
state of
nature

Foreword by Sir David Attenborough

The islands that make up the United Kingdom are home to a wonderful range of wildlife that is dear to us all. From the hill-walker marvelling at an eagle soaring overhead, to a child enthralled by a ladybird on their fingertip, we can all wonder at the variety of life around us.

However, even the most casual of observers may have noticed that all is not well. They may have noticed the loss of butterflies from a favourite walk, the disappearance of sparrows from their garden, or the absence of the colourful wildflower meadows of their youth. To gain a true picture of the balance of our nature, we require a broad and objective assessment of the best available evidence, and that is what we have in this groundbreaking *State of Nature* report.

This important document provides a stark warning: far more species are declining than increasing in the UK, including many of our most treasured species. Alarmingly, a large number of them are threatened with extinction.

The causes are varied, but most are ultimately due to the way we are using our land and seas and their natural resources, often with little regard for the wildlife with which we share them. The impact on plants and animals has been profound.

Although this report highlights what we have lost, and what we are still losing, it also gives examples of how we – as individuals, organisations, governments – can work together to stop this loss, and bring back nature where it has been lost. These examples should give us hope and inspiration.

We should also take encouragement from the report itself; it is heartening to see so many organisations coming together to provide a single voice, stating loud and clear what is happening to our wildlife. This partnership, backed by a combined membership of millions and enabled by the heroic efforts of thousands of volunteer recorders, provides a powerful force to bring the UK's nature back to its former glory.

Helen Atkinson (Butterfly Conservation)

Round-leaved sundew

Laurie Campbell

This carnivorous plant catches unsuspecting insects with its sticky hairs, before digesting them with acid.

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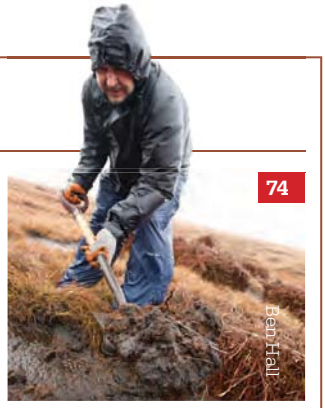
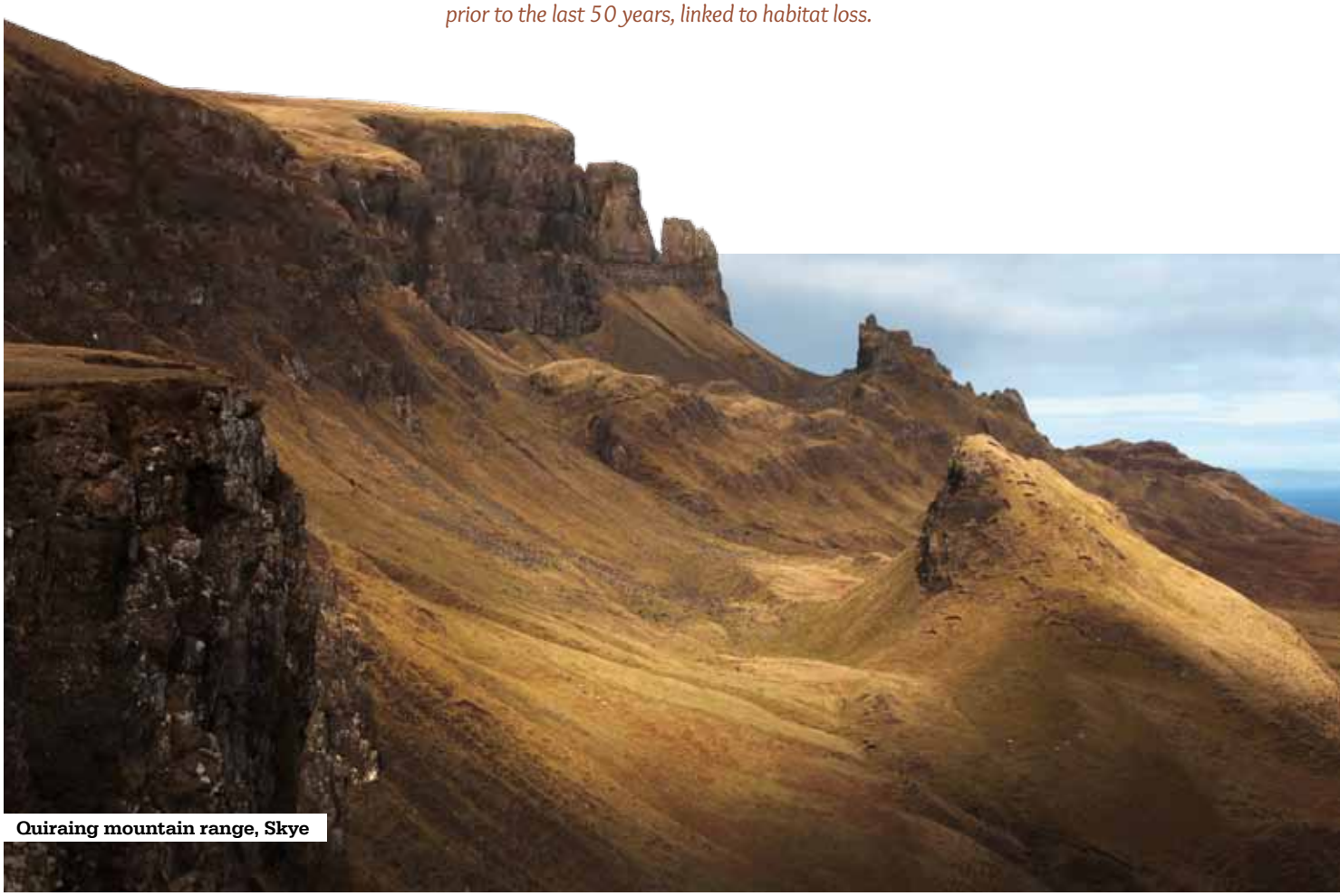


Headlines

For the first time ever, the UK's wildlife organisations have joined forces to undertake a health check of nature in the UK and its Overseas Territories. This report presents our findings.

- *We have quantitative assessments of the population or distribution trends of 3,148 species. Of these, 60% of species have declined over the last 50 years and 31% have declined strongly.*
- *Half of the species assessed have shown strong changes in abundance or distribution, indicating that recent environmental changes are having a dramatic impact on the nature of the UK's land and seas. There is also evidence to suggest that species with specific habitat requirements are faring worse than generalist species that are better able to adapt to a changing environment.*
- *A new Watchlist Indicator has been developed to measure how conservation priority species are faring, based on 155 species for which we have suitable data. This group contains many of our most threatened and vulnerable species, and the indicator shows that their overall numbers have declined by 77% in the last 40 years, with little sign of recovery.*
- *Of more than 6,000 species that have been assessed using modern Red List criteria, more than one in ten are thought to be under threat of extinction in the UK. A further 885 species are listed as threatened using older Red List criteria or alternative methods to classify threat.*
- *Our assessment looks back over 50 years at most and over a considerably shorter period of time for many species groups. It is well accepted that there were considerable (albeit largely unquantified) declines in the UK's wildlife prior to the last 50 years, linked to habitat loss.*



Quiraing mountain range, Skye

- *Although robust data are in short supply, it is clear that the UK's Overseas Territories (UKOTs) hold a wealth of wildlife of huge international importance. However, over 90 of these species are at high risk of global extinction.*

