

KEY STAGE 4

Mini Module Lesson Plans



Mini Modules

MODULE 1

- Levels of organisation within an ecosystem
- Abiotic and biotic factors
- Interdependence in ecosystems
- The importance of biodiversity

MODULE 2

- Evolution, inheritance and variation
- Dominant and recessive phenotypes
- Selective breeding and natural selection
- Modern biotechnology applications

MODULE 3

- The evidence for anthropogenic causes of climate change
- Potential effects of, and mitigation of, increased atmospheric carbon dioxide and methane

MODULE 4

- Communicable diseases: bacteria, viruses and fungi as vectors of disease in animals and humans
- Reducing and preventing the spread of infectious disease

MODULE 5

- Exploring the human perceptions of animals in different situations
- Examining intensive farming systems
- Exploring animal welfare

END OF MINI MODULES

Download certificate of completion.

TEACHER NOTES

Each mini module has direct Key Stage 4 National Curriculum links to the Biology, Geography and PSHE syllabus. Each mini module will take approximately 30-45 minutes to complete and concludes with a mini quiz, which is suitable for retrieval practice or revision purposes at a later date.

LOOK OUT FOR THESE SYMBOLS



Quick fire question



Differentiation



Video link



Read the text



MODULE 1

Agricultural Ecosystems



Learning Objectives

ABIOTIC AND BIOTICS FACTORS

The abiotic and biotic factors which affect communities within agricultural habitats.

INTERDEPENDENT RELATIONSHIPS

How different species within the same community depend on each other for survival.


THE IMPORTANCE OF BIODIVERSITY

The importance of supporting biodiversity in native British habitats.

Keywords: Abiotic, biotic, interdependent, species, population, community, biodiversity, habitat, abundance

INTRODUCTION

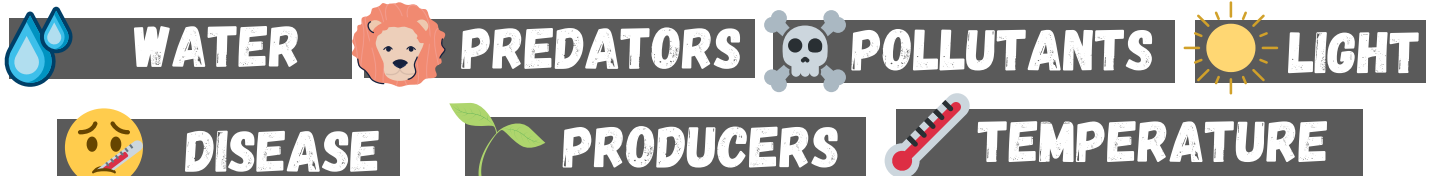


Every living **organism** on planet Earth lives within a particular **ecosystem**: this could be a desert, a tropical rainforest, or even your garden pond. In this module we are going to focus on the different **species** living in **communities** in the typical British countryside, including agricultural animals. We are going to learn how these species **depend on one another** for survival, the importance of that dependence, and the impact that humans have on animal and floral habitats. [To begin, watch this video](#) 

? What is the difference between a **population** and a **community** within an **ecosystem**?

Abiotic refers to the non-living parts of an ecosystem. The **biotic** factors are those that are alive.

Have a go at sorting the factors below. Are they biotic or abiotic?



✚ Try and list some different ecosystem factors. Can you explain why these are biotic or abiotic? How do they vary in different ecosystems, e.g. a desert vs. a rainforest?

MODULE 1

Agricultural Ecosystems

ABIOTIC & BIOTIC FACTORS IN UK HABITATS



The British countryside is well known for its agricultural landscape filled with abiotic and biotic factors: tessellating fields of wheat, maize, and other arable crops as well as vast pastures populated by domesticated grazing species: cattle, sheep, and pigs. Amounts of water, light and temperature vary over the course of the year. Known as 'species corridors', hedgerows form a vital pathway for wild native species such as hedgehogs to avoid the eyes of watchful predators such as red foxes. Native tree species such as apple, hawthorn, holly and beech support a great number of birds and invertebrates too by providing shelter and food throughout the changing seasons.

