

What are we doing about biodiversity loss?

The threats to the diversity of life are serious, but research in many scientific disciplines is giving governments and other organisations the knowledge they need to protect the Earth's biological heritage. Here are just a few examples.

Return of the native

The work of conservationists is helping bring back species that once flourished in Britain but have since died out. For example, the large blue butterfly disappeared from the UK in 1979, but has been successfully re-introduced after painstaking work by ecologists revealed the particular kinds of habitat and ecosystem it needs to flourish. It turned out that the large blue's survival depended on another species entirely – a kind of ant that looks after the butterfly's young. Conserving just one species meant understanding and protecting a much wider ecosystem.

Biodiversity in Britain

To protect diversity, we have to understand it. Because scientists have monitored the British natural environment for so long, we have one of the longest and most comprehensive records of bird, plant and butterfly populations anywhere on Earth. This means we can spot long-term trends more easily than in less-studied environments.

Roughly once a decade, the Centre for Ecology & Hydrology (CEH) conducts a survey of the countryside – a large-scale inventory of the plants, animals and other living things that make the British countryside their home. The results tell us how different species are faring in different parts of the country. Among other findings, the latest survey showed that the number of plant species in British fields, woods, heaths and moors fell by eight per cent between 1978 and 2007. This in turn affects insects, birds and other creatures. But most of the decline happened before 1998, and government schemes introduced since then to promote biodiversity seem to be taking effect.

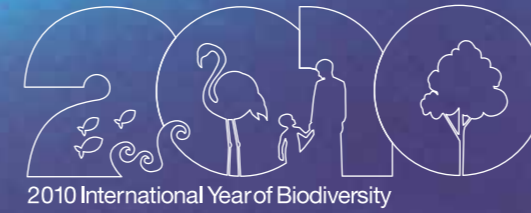
Defending against alien invaders

Alongside restoring lost components of Britain's original biodiversity, researchers are also working to find ways to control or eliminate the foreign species that have gained a foothold in the UK, many of which threaten to drive out native species. The UK Minister for Biodiversity recently estimated these 'invasive species' cost the British economy £2 billion a year.



Invasive species

The harlequin ladybird arrived in Britain in 2004 and has been spreading rapidly ever since. It doesn't just compete with indigenous ladybirds for food – it eats them. NERC-funded researchers are monitoring the harlequin's spread and investigating how it can be controlled. Other scientists are looking at topics ranging from how to protect endangered red squirrels from their invading grey cousins to how the seeds of invasive plants can be carried around the country while stuck to people's shoes.



More information

The Natural Environment Research Council is one of seven UK research councils. Among many other activities, we support research into biodiversity at universities and at several NERC Research Centres and Collaborative Centres.

Research Councils UK
www.rcuk.ac.uk

Centre for Ecology & Hydrology
www.ceh.ac.uk

Countryside Survey
www.countrysidesurvey.org.uk

Plymouth Marine Laboratory
www.pml.ac.uk

Centre for Population Biology
www.cpb.bio.imperial.ac.uk

Centre for Terrestrial Carbon Dynamics
www.shef.ac.uk/ctcd

National Oceanographic Centre
www.noc.ac.uk

We also support directed research programmes into biodiversity.

Soil Biodiversity Programme
<http://soilbio.nerc.ac.uk>

Marine and Freshwater Microbial Biodiversity Programme
www.bodc.ac.uk/projects/uk/mfmb

Other agencies and programmes

2010 International Year of Biodiversity
www.cbd.int/2010/welcome

UK Biodiversity Action Plan
www.ukbap.org.uk

Biodiversa pan-European biodiversity research project
www.eurobiodiversa.org

Convention on Biological Diversity
www.cbd.int

IUCN Red List of Threatened Species
www.iucnredlist.org

GB non-native species information portal
<https://secure.fera.defra.gov.uk/nonnativespecies/home/index.cfm>



The UK's Natural Environment Research Council funds and carries out impartial scientific research in the environmental sciences. NERC trains the next generation of independent environmental scientists.

For more information

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Preserving life's variety Biodiversity

Human activities threaten the natural environment all over the world. Science will help us protect irreplaceable species and habitats.

Biodiversity is the range of different organisms alive at any given point. Scientists know it builds up slowly over thousands of years, before dropping again in what are known as mass extinctions. And one of these is underway right now – it's estimated that species are becoming extinct some 1000 times faster than the normal 'background rate'. Creatures from snow leopards to blue whales are in danger.

But previous mass extinctions have stemmed from natural disasters like asteroid impacts or volcanic eruptions. This time humans are contributing. Our farms and towns are expanding into fragile habitats; we're using up resources more quickly than they can be replaced, polluting the environment and releasing invasive species into vulnerable ecosystems.

Many critical but fragile habitats, like cloud forests and coral reefs, are already showing the pressure. And we don't know what could happen if they disappear. Millions of people depend on these ecosystems, directly or indirectly, and their destruction could cause famine and widespread suffering. This leaflet sets out some of the latest research on the threats facing biodiversity, and what we're doing to deal with them.

The information presented here is gathered from a wide range of published international sources and includes work by scientists funded by the Natural Environment Research Council.

What is biodiversity?

Biodiversity is the variety of life, from genes to whole ecosystems. At its simplest, biodiversity is just how many different kinds of living thing are found in a particular habitat – the more species live in a forest, grassland or stretch of ocean, the more biodiverse it is. So far we have identified around 1.75 million species around the world – mostly insects – but many scientists think that’s just the beginning and millions more could remain unidentified. Some reckon the total could be as high as 100 million.

But biodiversity can also mean the range of genetic variation within a species, or the different kinds of habitat found within a larger area.

biodiversity

What is a species?