- *Our ability to monitor the state of nature, and respond with appropriate conservation action, is hampered by a lack of knowledge on the trends of most of the UK's plant and animal species. As a result, we can report quantitative trends for only 5% of the 59,000 or so terrestrial and freshwater species in the UK, and for very few of the 8,500 marine species. Our knowledge is strongly biased towards vertebrates and we know little about the fortunes of many invertebrates and fungi. Much needs to be done to improve our knowledge.*

- *What we do know about the state of the UK's nature is often based upon the efforts of thousands of dedicated volunteer enthusiasts who contribute their time and expertise to species monitoring and recording schemes.*

- *The threats to the UK's wildlife are many and varied, the most severe acting either to destroy valuable habitat or degrade the quality and value of what remains.*

- *Climate change is having an increasing impact on nature in the UK. Rising average temperatures are known to be driving range expansion in some species, but evidence for harmful impacts is also mounting.*

- *We should act to save nature both for its intrinsic value and for the benefits it brings to us that are essential to our well-being and prosperity.*

- *This report carries a message of hope: targeted conservation has produced a legacy of inspiring success stories and, with sufficient determination, resources and public support, we can, and will, turn the fortunes of our wildlife around. It also serves to illustrate that with shared resolve we can save nature.*

Guy Rogers

Introduction

This, the inaugural *State of Nature* report, is the first of its kind to document the status and population trends of animals and plants in the United Kingdom and its Overseas Territories.

The wildlife here is special and diverse; many rare and threatened habitats support endemic species found nowhere else on Earth. Our shores are home to huge, internationally important seabird colonies and beautiful species of mosses and lichens that clothe the surface of trees and rocks. The diverse landscape is made up of a patchwork of different habitats, from the magnificent Caledonian pine forests of Scotland to the purple-hued heathlands of Dorset, each one special and irreplaceable.

Wherever you are in the UK, an exciting encounter with nature is never far away; be it the sight of an azure hawker dragonfly skimming over a Scottish bog pool, a pod of common bottlenose dolphins frolicking in the waters of Cardigan Bay, or the world's fastest bird, the peregrine falcon, stooping to catch prey above the Tate Modern in London.

There has always been a special connection between people and nature and it continues to enrich our lives and inspire each new generation. However, our wonder and joy at this abundance of nature is tempered by concern about the changes it is experiencing and the threats it faces.

Our countryside has lost millions of the skylarks that herald the spring dawn, Duke of Burgundy butterflies have disappeared from our woodland glades, and even hedgehogs struggle in our gardens. But there is good news too; otters can be seen in our rivers once again, red kites and sea eagles soar where they have been absent for centuries and new species are pushing north from continental Europe.

Our aim

So what is the overall state of nature in the UK? Here, we attempt to summarise the best available information in order to come to a conclusion. We weigh up the pluses and minuses to give an objective overview of how wildlife is doing in the UK. We have, however, found ourselves constrained by the availability of reliable data and as a result we must accept the limitations of the conclusions we draw from this overview. We hope that this is a step in the right direction, towards a more complete understanding of the state of our nature.

The aim of this report is to produce an authoritative assessment of the changing fortunes of nature in the UK, by focusing on the building blocks of our ecosystems – species. We have looked across the UK's major habitat types and taxonomic groups, and attempted to reflect the situation across the UK's four constituent countries. We have also tried to shine a light upon the immense wealth of globally important wildlife found in the UKOTs, scattered across the globe from the Antarctic to the Caribbean.

Working together

Produced by an exciting new coalition of conservation and research organisations, this report draws on the very latest information available. A wide range of people and partner organisations have contributed, each bringing with them special expertise on particular groups of animals and plants.

Never before has information been brought together in this way to provide a powerful and unique insight into the state of nature, and how it is changing. Our synthesis is both revealing and concerning at the same time.

There is much to be proud of in terms of conservation success stories. We have a fantastic range of volunteer and professional expertise covering an array of species, and some of the most impressive citizen science projects in the world producing high-quality data to inform conservation. We have

Large scabious bee

Steven Falk (Buglife)

Building on other reports

This report does not stand in isolation, but on the shoulders of many others that have reported on particular elements of our natural heritage. There are a number of "State of..." *reports, which in recent years have focused on trends in the UK's nature:*

- The state of Britain's larger moths *(2013) reported that the total number of larger moths had fallen by 28% between 1968 and 2007, and two-thirds of the 337 species monitored had declined, 37% by over half.*

brought species back from the brink of extinction through far-sighted protection and conservation measures, including bold re-introductions, novel partnerships, legislative protection of special sites and by building a deep understanding of species' ecology and needs. Corncrakes, large blue butterflies and otters are just some of those thriving through targeted conservation efforts. However, despite these successes, there is cause for concern over the state of much of our nature.

The knowledge gap

We hope that this report will inspire greater interest, curiosity and admiration of nature. A recurring theme is that, despite a rich resource of data collected over recent decades, and the existence of databases holding millions of wildlife records, we are unable to assess population trends for more than a small percentage of species. Birds, butterflies and mammals often steal the limelight, while the many thousands of invertebrates, fungi, lichens and mosses that make up so much of the UK's biodiversity receive less attention.

Work is currently underway to improve the situation by increasing the quality and quantity of species monitoring and recording schemes, however current initiatives are not sufficient to fully redress these imbalances.

How you can help

This report serves as a reminder that nature needs our help and each of us can do our bit to save it. We all have a role to play, from decision makers and land managers, to businesses and individuals. We encourage you to get involved in some way, by supporting the organisations responsible for bringing this report together, or taking practical actions to help wildlife. Perhaps you could provide space for nature in your garden, reduce your carbon footprint or volunteer at a local nature reserve? Why not develop your identification skills and take part in surveys to contribute to our collective knowledge, or speak out about issues affecting the UK's nature?

We aim to produce more *State of Nature* reports in the future, and with your help, we hope to bring better news with each one. Together we can make a real difference to wildlife, and in turn safeguard a sustainable future for ourselves.

What you need to know

This report reviews the state of nature in eight major habitat types in the UK. We also give brief overviews of the major reasons for change in our wildlife, weigh up the gains and losses of species over the last few decades, and highlight the role of volunteers in providing the monitoring that underpins this report, and conservation in the UK as a whole.

Short case studies throughout the report give extra insight into individual species, sites, conservation issues and recovery projects.

You can find more information on data and further reading on the state of the UK's nature at ***www.rspb.org.uk/stateofnature*** *and on partner organisations' websites.*

Never before have so many wildlife organisations come together to undertake a health check of nature in the UK.

- The state of the UK's butterflies *(2011) concluded that 72% of species had decreased over the previous ten years, including common "garden" butterflies that had declined by 24%.*

- The state of the UK's birds *(2012) reported that the UK has lost in the region of 44 million breeding birds since the late 1960s.*

- *In 2012,* Our Vanishing Flora *looked at the extinction of plants from counties across the UK in the 20th century, and found widespread losses. In 16 counties, one plant species went extinct every other year.*

- The state of Britain's mammals *(2011) highlighted the decline of hedgehogs, the ongoing loss of red squirrels and the recovery of otters.*

- *In 2010, Norman Maclean's book* Silent Summer *summarised dramatic declines in the UK's insect populations, and concluded that "our wildlife is clearly in for a bumpy ride".*

Danny Green

Otter

The facts behind the headlines

In this report, we present the results of three analyses which, together with existing indicators of biodiversity in the UK, case studies and additional information, form the basis of our assessment of the state of the UK's nature. They are:

- ***the Watchlist Indicator – a brand new biodiversity indicator charting the changing status of our most threatened species***
- ***a summary of trends in UK species' population and range changes, covering all species for which data are available***
- ***a summary of national Red Lists of threatened species in the UK.***

You will find more information about how these measures were produced, and their limitations, in summary on page 13 and in detail on pages 78–81.