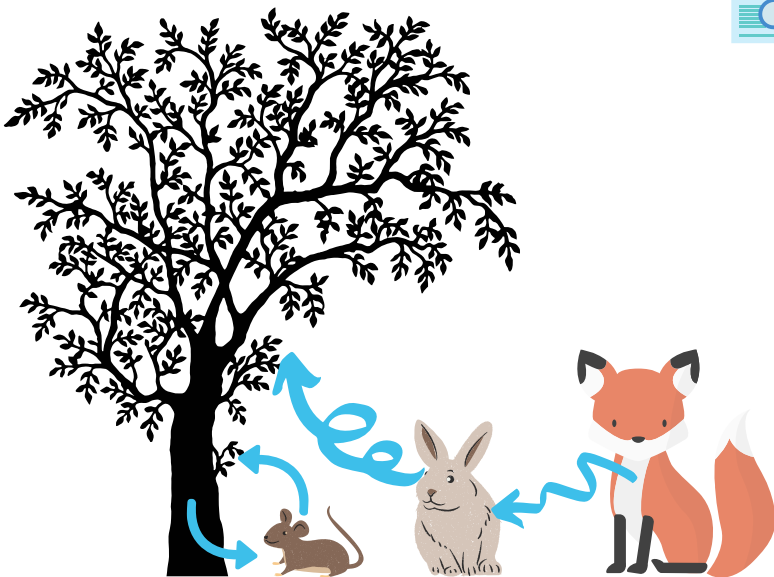
However, this idealised image of the British countryside that we grow up with as children fails to really explore the **devastating damage** that agricultural practices can have on native British habitats.



INTERDEPENDENT RELATIONSHIPS

When two or more different species rely on each other for a resource to survive, such as shelter or food, we describe these species as being **interdependent** (remember: they *depend* on each other to survive). This relationship usually benefits both parties, but sometimes only one species actually benefits.

Let's explore an example:



The field mouse is dependant on the beech tree because the tree provides food in the form of beechnuts. It also provides shelter for the mouse and the rabbit. The fox is dependant on the rabbit for food. Did you also realise that the tree is dependant on the mouse to spread its seeds so that it can reproduce?

The closer you look at an ecosystem, the more complex and connected the relationships are.



Some ecosystems can change completely depending on the species in it.

[Click here](#) to see an incredible example where the re-introduction of wolves actually caused the course of rivers to change.

WHAT HAPPENS WHEN YOU CHANGE A SPECIES IN A COMMUNITY?



The species in a community can change for many reasons, including **disease**, **extinction**, or the introduction of an entirely new species known as an '**invasive species**'. When one species is affected, so is the rest of the ecosystem.

Look at the example on the left. What would happen if the number of rabbits decreased significantly due to illness or disease?

1. The number of foxes would also decrease due to having less food available.
2. Foxes would probably begin preying on field mice, so field mice numbers would also drop.
3. When field mice numbers drop, fewer beechnuts are spread through faeces, so fewer beech trees reproduce.
4. Eventually, the number of beech trees will also decrease.



Can you think of any invasive species that have been introduced into the UK?

Here's a clue... the red squirrel hasn't been doing so well since the introduction of this American species!



MODULE 1

Agricultural Ecosystems

EXAMPLES OF INVASIVE SPECIES THE UK



Japanese knotweed was first introduced into the UK in the 1800s as an ornamental plant. In its native Japanese habitat, ash deposits from regular volcanic eruptions keep the plant in check, but here in the UK it has become a massive problem. With no natural predators, the weed grows unabated and takes over all other plants in the vicinity.



American mink escaped or were intentionally freed from fur farms in the UK in the 1960s. They have since thrived here. Although cute, these mammals are carnivorous and pose a serious threat to our native water vole and seabird populations. The Wildlife Trust is working hard to help protect water voles by strengthening their riverside habitats.




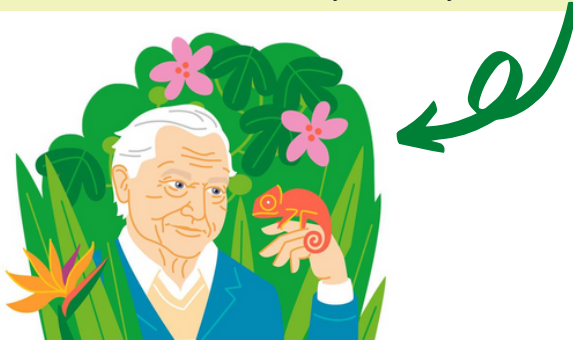
The grey squirrel is a rodent native to North America. Since arriving in the late 1800s, it is now widespread across the UK. It poses a serious threat to our native red squirrels. This is because the grey squirrel is a generalist - they will eat nearly anything, leaving less food for our native reds. A disease called squirrelpox was also very effective at wiping out the reds but seemed to have less effect on the greys.