A species is a group of organisms with unique characteristics, from physical shape to unusual behaviour, that distinguish them from all other living things. Only two individuals from the same species can have fertile offspring together.

Each species plays a particular role within an ecosystem, so adding or removing just one may throw the whole system out of balance.

The more species a habitat contains, the more biodiverse it is.

Breakthroughs in areas like genetic analysis are shedding new light on biodiversity across whole ecosystems. When people talk about biodiversity and species loss, they often think of big, impressive animals like pandas or tigers. But scientists are increasingly aware that much of the world’s biodiversity is in the microbial world – the bacteria, viruses, algae and other organisms that swarm in their trillions all around us, too small to see. Many of these organisms play vital roles in regulating the ecosystems they live in, making life possible for bigger plants and animals.

When researchers sampled the waters of the Sargasso Sea near Bermuda in 2004, they found more diversity than they’d ever imagined – more than 1.2 million new genes and 1800 microbe species, including 148 that had never been discovered before. And this was in a stretch of sea thought to be relatively barren. Since then, many thousands more new species have been found – we’re only just starting to understand how diverse life on Earth is.

Why does biodiversity matter?

A diverse natural environment doesn’t just bring ecological advantages – it has economic benefits too, and it makes our lives better in less easily defined ways.

It’s easy to take the benefits of living in a diverse environment for granted, until they’re gone. When biodiversity is lost, problems ranging from water shortages to flooding or disease outbreaks can suddenly appear. A particular species of insect may seem insignificant. But if it dies out, the plants it used to eat have nothing to control their numbers. They can then spread unchecked across the landscape, forcing out other species and upsetting a delicate ecological balance that may have taken centuries to develop.

Research shows that biodiverse habitats are more productive and more stable, with more chance of recovering from shocks like natural disasters or sudden climate change than environments dominated by just a few species. A wide range of different inhabitants makes a natural habitat more resilient – some species may die out when crisis hits, but some will survive.

Healthy habitats provide benefits that range from helping prevent flooding by slowing down water running off the hills to allowing fish to breed that people can then eat. For instance, a 2003 Forestry Commission report estimated that the UK’s woodlands bring British people benefits of around £1 billion a year.

Different living things benefit the organisms around them, including us, in different ways. Tiny microbes in the oceans transform sunlight into stored chemical energy that bigger creatures can then feed on. Wetlands and estuaries filter impurities out of water. Plants absorb carbon dioxide and release oxygen, keeping the atmosphere breathable.

Living things have already given us medicines like aspirin, antibiotics and anti-cancer compounds. About a quarter of prescription drugs originally come from plants. Countless organisms around the world, from rainforest flowers to microbes in the mud of the seafloor, still haven’t been properly researched. They could hold the key to even more revolutionary treatments.

A biodiverse environment doesn’t just provide practical benefits. People like to experience beautiful and varied landscapes in their spare time. In many areas the leisure and tourist industries could be destroyed if biodiversity continues to decline.

Bees on the brink

Of the 25 bumblebee species native to Britain, three have already become extinct and the populations of ten other species have dropped drastically in the last 60 to 70 years. Researchers think this could be due to the steep decline in UK farmland’s biodiversity that intensive farming methods have caused. If these insects died out, many plants wouldn’t get pollinated and we could lose crops from green beans to strawberries.

Threats to biodiversity

More people are alive than ever before, and we all want a better standard of living. This is understandable, but it puts the natural environment under huge pressure – the United Nations Millennium Ecosystem Assessment in 2005 found that changes in many important measures of biodiversity have been faster over the last 50 years than at any other time in human history. Behind this loss are problems including habitat destruction, pollution, over-exploitation of natural resources and climate change.

In 2009, an international list of endangered species suggested that around 21 per cent of the mammal species that have been described by scientists are threatened with extinction. For birds, that figure is around 12 per cent; for reptiles and fish, around five per cent, and for amphibians 29 per cent.

- Since 2000, around six million hectares of old-growth forest have been lost each year.
- In the North Atlantic, fish numbers have fallen by two thirds in the last half-century.
- 35 per cent of mangrove swamps have disappeared in just 20 years.

Nutrient pollution

Artificial fertilizers let farmers grow more crops on the same area of land. But if they’re not managed carefully, they can wash off the land into streams and drainage ditches, from which they flow into rivers. Too many nutrients then cause algae to form huge blooms, use up all the oxygen in the water and kill fish and other living things en masse. When this nutrient-poisoned water flows out to sea, it can even cause huge offshore dead zones. These are already found all over the world – for example, the fertilisers and other waste washed down the Mississippi river create a lifeless stretch of water covering more than 22,000km² in the northern Gulf of Mexico.

Reefs at risk

Covering less than 0.25 per cent of the ocean, coral reefs host an extraordinary variety of living things. They contain a quarter of marine biodiversity. This isn’t just good for the plants and animals that live nearby; millions of people depend on the fish these habitats produce for their livelihoods. But corals face severe threats, ranging from destructive fishing practices to warmer water caused by climate change, which can kill whole reefs. It’s already happening, and recovery can take decades or even longer.

Another major concern is ocean acidification. As we emit carbon dioxide into the atmosphere by burning fossil fuels and other activities, some of this gas dissolves in the oceans and makes them more acidic. The rocky skeletons that coral animals make to live in are made of calcium carbonate, which dissolves readily in acidic conditions. If our oceans become even a little more acidic, many kinds of coral may not be able to cope.

This isn’t just a threat to corals; many types of microscopic plankton also make shells out of calcium carbonate, which will come under increasing stress as the oceans become more acidic. These tiny plants and animals form the base of the marine food chain; if they die off in large numbers, the effects will be felt throughout the ocean.