It is worth remembering that assessments of trends and threats are available for only a small proportion of the UK's wildlife, and we cannot be certain that those we do know about are representative of the overall picture.

Stag beetle

The Watchlist Indicator

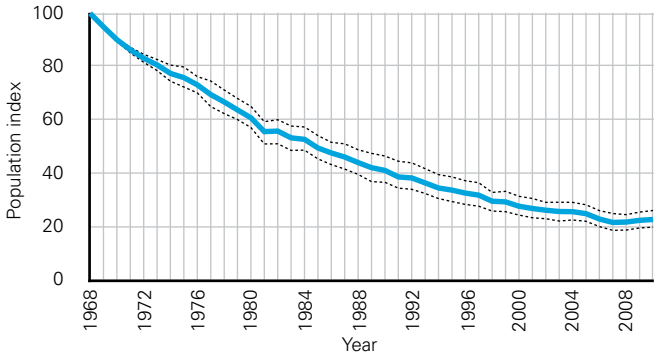


Figure 1
Watchlist Indicator showing the average population trend for 77 moths, 19 butterflies, 8 mammals and 51 birds listed as UK BAP priorities. Species are weighted equally. The indicator starts at 100; a rise to 200 would show that, on average, the populations of indicator species have doubled, whereas if it dropped to 50 they would have halved. Dotted lines show the 95% confidence limits.

Between 1995 and 1999, 577 species were identified as priorities for conservation in the UK under the UK Biodiversity Action Plan (BAP). The list was reviewed in 2007, and doubled in length to 1,150 species. Since then, national biodiversity strategies have been developed so that each of the UK's four nations now have their own list of priority species.

We have developed a new Watchlist Indicator, showing the overall trends in populations of 155 species that were listed as UK BAP priorities, and present it here for the first time. Lack of comparable data meant that we were unable to include trends for any species of plants or fungi, despite these making up 48% of the UK BAP list, nor any invertebrates other than butterflies and moths.

Since 1970, the indicator has dropped by 77%, representing a massive decline in the abundance of priority species. There was a steep decline in the early years of the indicator, but this is to be expected because it was these declines that led many species to be included in priority lists in the first place. What is important is whether the decline has stopped in response to conservation action: worryingly, it has not. The indicator declined by 18% between 2000 and 2010, suggesting ongoing declines in priority species. It may now be stabilising, but more years of data are needed to confirm this.

As with all composite indicators, the Watchlist Indicator hides considerable variation in individual species. Some priority species, such as the bittern and Adonis blue butterfly, have shown substantial recoveries since they were added to the first priority species list in 1995 thanks to creative and concerted conservation efforts. However, many species are showing continuing, and in some cases severe, or even accelerating, declines.

Trends in species' abundance and distribution

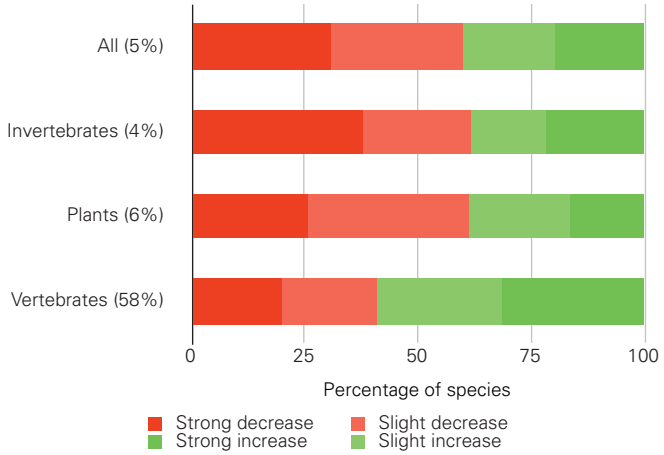


Figure 2
The percentage of species increasing or decreasing across all 3,148 species assessed, and by the three main taxonomic groups. The values in brackets represent the percentage of species assessed for each group.

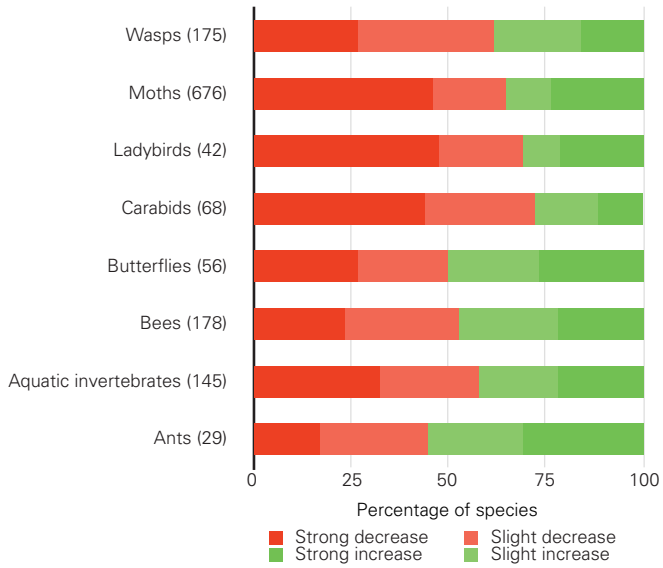


Figure 3
The percentage of species increasing or decreasing in eight invertebrate groups. The values in brackets represent the number of species assessed.

We have collated trends in abundance, distribution, or both, for as many species of plants and animals as possible – 3,148 in total – but this represents only 5% of the estimated 59,000-plus terrestrial and freshwater species in the UK. For many species, the available monitoring data, although valuable for a wide variety of purposes, does not allow the calculation of species trends. There were large differences between groups: 58% of vertebrates were assessed compared to only 4% of invertebrates and 6% of plants and fungi. Even amongst the best known group, the vertebrates, we have information only for birds and some mammals, and for just one amphibian. However, national monitoring of amphibians and reptiles is now in place and will soon be able to contribute data. In many cases, we believe that changes in species' abundance or range have occurred, but in the absence of quantitative measures at the time of publication, we have not been able to include such species in our analyses.

Figure 2 shows that, of the 3,148 species assessed, 1,884 (60%) have decreased and 962 (31%) have decreased strongly in the last 50 years.

Our thresholds for defining species trends as "strong" were deliberately set high, yet 51% of the species assessed have shown substantial changes in numbers or range since the 1960s, or more recently. Whilst fluctuations in numbers are normal, these changes suggest an environment in flux, and indicate substantial changes in the UK's environment over our study period. As shown on pages 76–77, and referred to throughout the report, the main cause of changes to the UK's nature, good and bad, is human activity. We are having a profound impact on the UK's nature.

The proportions of species assessed as decreasing or increasing do not vary markedly between habitat types. Many species use more than one habitat type and some are present in several of the major habitats in this report. The major trends in the overall summary, such as the large-scale declines in moths, tend to be mirrored in the individual habitats.

