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

This is the second episode in a series on Ecology. Today, we're going to talk about the resources that plants and animals compete for and the adaptations that they've developed. I'll also be looking at abiotic and biotic factors, the non-living and living parts of an ecosystem that can change.

If you haven't listened to the last episode on the organization of ecosystems, I think you should otherwise there are lots of terms that you might not understand.

But let's quickly remind ourselves of a few key ecology terms:

A population is all the members of a single species.

A community is two or more populations of different species.

An ecosystem is the interaction between a community of living things and the environment.

Ecosystems are all about competition. Organisms need specific resources from their environment, and there is not an infinite amount for everyone. Grab a pen and write this down:

Plants need light and a regular water supply for photosynthesis to happen, as well as space for healthy growth.

All animals need food.

But animals within the same species also compete for mates. Some deer engage in physical fights locking antlers in order to win mates, also, if you haven't seen giraffes fighting one another just using their necks it is terrifyingly fascinating. Look it up.

Animals also compete for territory. Territories contain all the resources and conditions they need to survive

So how are animals able to compete like this?

Yes, you've guessed it. They've developed adaptations that make them better suited to their environment, so they have a higher chance of survival and successfully breeding.

The adaptations that arise from competition are due to the process of evolution that we discussed on previous series.

Adaptations can be structural, behavioural or physiological – let's start with plants:

In plants, structural adaptations are physical features like spines found on cacti that stop them being

eaten or bright flowers which attract insects to pollinate them.

Behavioural adaptations of plants are behaviours which give them an advantage like growing up quickly towards light, to maximise photosynthesis, or plant roots growing downwards to take up more water.

Physiological adaptations of plants are processes like the formation of poisons for defence, found in nettle stings and deadly nightshade.

But what about in animals?

Structural adaptations of animals are physical features such as sharp claws that can catch prey or dig burrows. Predators and prey often have similar adaptations – for instance, both might have good vision and good hearing.

Behavioural adaptations of animals are behaviours such as mating rituals, like a male peacock showing his tail to attract a female. Many bird species migrate to warmer areas in winter times to avoid the cold.

Physiological adaptations of animals are processes like the production of venom in snakes and spiders, which can help them to defend themselves and kill their prey. Or dogs – like my baby boy Ollie – can have amazing sensitivity for detecting movement with their eyes, a trait that is useful for hunting and guarding.

But not all environments are the same.

An organism that lives in an extreme environment is known as an extremophile.

These organisms live in extreme environments such as frozen polar regions, the driest deserts, high pressure in the deep ocean and super-hot thermal vents or volcanoes.

Usually these are microorganisms like bacteria.

Extremophiles have a few highly specialised adaptations that help them to survive in the extreme environments. Very few other organisms would be able to survive in there.

So now we've understood what organisms compete over, and the adaptations they've developed, the final section of this episode is about abiotic and biotic factors. These are factors within an ecosystem that can affect he abundance and distribution of living organisms

The names sound complicated but honestly, it's really not. They literally meaning "non-living" and "living."

Let's start with abiotic factors, the non-living elements in an ecosystem that change.

You need to be aware of these in case they pop up in your exam, grab a pen so you can write this down:

Light intensity – some plants might need shade, some might prefer bright light.

Temperature - plants and animals might prefer hot or cold areas. Polar bears have evolved to live in the cold North Pole and would not survive elsewhere, like a desert.

Moisture Levels – plants cannot survive in soils that are too waterlogged, as their roots cannot respire.

Soil pH level - different plants prefer acidic or alkaline soils.

Soil minerals – many plants need high levels of minerals in their soil for growth.

Wind intensity and direction affects the distribution of organisms (where they live in a habitat). Many prefer locations that are sheltered away from strong wind.

Carbon dioxide levels affect plants, as they need carbon dioxide for photosynthesis.

Oxygen levels affect aquatic animals (animals that live in water). Oxygen is essential for aquatic animals to survive; they would suffocate otherwise. Polluted waters often have low levels of oxygen.

An increase or decrease in an abiotic factor can have a huge impact on a species population size within a community. Remember, many organisms are interdependent, and so multiple organisms can be affected by a change in abiotic factors.

Just because a rabbit might not care about moisture levels, doesn't mean the grass they eat is the same way. Remember animals depend on plants for food, so a lower number of a plant species could affect an animal species in a community.

Let's look at some biotic factors now, these also affect the abundance and distribution of organisms in an ecosystem, but they are living things.

You going to need to know four biotic factors: availability of food, new predators, new pathogens and competition.

Availability of food is a major factor in how many animals live in an ecosystem. Rainforests have lots of varied food sources and so have a wider variety of species living there. Areas like deserts where there is less food have fewer species.

New predators can have a devastating impact on ecosystems. They can upset the balance of predator-prey cycles and cause a big decrease in the numbers of prey, which in turn reduces the food for existing predators, so they're affected too.

New Pathogens. We talked about pathogens in our series on Infection. When organisms move to new habitats, they often bring with them new pathogens, like viruses that the existing organisms in the habitat aren't immune to.

Finally let's not forget competition. We've already talked about how many resources plants and

animals compete over. The introduction of a new species into an ecosystem can result in it over-competing with an existing species, where the population levels of the existing species become too low to successfully breed and don't survive.

For example, the Red Squirrel is native to Britain. It has been here for about ten thousand years. But in the 19th century, Grey Squirrels were brought over from America. They're considered an invasive species. Why?

Red and Grey squirrels eat the same food and live in the same habitats.

Grey Squirrels are larger, can store more fat and survive harsher winters than Red ones.

Grey Squirrels carry a virus called Squirrel pox, that they are immune to, but it can be deadly to Red Squirrels.

So the numbers of Red Squirrels and where they live, reduced dramatically, as they are outcompeted for food by grey ones.

This is why certain countries like Australia are really strict about the things that people can bring into the country from overseas, as changes to the ecosystem could have huge effects.

So organisms can be affected by biotic factors too. Species can decline in numbers if they are outcompeted, or if there's a new pathogen, or a new predator arriving.

And the same interdependent species are also affected when these things happen. Don't forget about the knock-on effects.

I'm Dr Alex Lathbridge and this is Bitesize Biology – listen again on BBC Sounds