Himalayan balsam was first introduced to the UK in the 1830s. It is now a naturalised plant, particularly found along waterways and in waste places where it has become a problem weed. As it grows, it shades other plants trying to grow around it so can quickly take over an entire habitat. You can remove Himalayan balsam by pulling the plant up by its roots.

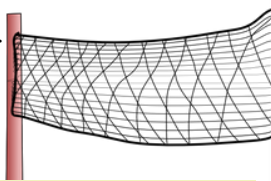
WHAT DOES BIODIVERSITY MEAN?


 Click the picture of David Attenborough below to find out what **biodiversity** actually means!



 If you want to challenge yourself, [click here](#) to learn more about the different types of biodiversity.

Some scientists think of biodiversity like a net. The greater the number of species in an ecosystem, the greater number of threads to the net.



 Do you think the net will be stronger with more threads or less threads?

The greater an ecosystem's biodiversity, the greater its ability to adapt to change. This is really important during great climatic events such as **The Ice Age** or a **very long draught**. We are currently living in an age known as **The Anthropocene** : The Age of Humans, which is causing vast change to many ecosystems.


HOW DO HUMANS AFFECT GLOBAL BIODIVERSITY?

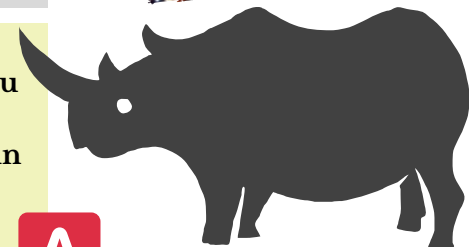
Humans are having a massive impact on global biodiversity. Here are just some of the factors involved:

- **URBANISATION DUE TO OUR GROWING POPULATION**
- **UNSUSTAINABLE AGRICULTURE AND THE DEMAND FOR FOOD**
- **CLIMATE CHANGE AND POLLUTION**

All of these human activities are swiftly destroying habitats and driving species extinction, such as the Western Black Rhinoceros which went extinct in 2006.



 How many species do you think have gone extinct in the last 100 years?



 500!

MODULE 1

Agricultural Ecosystems

END OF MODULE QUIZ

- 1. DEFINE WHAT THE TERMS POPULATION, COMMUNITY AND ECOSYSTEM MEAN**
- 2. LIST 2 BIOTIC FACTORS AND 2 ABIOTIC FACTORS THAT AFFECT SPECIES IN AN AGRICULTURAL HABITAT**
- 3. GIVE AN EXAMPLE OF TWO SPECIES THAT ARE DEPENDENT ON EACH OTHER FOR SURVIVAL. EXPLAIN HOW THEY ARE INTERDEPENDENT**
- 4. WHAT ARE SPECIES CALLED WHEN THEY ARE INTRODUCED INTO A NEW HABITAT?**
- 5. GIVE ONE EXAMPLE OF AN INVASIVE SPECIES IN THE UK AND EXPLAIN WHY IT IS A PROBLEM**
- 6. WHAT DOES BIODIVERSITY MEAN?**
- 7. WHY IS BIODIVERSITY IMPORTANT TO AN ECOSYSTEM?**
- 8. LIST 3 WAYS HUMANS ARE HAVING AN IMPACT ON GLOBAL BIODIVERSITY**
- 9. IS BIODIVERSITY INCREASING OR DECREASING DUE TO HUMAN ACTIVITY? WHY?**
- 10. LIST ONE SPECIES WHICH HAS BECOME EXTINCT DUE TO HUMAN ACTIVITIES**

NO CHEATING NOW...

- Population = a group of the same species.
Community = multiple groups of different species.
Ecosystem = all of the living and non-living components in an area.
- Biotic = Predation from foxes, buzzards. Amount of prey available such as rabbits or field mice.
Abiotic = The amount of sunlight available for plant growth. The temperature of the ecosystem.
- A field mouse is dependent on a beech tree for food. Without it, it would have to find another source of food. Other examples are accepted.
- An invasive species.
- The grey squirrel / american mink / himalayan balsam / japanese knotweed. These species usually outcompete their native counterparts and can quickly take over a habitat.
- Biodiversity is the number of different species within an ecosystem.
- The greater the biodiversity, the greater the ecosystem's ability is to adapt to change. This means that more species are likely to survive.
- Humans are having an effect on biodiversity through urbanisation, agriculture and climate change.
- Biodiversity is decreasing due to human activities because habitats are being destroyed amongst other issues.
- The Western Black Rhinoceros became extinct in 2006.