However, when we look at assessments by taxonomic group, differences are more obvious. Invertebrate groups have tended to fare worse: 65% of moths and 72% of carabid beetles have declined, for example. As well as illustrating potential differences between taxonomic groups, this may also be a result of the period over which trends are measured.

For some groups, we have assessments over the full 50 years of our study period, but for others, data are only available for the last 15 years. Not surprisingly, this can influence findings, particularly as shorter, more recent periods can miss spells in which we suspect there may have been substantial changes. For example, we know that many species of bats suffered severe declines before the National Bat Monitoring Programme began in 1997, but our trends only cover the period since that date and we can only report the slight recovery since then.

National Red Lists

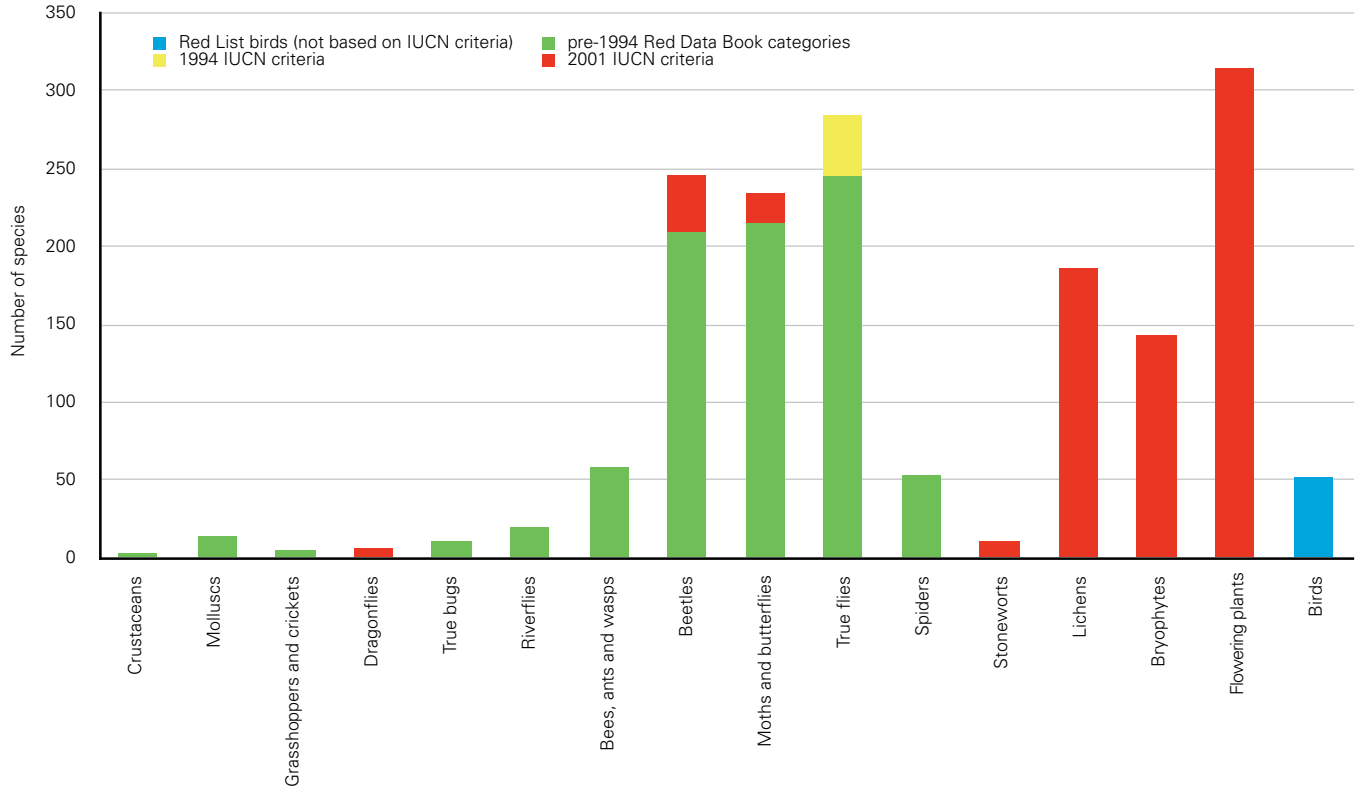


Figure 4
The number of species Red Listed using various assessment methods.

Red Lists attempt to identify species under threat of extinction. In recent years, most have been produced using standard criteria defined by the World Conservation Union (IUCN), but older assessments, often known as "Red Data Books" were made using less stringent, though broadly similar approaches. Here we have used numbers of species Red Listed by either approach (and a separate system used for the UK's birds).

Of the 6,225 species with published assessments of threat using current IUCN Red List criteria, 755 (12%) are thought to be threatened with extinction in the UK. A further 833 species have been listed in Red Data Books or similar assessments, and 52 birds are currently Red Listed as Birds of Conservation Concern.

Of the groups considered, stoneworts have the highest proportion of threatened species – about one third of species – although the overall number is modest, as this is a relatively small group. The highest number of threatened species can be found within the flowering plants and there are over 200 threatened species each within the flies, beetles and moths and butterflies.

For flowering plants and bryophytes, we were able to compare the proportion of threatened species in different habitat types. For both taxonomic groups it is the habitat richest in species that contains not just the highest number of threatened species, but the highest proportion as well. For example, grasslands and heathlands are very rich in flowering plants and of the 472 species found there, around one in four are threatened.


Steven Falk (Buglife)

Small fleabane

Measuring the state of nature

Elephant hawkmoth

Katie Fuller (RSPB)

In this report, we have used figures to represent the trends in species' abundance and distribution, as well as the number of species featured on national Red Lists. In addition, we present a new Watchlist Indicator on the fortunes of conservation priority species. You can find a full description of how we produced these figures on pages 78–81, but here we highlight the key information, limitations and biases that you should bear in mind when reading the rest of the report.

Trends in abundance and distribution

- *We were able to collate abundance and distribution data for about 5% of the UK's species.*
- *These data cover a variety of time periods from the 1960s onwards, and in some cases starting as recently as 1997.*
- *The species included in our measures appear because we have sufficient data for them. They have not been selected as a representative sample of UK species; in fact, there are huge biases in how well different groups are represented.*
- *Each species was allocated to one of four categories: strong increase, slight increase, slight decrease and strong decrease. Thresholds and methods for assigning species are given on pages 78–81.*
- *In our synthesis we have combined data covering different time periods, collected using different methods that measure different aspects of species status and analysed data using different statistical techniques.*

National Red Lists

- *We have brought together all the national Red Lists for the UK, giving precedence to those that have been produced using the latest IUCN guidelines, but otherwise we have used older "Red Data Book" style assessments.*

The Watchlist Indicator

- *The indicator is constructed from trends in abundance for 155 of the 1,150 species that were listed as priorities on the UK BAP.*
- *Each species is weighted equally. Not all species enter the indicator in 1970.*
- *Due to the lack of quantitative trend data, a biased subset of BAP species are included, with no plants, fungi, lichens or invertebrates, other than butterflies and moths.*

Setting the scene: historical changes in the UK's nature

The *State of Nature* report provides an overview of the fortunes of the UK's wildlife over recent decades. This time frame was chosen partly because we wanted to focus on what is happening to our wildlife now, but it was also dictated by the fact that the systematic monitoring of wildlife in the UK didn't begin until relatively recently.

Where possible, we have used data stretching back to the 1960s, but for many species we have had to report trends over a much shorter period. Despite this, we know that many of the most dramatic changes to the UK's landscape and wildlife occurred before the beginning of our study period, so it is important to understand recent changes in the context of historical ones.

