

What do you want to know about biodiversity loss?

What is biodiversity?



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Biodiversity is made up of all living things on our planet. It encompasses the full spectrum of life on Earth that has been shaped by billions of years of evolution, from the smallest bacteria to the largest plants and animals, including our own species.

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Are there different types of biodiversity?

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When we try to define biodiversity more formally, we can look at it in many different ways. Most commonly it is used to describe the variety of species we might find in a habitat or given area, but it also refers to how communities of species interact with each other within ecosystems and with the physical environment itself. Biodiversity can also include the variety of ecosystems that can occur in an environment, such as a desert, forest, river or stretch of farmland. The size of the ecosystem can vary too – it can be the leaf litter that blankets the floor of an entire forest, or a section of coral reef in an ocean or a pond in your back garden. All of these have biodiversity that is crucial for maintaining that environment in the way it is. We can also find biodiversity at a molecular level – between the DNA of individuals within a species.

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What is genetic diversity?

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Genetic diversity within species determines how unique each individual is from another and is as crucial for functioning ecosystems as having a wide variety of different flora and fauna. Genetic diversity corresponds to the variety of genes contained in plants, animals, fungi and micro-organisms. It occurs within a species as well as between species. For example, poodles, German shepherds and golden retrievers are all dogs, but they all look different.

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How much biodiversity is there on Earth?



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Scientists have spent hundreds of years collecting, counting and documenting the life on Earth. Each year we discover thousands of new species and have a catalogue of 1.6 million or so that have been so far described by science.

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Have we discovered all the species that exist on our planet?

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Scientists believe we have barely scratched the surface. They believe that there may be 7 or 8 million more that we don't know about yet. While we have a reasonable idea about the number of species of relatively large animals, like mammals, there are doubtless still more of these to be found. When it comes to the invertebrates, we still only know a small fraction of what exists. When we consider microbes, we haven't even got a clear idea of what biodiversity means at those levels because of the way genetic information can be transferred between organisms. Much of this undiscovered life is likely to be high in the canopies of tropical rainforests, or hidden in the soil or in the deep ocean and sediments there. Some scientists fear that, as the human impact on the planet intensifies, many species could be lost before we even discover them.

What do you want to know about biodiversity loss?

Why is it important that we protect the planet's biodiversity?

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Biodiversity is the inherited wealth of four billion years of evolution on planet Earth, of which humans are only a very recent addition. Life has been around a lot longer than we have, and we are now the stewards who have a responsibility towards it. But biodiversity is also essential for human wellbeing. Without a wide range of animals, plants and microorganisms, we cannot hope to have the healthy ecosystems that we all rely upon to provide us with a wide and surprising range of benefits.

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What role does biodiversity play in food production?

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There are lots of ways that we depend upon biodiversity and it is important for us to conserve it. Agriculture, for example, is incredibly reliant upon invertebrates – worms help to maintain the health of the soil that crops grow in, while many fruits, nuts and vegetables are pollinated by insects. Without bees we wouldn't have apples, cherries, blueberries, almonds and many of the other foods we love on our supermarket shelves. Pollinators such as birds, bees and other insects are responsible for a third of the world's crop production. Soil is also teeming with microbes that are vital for liberating nutrients that plants need to grow, which are then also passed to us when we eat them. In the oceans, fish and other forms of sea life provide the main source of animal protein for around one billion people.

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Why is biodiversity important to protect us against the effects of climate change?

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Trees, bushes and wetlands play an important role in helping to protect us from flooding, by slowing down water and helping soil to absorb rainfall. Plants and trees also clean the air we breathe and can help us tackle the global challenge of climate change by absorbing carbon dioxide. Coral reefs and mangrove forests act as natural defences protecting coastlines from waves and storms.

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What role does biodiversity play in the production of medicines?

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Many of our medicines, along with other complex chemicals that we use in our daily lives such as latex and rubber, originate from plants. An example is aspirin which is created from salicylic acid originally sourced from willow trees. There may be other natural cures for diseases in different animals, plants and microbes around the world which just haven't been discovered yet.

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Why is biodiversity important to our wellbeing?

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We must not overlook the basic improvements in human health that come from spending time in nature. There is a growing body of literature on the relationship between human health and biodiversity. Simply having green spaces and trees in cities has been shown to decrease hospital admissions, reduce stress and lower blood pressure.

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Are we losing biodiversity?

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Globally there is no doubt that biodiversity has been in decline and that loss is intensifying. The latest International Union for Conservation of Nature (IUCN) Red List reports that more than 28,000 species – nearly a third of all those assessed – are now threatened with extinction. Some of the hardest hit groups are amphibians, reef-building corals, conifer trees, sharks and mammals, and there are of course many more that we don't know about.

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Is it true that extinction is happening at a speed never seen before?

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A recent study indicated that one million species could be threatened with extinction. More species of plants and animals are threatened with extinction now than at any other time in human history. And there is much we don't know about how sensitive biodiversity really is to climate change.

