, that can be used to compare the biodiversity of different communities.

We can calculate this for the example above using a table:

Species (N = 9)	n	n/N	(n/N) <sup>2</sup>
Daisy	3	3/9 = 0.3	(3/9) <sup>2</sup> = 0.1
Grass	6	6/9 = 0.7	(6/9) <sup>2</sup> = 0.4
Sum ( $\Sigma$ )			= 0.1 + 0.4 = 0.5
1 - $\Sigma$			= 1 - 0.5 = 0.5

Another way to measure diversity is genetic diversity:

- Genetic diversity is how many alleles present in the population (the variety of genes)
- It can be measured by:
  - comparing characteristics.
  - analysing genomes.

Here is another example: [Khan Academy explanation of Simpson's index.](#)

## Exercises

- Next time you can see the sky, look up. Can you see **swifts**? If not, what can you see? Try to identify one bird species. Here is a **bird identifier** from the RSPB to help you.

Following the swift example, write a profile of the species. You could include information such as:

- Where is it commonly found?
  - What is their status – are they endangered?
  - How many are there in the UK, do we know, and how do we know?
  - What do they eat?
  - How are they adapted to their environment?
  - Etc.
- If you have materials at home, you could design and make a birdhouse for your specific bird to nest in (such as this plan for **swift boxes**).

## For teachers and home schoolers

Links to Science in the National curriculum for Wales (KS5)

### As-Level Biology, Unit 2: Biodiversity and Physiology of Body Systems

#### 1. All organisms are related through their evolutionary history

(h) biodiversity as the number and variety of organisms found within a specified

geographic region

(i) biodiversity varying spatially and over time and affected by many factors

**(j) biodiversity can be assessed in a habitat e.g. Simpson's Diversity Index**

(k) biodiversity can be assessed within a species at a genetic level by looking at the variety of alleles in the gene pool of a population, i.e. the proportion of polymorphic loci across the genome

(l) biodiversity can be assessed at a molecular level using DNA fingerprinting and sequencing

(m) biodiversity has been generated through natural selection  
SPECIFIED PRACTICAL WORK: Investigation into biodiversity in a habitat

(n) the different types of adaptations of organisms to their environment including

anatomical, physiological and behavioural adaptations

Falcon eyesight: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1771963/>



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