Historical changes such as Neolithic woodland clearance and the 17th century drainage of the East Anglian fens had a huge impact on our wildlife, but we have little information about these ancient events. Therefore, we have focused on the last two centuries, a period for which documentation is better and the reporting of wildlife by enthusiasts began to flourish. During this period we have much evidence of the loss and modification of habitats across the UK, and the corresponding loss of the wildlife they supported. These are some of the stark statistics:

- ***The area of lowland meadow in England and Wales declined by 97% between the 1930s and 1984[1] – a total loss of 64,000 sq km. A huge number of wildflowers and insects were affected, including the once widespread scabious cuckoo bee*** **(Nomada armata)*****, which is now extremely rare.***

- ***The area of coppiced woodland fell by at least 90% from 1900 to 1970[2], with dramatic effects on invertebrates such as fritillary butterflies, the pennywort hoverfly*** **(Cheilosia semifasciata)*****, and the fringe horned mason bee*** **(Osmia pilicornis)*****, as well as the spring wildflowers that once carpeted woods.***

- ***An estimated 80% of all the UK's lowland heathland has been lost since 1800[3]. The ranges of specialist heathland species, such as the nightjar, ladybird spider and marsh clubmoss, have contracted as a result.***

- ***94% of Britain's lowland raised mires, home to rare invertebrates such as the bog bush cricket and white-faced darter, were destroyed between 1800 and 1978. Most of those remaining have been damaged[4].***

- ***44% of Scotland's internationally important blanket peat bog was lost to afforestation and drainage from the 1940s to the 1980s[5].***

- ***The 19th century ended with the extinction of the marsh fleawort due to drainage of the East Anglian Fens – it was just one of many species to suffer from the loss of wetlands. An estimated 1,000 sq km of wetlands were drained annually between 1840 and 1880[6].***

- ***The loss and degradation of localised habitats has hit the animal communities they support. For example, the loss of soft rock cliffs has led to the range contraction of specialist invertebrates such as the impressive cliff tiger beetle.***

- ***Declines in farmland birds, including corncrakes, quails and corn buntings, were already being recorded during the 19th century, well before the advent of the Farmland Bird Indicator. In 1947, the Agriculture Act drove changes in farming policy that had a significant impact on farmland. Hedgerows were lost as fields became larger, chemical use increased and the quality and quantity of farmland habitats diminished. Samples of the seed bank in arable soils suggest the number of weed seeds declined by 1% per year during the 20th century[7], a finding paralleled by the loss of farmland wildflowers and the extinction of some, such as thorow-wax and swine's succory.***

Guy Rogers

Bog bush cricket

Although the evidence for the widespread and dramatic loss of wildlife before our *State of Nature* study period is overwhelming, we should not ignore the gains that have been made. A number of bird species have prospered over the last two centuries, including seabirds such as fulmars and common gulls, as well as farmland generalists such as jackdaws and woodpigeons[8].

Some gains have been particularly dramatic: for example the tufted duck was deemed to have shown "huge" or "spectacular" increases in three of the four assessment periods between 1800 and 1970. Similarly, the collared dove, now one of our most common and widespread birds, only arrived in the UK in 1955.

Many other species have made partial recoveries from historical declines: red kites have spread following protection and successful reintroductions, silver-spotted skippers have returned to southern downlands, corncrakes are increasing in the Hebrides and otters are back in many rivers.

Although these recoveries are certainly worth celebrating, we should remember that they have only brought species back to a fraction of their former level. For example, although we have highlighted the recovery of the cirl bunting on page 20, it is still restricted to just two counties (Devon and Cornwall), compared to the 38 English and Welsh counties where it could be found between 1875 and 1970[9]. Likewise, although greater horseshoe bats have responded well to conservation action (see page 20), their population is still at just 10% of the level it was a hundred years ago[10].

It is important to understand recent changes to the UK's landscape and wildlife in the context of historical ones.

Seven-spot ladybird on bluebell flower

Ernie Janes

Farmland

"The earth was green, the sky was blue:
I saw and heard one sunny morn
A skylark hang between the two,
A singing speck above the corn..."

Christina Rossetti, from *A Green Cornfield*

Farmland makes up around 75% of the UK's landscape. However, in this part of our analysis we concentrated on enclosed farmland, which covers 40% of the UK's land area[1] and includes arable fields, improved and semi-improved grassland in livestock production and associated features such as fallow land, field margins and hedgerows.

Such enclosed farmland is home to many much-loved species, from singing skylarks and boxing hares, to chirruping grasshoppers and blood-red poppies that carpet summer fields. The wildlife here provides many people with their closest connection to nature, as they live in, travel through, or visit farmland.

This natural richness – a single hedgerow alone can support 750 species of fly[2] – is affected by the way that the land is managed for food. If farming systems, practices and policies change, they can have a massive impact on farmland wildlife, and there is extensive evidence of this.

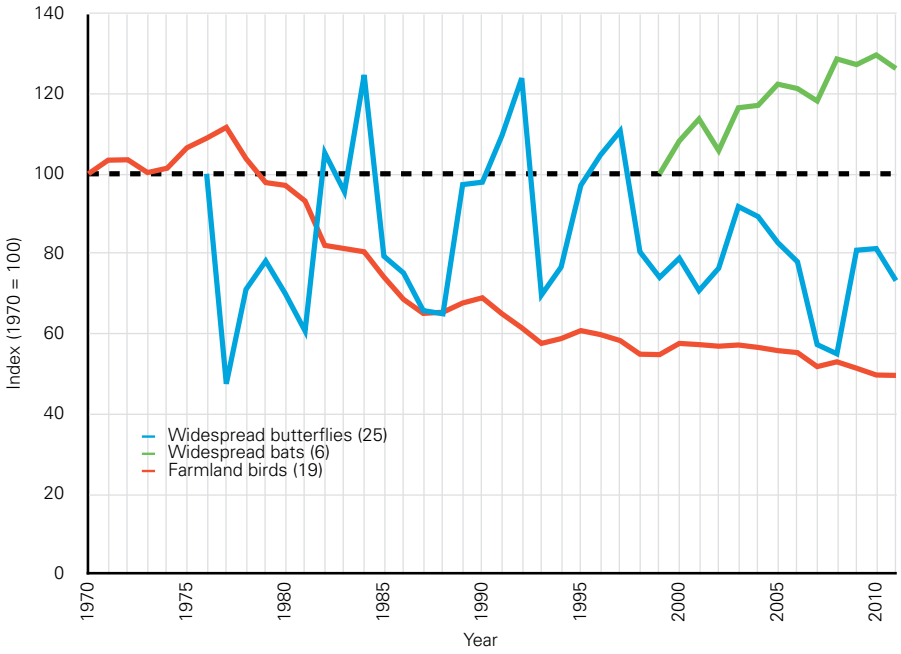


Figure 5
UK indicators for farmland birds, widespread bats and butterflies[3]. The numbers in brackets refer to the number of species in each group. Data from BC, BCT, BTO, CEH, Defra, JNCC and the RSPB.