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How do scientists measure biodiversity?

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Biodiversity can be measured in a variety of ways – scientists use different sampling techniques depending on the organisms of interest; from a simple hand-held magnifying lens to images of whole landscapes captured by satellite; sampling and sequencing traces of DNA in soil, water and snow; and acoustic monitoring devices. There are also large-scale citizen science programmes such as the Reef Life Survey, Big Butterfly Count and Penguin Watch. For the big animals, plants and ecosystems, we have well established measures of biodiversity such as the Living Planet Index. In places like Europe there are records from scientists and amateur naturalists going back hundreds of years that also help us judge how biodiversity has been changing. For smaller creatures such as invertebrates and microbes, we have much less of an idea about how these populations may be changing.

But we are able to compare surveys of insects from the 1970s and 1980s to what we have now. These are starting to confirm what many of us probably suspect from anecdotal evidence – that there are fewer insects around. One study showed that 40% of the world's insects may be threatened with extinction.

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What impact does land use have on biodiversity?

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Human actions have resulted in multiple changes to the natural environment, which has had a detrimental impact on biodiversity. Probably the most important example of this is land use change, specifically the conversion of natural habitats into landscapes that are used intensively by humans. There is a direct loss of habitat as trees are chopped down to make way for farmland, pastures for cattle, mining and other industrial infrastructure. The loss of green space to make way for urban areas is also a contributor but relatively small by comparison. In post-industrialised countries like the UK and the US, while the direct loss of natural habitats is now relatively small, the intensity with which the landscape is used has been changing. Remaining habitats can also be degraded by pollution making them less suitable for species.

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What effect does land loss have on the gene pool of certain species?

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Landscape change not only destroys the habitat where the species lives, but also fragments it, leaving species that were once widespread clinging on in tiny scattered pockets. If they are too far apart, then the gene pool for those species can become so restricted they can eventually die out. We are seeing this in the koalas affected by the forest fires in Australia. So many have died that the gene pool may be becoming too small for the species to survive.

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How has the movement of people and goods around the globe affected biodiversity?



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The spread of disease and pests are also a problem. The mass movement of goods and people between far flung locations allows them to spread much more quickly. More than half of Europe's endemic trees are now threatened with extinction, mainly as a result of disease and pests. Ash dieback, which is currently cutting swathes across Europe, is a good example of this. Another example is the decline in amphibians caused by chytridiomycosis (a disease caused by two types of fungi thought to originate in Asia (likely Korea)). Frogs and salamanders in Asia can be found with these pathogens on their skin, but they don't develop the disease because they have evolved with the fungus over a long time period. Globalisation and activities like the amphibian pet trade have spread these pathogens to new regions of the world where the frogs and salamanders are not adapted to them. The introduction of foreign, or invasive, species onto islands has also caused huge amounts of biodiversity loss across the planet. This has probably been going on since humans first started colonising islands and bringing animals like rats and cats with them from the big continents that the local wildlife was not adapted to deal with.

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How is climate change affecting biodiversity?

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Climate change is increasing the rate of biodiversity loss. As the climate warms, habitats are changing, and species may have to move accordingly to new areas. Species in fragmented habitats or hot or elevated areas will be particularly vulnerable. Some animals that migrate are changing the timing, routes and destinations of their migratory journeys as global temperatures get warmer, but many animals may not be able to adapt so easily.

Carbon dioxide, as well as being a greenhouse gas that causes climate warming, dissolves in the oceans, decreasing its pH and leading to ocean acidification. As a consequence, corals and other marine life that are already in a critical situation because of warming sea water, are further impacted.

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What are biodiversity hotspots?

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These are areas that have high levels of biodiversity which are also highly threatened by human activities. These can be local areas that have rich diversity or are internationally important because they have flora and fauna found nowhere else on the planet, such as Madagascar.



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How can we conserve biodiversity?

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There are a range of things we can do. We could improve the protection of areas like biodiversity hotspots. We could also provide alternative pathways for economic development that help people find value in the natural areas around them. Ecosystems provide many benefits, such as purifying water and air, buffering the climate and enhancing psychological health, so we need to persuade people to recognise the value in having a forest outside their city to protect them from flooding, for example. Equally it is important to make sure that the goods we buy do not harm biodiversity (either because diverse ecosystems are destroyed to produce them, or because they damage the surrounding nature when they are discarded).

What do you want to know about biodiversity loss?

How can we restore biodiversity?



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Loss of natural habitats has been taking place over thousands of years but there are ways to increase biodiversity again. It will require us to think about ways of farming differently by managing land for different purposes. There is still a lot of debate about how to do this effectively.

Since what we consume drives the supply of food, choosing to buy only sustainably sourced products, can also help to protect biodiversity – that could mean eating less meat, for example. This is especially important for products from the tropics where most of the planet's biodiversity resides. We also need methods to compensate local people for saving their forests and biodiversity rather than clearing it away to grow more food.

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