

B B C BITESIZE

Hello. I'm Dr Alex Lathbridge and this is Bitesize Biology.

This is the first in a series on Ecology. We're going to be looking at ecosystems, biodiversity and climate change.

You might already be really familiar with some of the topics that we're covering in this series, which is great, but don't skip over these episodes.

I'm going to be explaining the science behind all of it and the main key terms you'll need to pass your exams.

In this episode we're going to be starting off talking about what an ecosystem is, how organisms interact within them, and we're going to take a look at quadrats and transects.

Let's go through some key ecology terms that I'm going to keep mentioning throughout this series, so it's a good idea to write them down now. Grab a pen:

An Ecosystem is the interaction between a community of living organisms and their environment.

A community is the many populations of different species living in a habitat.

A population is all the members of a single species that live in a habitat.

And finally, a habitat is a place where plants, animals and microorganisms live.

Let's take a look at how some of the different types of organisms all interact inside an ecosystem.

You might have heard of the term food chain.

Food chains show the feeding relationships between different species in an ecosystem, basically, what an organism eats and what eats them.

A simple food chain would be: grass, which is eaten by rabbits, which are eaten by foxes.

The first thing in a food chain is at the bottom level, and it's always called a producer.

These are usually plants or algae that produce their own food, using photosynthesis to store energy in the form of glucose using carbon dioxide and water.

Easy to remember: Producers are often plants.

Producers produce biomass, which is the dry mass (meaning weight, but you need to write mass in your exam) of all the living material inside an organism.

The biomass is passed along the food chain from one organism to the next, when organisms eat one another.

All organisms above the producers in the food chain are called consumers.

Generally speaking, plants aren't eating other plants. Consumers are animals.

The organism that eats the producer is called the primary consumer, then the one that eats that is the secondary consumer, and then you have the tertiary consumer.

The final level of a food chain is called an apex predator, which isn't eaten by anything else.

So, the order of the food chains is: producer (usually a plant), primary consumer, secondary consumer, tertiary consumer, and so on, with an apex predator at the top.

There are also things known as decomposers, things like bacteria and fungi, which break down dead matter in a process called decomposition or rotting.

They do this by releasing enzymes, that break down the dead matter into simpler molecules for consumption. Plants can then absorb the broken-down nutrients through their roots.

As you can see from food chains, animals that hunt, kill and eat other organisms are called predators and animals that are eaten are called prey.

But in a healthy, balanced ecosystem the population of predators and prey remain constant.

But if the predators or prey increase or decrease in population size they affect one another, so they are linked together in a predator-prey cycle.

If the population size of a prey animal increases, the population size of the predators will increase too, because they can eat more.

But, when the population of the predators increase by a large amount, the prey will start to decrease, because they will have so many more predators eating them.

But then, the prey population decreases, and the predators will start to decrease, as they have less food to eat.

But remember, this isn't instantaneous. The predator and prey cycle is out of sync, because it takes a while for one to respond to changes in the other and reproduce or decline.

But it's not just predators and prey that are linked together, lots of different species all depend on one another within an ecosystem, so we call them interdependent.

If one species increases or decreases in a big way, it can affect the whole community.

Often very small changes to ecosystems have far-reaching effects, that you might not think about.

Think back to our original simple food chain: grass eaten by rabbits eaten by foxes.

If all the foxes were killed, the number of rabbits would greatly increase because there are no more foxes to eat them.

But this would also mean that the grass in the ecosystem would decrease rapidly, because of the increased population of rabbits eating it.

In reality, organisms are not in just in one simple food chain, but are instead part of a complex food web with lots of different organisms involved.

Interdependence doesn't just refer to food. All organisms that live in an ecosystem depend on each other for food, but also protection and shelter in order to survive.

A community where the population size of many different species remains relatively constant over time is called a stable community.

In these communities, the species and environment are in a healthy balance.

Stable communities have existed for a very long time and are not affected by changes.

Examples of stable communities include ancient oak woodlands and rainforests.

So, if population sizes are so important, how do you measure them?

It's impossible to count every single animal within a population.

Instead, scientists look at a small section of a population to draw conclusions about the rest.

There are two tools to do this: quadrats and transects.

This process is called sampling and the small area or part of a population investigated is called a sample. You might have heard the term sample size.

When sampling a population, the numbers of organisms are counted within a sample site, and then the results are multiplied to get an estimate of the total number of organisms within the whole habitat.

Quadrats are square frames of wire placed on the ground used for a few things:

To record the total number of just one species within the quadrat.

To record the number of different plant or animal species, this is known as species richness.

To record the percentage cover, the percentage of the quadrat that is covered by one species.

There are two types of sampling you need to know: random sampling and systematic sampling.

Random sampling involves placing the quadrat at random coordinates within an area. Taking random samples makes a study more valid. Quadrats are placed in random areas and so they use random sampling.

Systematic sampling involves investigating a trend or pattern across a habitat, to find out how organisms are distributed along a distance, like a beach.

Transects are used to do systemic sampling. Transects are lines, created with a tape measure, which sampling can occur on along a distance.

It's likely you might get a question in your exam about quadrats, transects and sampling, likely it's going to use maths, perhaps working out averages or percentages. If you need some help, check out our episode on Maths skills in Biology.

I'm Dr Alex Lathbridge and this is Bitesize Biology. Subscribe to the series now on BBC Sounds.