- ***UK indicators show that farmland birds and butterflies have declined substantially since the 1970s and 1990s respectively.***
- ***Of 1,064 farmland species for which we have trends, 60% have decreased and 34% have decreased strongly.***
- ***14% of all farmland flowering plants are on the national Red List: 62 species in all.***
- ***Many of the changes in farmland wildlife are linked to shifts in farmland management, particularly those intended to boost productivity.***
- ***Some species groups, such as birds and bats, have benefited from conservation action, particularly through agri-environment schemes. Despite this, most farmland species have failed to recover from the declines of recent decades.***

The state of farmland nature

Trends in farmland birds, together with those of widespread bats and butterflies, are used as indicators of the state of biodiversity (see Figure 5)[3]. Farmland bird populations declined rapidly during the 1970s and 1980s, and by 2000 their numbers were just half what they were in 1970. There has been no subsequent recovery, and some species, such as the turtle dove, have continued to decline rapidly. The only bat monitored over the same period was the pipistrelle, which showed an even steeper decline. However, larger-scale monitoring of more bats shows that several species have increased or remained stable since 1997, albeit at lower levels than those seen historically. Butterfly populations show considerable year-to-year variation, but the overall trend shows a 32% decline in the last 21 years.

Within the indicator, birds can be classified as specialists (heavily reliant on farmland for food and breeding), or generalists (those able to use other habitats). Specialist birds have declined more severely, possibly because they are less able to adapt to their changing environment (see Figure 7)[4–6].

It is a similar story for moths, carabid beetles and plants: 64% of farmland moths and 70% of carabid beetles studied are declining, with few species increasing.

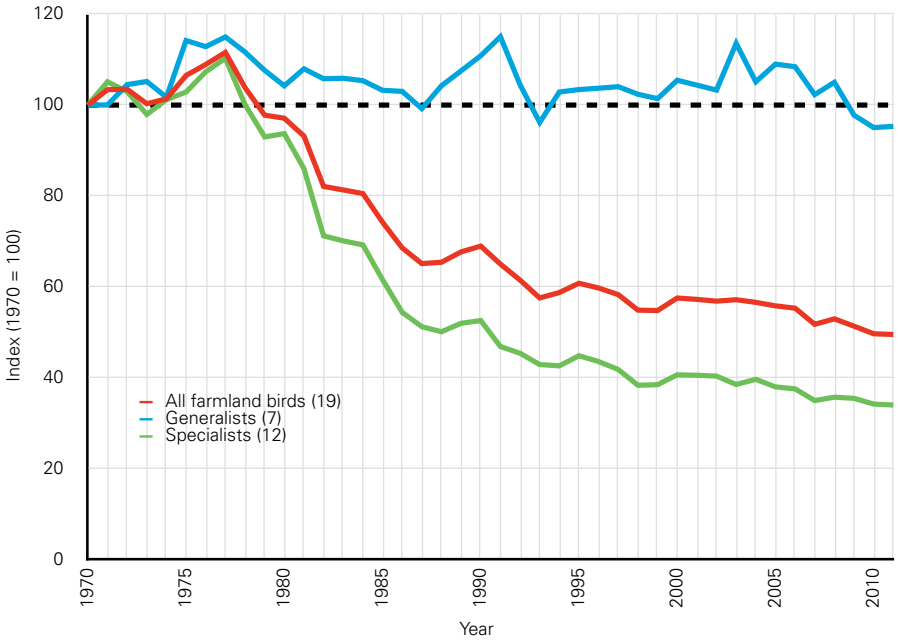
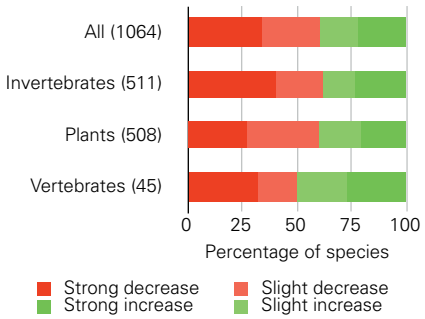


Figure 7
The UK Farmland Bird Indicator, showing differing trends for specialist and generalist species[4]. Data from the RSPB, BTO, JNCC and Defra. The numbers in brackets refer to the number of species in each group.

Figure 6
The proportion of farmland species that are increasing or decreasing in each taxonomic group, measured by either population size or range over a period of up to 50 years. The values in brackets represent the number of species assessed.



Arable plants are considered the fastest-declining group of plants in the UK – a quarter are threatened and others, such as downy hemp-nettle, have already been lost from the UK.

Common farmland mammals such as brown hares and hedgehogs have also declined, although badgers have increased[7]. For other groups, the evidence is less certain[8], but it seems that small mammals, such as yellow-necked mice, have declined, along with reptiles, amphibians and bumblebees.

Our assessment of 1,064 species found that more species (60%) had decreased than had increased (40%) over a period of up to 50 years (see Figure 6). A slightly larger proportion of invertebrates have decreased (62%) and this group is underrepresented in our analysis.

There are 62 threatened farmland flowering plants on the national Red List, a high proportion (14%) of the species assessed. Some of these are considered Critically Endangered and have an extremely high risk of extinction in the UK, including red hemp-nettle and corn cleavers.

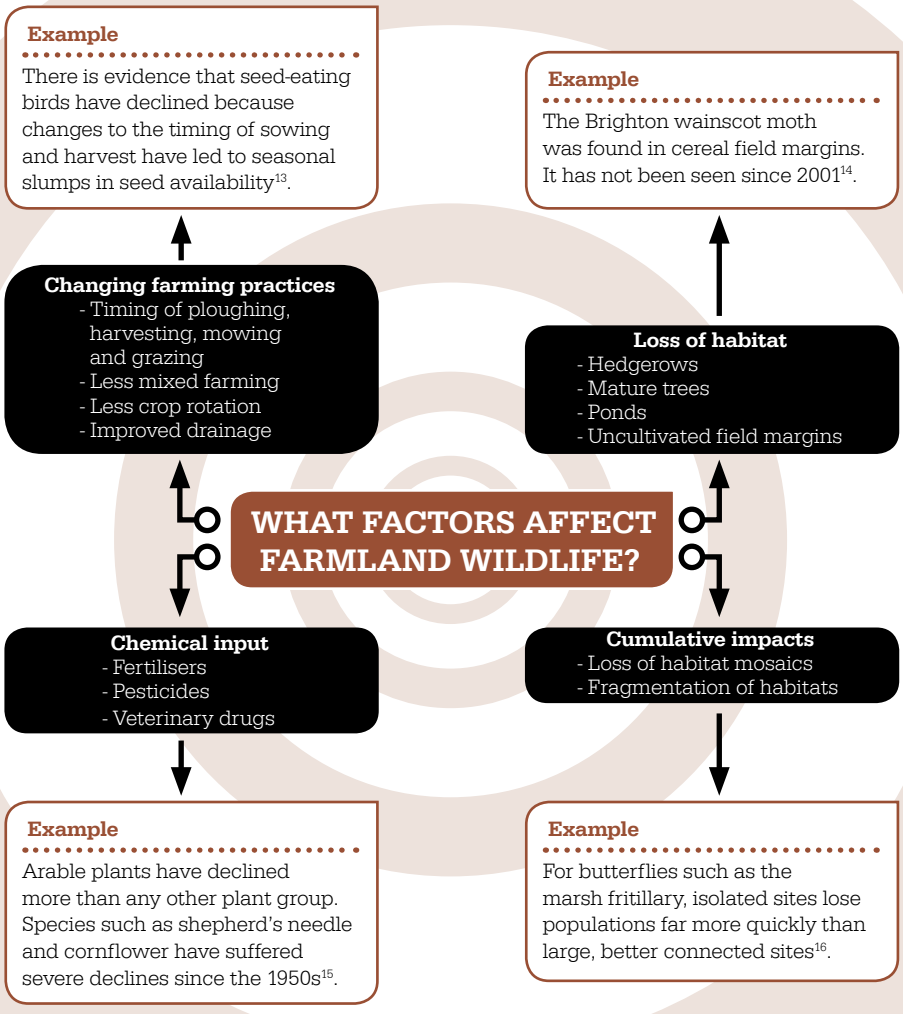
But it's not all bad news. Some species have stabilised after declines during the second half of the 20th century, including the brown hare and several species of bat. There is also evidence that some species, including the greater horse-shoe bat and at least four rare farmland bird species are beginning to recover, although there is a long way to go before they return to earlier levels. All of these have benefited from special conservation programmes.

There are also many species whose populations are stable, as well as those that have increased in recent years. The woodpigeon has increased by 130% since 1970 thanks to modern agricultural practices, as have nitrogen-loving plants such as black grass. Recent changes to the climate may be benefiting some farmland butterflies such as the ringlet and speckled wood, and southern species in some other taxonomic groups such as flies show similar range increases.

Why is farmland wildlife changing?

Over recent decades, there have been many far-reaching changes to the way the UK's countryside is farmed – these are summarised in the figure below. While some factors affect a wide range of species, others have more specific impacts. For example, depending on the time that silage and hay is cut, harvesting machinery can destroy the nests and young of birds, such as skylarks[9], and bumblebees, such as carder bees[10]. The biology of some species makes them particularly vulnerable to certain threats: for example, adders hibernate communally at traditional sites, so destruction of a relatively small area of habitat can have a huge influence on the local population[11].

Although there are still some farming systems that are of high value for nature, most of the changes listed below can be attributed to a drive to maximise yields. Modern agriculture tends to simplify the landscape, with larger machinery and more specialised farming systems taking over from traditional mixed farming methods. These changes have increased agricultural yields substantially, but they have also had unintended consequences for the environment. By identifying the harmful impacts of this intensification, it is possible to work with farmers to find solutions that help them to manage their land for efficient, sustainable food production as well as wildlife. Progress has been made with wildlife-friendly farming, but there are still many challenges that must be addressed, including neonicotinoid insecticides, which may be reducing the breeding success of bumblebee colonies[12].



Case study

The decline of farmland flowers


Mark Gurney (RSPB)

Cornflower

Between the 1930s and 1984, the area of lowland meadow in England and Wales declined by 97%[17], and the majority of remaining meadows are of poor wildlife value. Plants of arable farmland are also struggling as a result of the use of herbicides and nitrogen fertilisers, as well as the loss of non-cropped areas.

The decline of these important nectar and pollen sources has had a knock-on effect for insect pollinators. Of the 97 food plants that we know bumblebees prefer, 76% have declined over the past 80 years[18]. As bumblebees are pollinators of some commercial crops and many wildflowers, threats to their populations may have far-reaching consequences for farming, people and other wildlife.

Once a common cornfield wildflower on calcareous soils throughout lowland England, the corn cleaver has undergone one of the most dramatic declines of any plant species. The intensification of arable farming, including improved seed cleaning technology and the use of herbicides, is thought to be to blame.

The species has not been recorded as an arable plant for many years. It only survives on experimental plots at Rothamsted Experimental Station in Hertfordshire, which have not received fertilisers or weed control for more than 100 years[19].

Case study

Bats, flies and cow dung

Avermectins are common veterinary drugs used to treat worm infections in cattle, and may have contributed to severe declines in the range of greater horseshoe bats[20].

Why? Because they reduce the number of larval insects in cow dung, depleting a key food source for bats, as well as birds. Populations of the threatened hornet robber fly are also thought to be suffering.

To tackle the problem, Natural England led a project to encourage land owners to manage land close to greater horseshoe bat maternity roosts more sensitively, and to reduce avermectin and insecticide use. Together, these actions are thought to be responsible for a 58% increase in bat numbers over the course of the project[21].

Franz Christoph Robi (Imagebroker/FLPA)

Greater horseshoe bat

Saving farmland wildlife

Mike Read

Meadow buttercup

In the UK, farmers are encouraged to manage their land for nature using subsidies from agri-environment schemes. Many early agri-environment options were successful at countering declines in rare farmland birds, such as corncrakes and stone-curlews, and also provided benefits beyond the target species. For instance, providing unsown tilled fallow plots for stone-curlews benefits other wildlife, including skylarks, brown hares, arable plants, butterflies and bumblebees[22]; while spiders, bugs and harvestmen thrive on the vegetation designed for corncrakes[23].

Research has shown that the number and diversity of bumblebees increases rapidly when wildflower, pollen and nectar mixes are provided[24], and grasshoppers benefit from 6 metre-wide margins[25]. Uncultivated margins and conservation headlands benefit rare arable plants, especially when targeted at areas with light, infertile soils[26]. These studies clearly show that some agri-environment options provide multiple benefits, but it is likely that a mosaic of different options, over a sufficiently large area, is required to benefit wildlife as a whole. Some species groups would undoubtedly benefit from more targeted agri-environment options.

Agri-environment schemes have helped to increase the population of rare species and local populations of more widespread species, and there is evidence that even simple measures, such as those available in the English Entry Level Scheme, benefit birds[27,28]. However, we have not seen the much-hoped for recoveries of farmland wildlife – probably because not enough farmers have taken up the most effective agri-environment options, and available funding is limited.

Case study

Hope for cirl buntings

Once common across farmland in southern England, cirl buntings had declined to just 118 pairs in South Devon by 1989. Research by the RSPB revealed that these birds need mixed farmland, including suitable hedgerows or scrub for nesting, sources of seed throughout the winter and summer pastures rich in insects to feed their young. All these habitats were provided through agri-environment schemes, and the cirl bunting population increased significantly, to 862 pairs in 2009. Although these birds still depend on conservation efforts, the outlook is positive and shows that, through a combination of research, advocacy and management, conservation can bring species back from the brink[29].

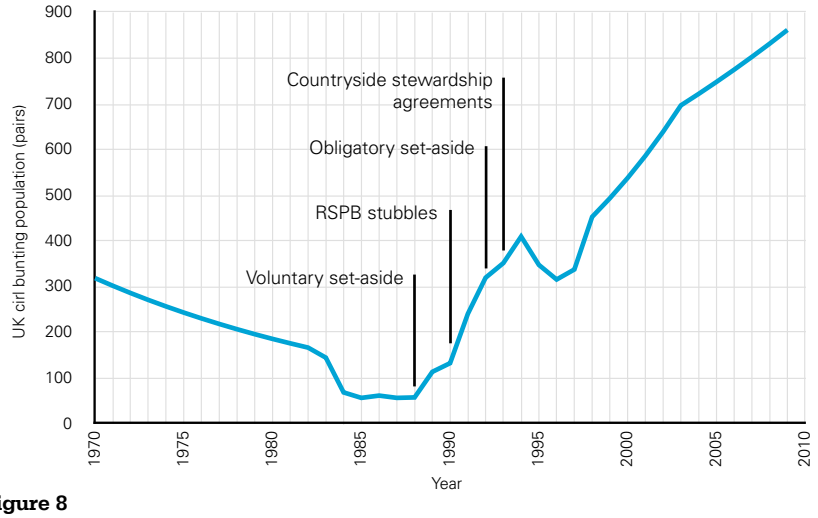


Figure 8
Recovery of the UK cirl bunting population, in relation to the timing of conservation actions. Data from the RSPB and NE.

Brown hares have benefited from habitat provided for stone-curlews through agri-environment schemes.

David Tipling

Brown hare

Ray Kennedy

Lowland semi-natural grassland and heathland

"... she looked up the valley of the heath, alive with butterflies, and with grasshoppers whose husky noises on every side formed a whispered chorus."

Thomas Hardy, from *The Return of the Native*

Semi-natural grasslands consist of meadows and pasture under traditional management, including neutral, acidic and chalk grassland. Together with lowland heathlands, they provide vital, exceptionally species-rich open spaces for wildlife in our lowland countryside, and are home to many rare and threatened species. Churring nightjars, all six native species of reptile, the grey long-eared bat (one of the UK's rarest mammals), thousands of invertebrate species and spectacular displays of orchids and other colourful wildflowers can all be found in these habitats.

We have a special responsibility to conserve these habitats due to their international importance: the UK holds 20% of the world's heathland, whilst Salisbury Plain is the largest remaining area of chalk grassland in north-west Europe. This natural interest, maintained by centuries of management, can make them important historical features and popular visitor attractions.

Tragically, the majority of these habitats have been destroyed or damaged over the last 100 years (see page 14). The transitional nature of the vegetation and the current low commercial value of the habitat places it at extreme risk of further loss or degradation through poor management or neglect. Recreational disturbance is an increasing threat, particularly to heathland birds.

The wider value these habitats have for human wellbeing has been underestimated, and recent research has shown that they are also important carbon stores that help mitigate the negative effects of climate change.

Silver-studded blue

Mark Sisson

- ***Following decades of widespread habitat destruction and species declines due to agricultural intensification, afforestation, urban development and neglect, the rate of this habitat loss has slowed since the late 1990s.***
- ***Overall, 65% of the 1,236 species for which we have sufficient data have declined, and 35% have declined strongly. And yet, a warming climate may be helping some species.***
- ***One in four species of flowering plant in this habitat is threatened. Nitrogen deposition, disturbance, inadequate or inappropriate land management, and habitat loss and fragmentation all pose barriers to recovery.***
- ***Targeted conservation action, especially in protected areas and through agri-environment schemes, has benefited some priority species, including bats, birds and butterflies.***

The state of lowland semi-natural grassland and heathland nature

The amount of lowland semi-natural grassland has declined by 97% between the 1930s and 1984, whilst lowland heathland has shrunk in area by 80% since 1800[1-4], with habitat loss continuing through the 1980s and 1990s[4]. In Derbyshire, an estimated 80–91% of semi-natural grassland was lost between 1984 and 1999[5]. Loss of habitat on this scale led to corresponding national declines in species strongly associated with heathland, including the Dartford warbler, silver-studded blue butterfly, smooth snake, mottled bee-fly, heath lobelia and small red damselfly, whilst on grassland there were serious declines in the silver-spotted skipper, marsh fritillary, whinchat, wart-biter (a bush cricket), green-winged orchid and field gentian, amongst many others.

The burnt orchid, a calcareous grassland specialist, has been lost from 27 counties[6], and many of the special flowers of chalk and limestone maintain a precarious existence over much of their range today. Several species associated with these habitats have been lost entirely, including the short-haired bumblebee and starry breck lichen.

65% of the semi-natural grassland and heathland species for which we have data have declined (see Figure 9), – a greater proportion than in any other habitat. The same large declines in invertebrates seen in other habitats are also found here, but it is the number of declining and endangered plants that is notable. Some 398 species of flowering plants found in these habitats – 69% of the total we have trends for – have declined since the 1960s. One in four flowering plants found on heathland and semi-natural grassland are threatened, a higher proportion than in any other habitat.

Habitat loss has slowed considerably since the late 1990s and is beginning to reverse in some heathland and grassland types, though existing data are poor. However, it is important to remember that this is a slight increase from a much reduced level, and new heathlands and grasslands do not yet match the wildlife value of centuries-old habitat. The condition of semi-natural grassland habitat has continued to decline outside of protected sites. Partial habitat recovery has led to a reversal in the fortunes of a number of species, including the sand lizard on lowland heathland, and Adonis blue butterfly on grassland.

Species recovery is largely down to targeted conservation efforts, including some high-profile re-introductions like that of the large blue butterfly in Somerset[7]. In spite of these successes, there are more species in long-term decline than recovery. The condition of grasslands and heathlands is generally considered "poor but improving"[8], although species richness and characteristic species continue to decline in some places.

The status of habitat-specialist butterflies has been used as an indicator of the state of biodiversity in semi-natural grasslands and heathlands in England, as these species are largely restricted to high-quality habitat[9]. Although fluctuating markedly, the underlying measures of habitat specialist butterflies show a significant overall decline of 40% between 1990 and 2011 (see Figure 10), with species including the small blue and northern brown argus declining. However, a number of others, including the silver-studded blue and silver-spotted skipper, are in recovery following long declines. Both of these species, as well as others, may benefit from warmer temperatures.

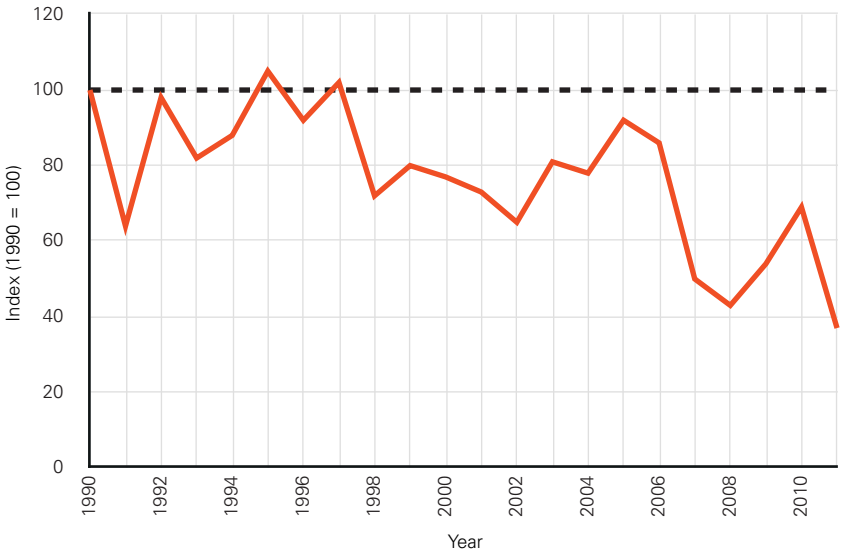
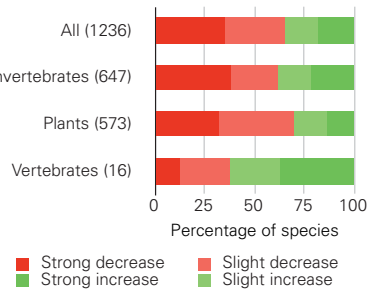


Figure 10
English indicator for specialist butterflies in farmland[9]. Data from BC, CEH, JNCC and Defra.

Figure 9
The proportion of lowland semi-natural grassland and heathland species that are increasing or decreasing in each taxonomic group, measured by either population size or range over a period of up to 50 years. The values in brackets represent the number of species assessed.

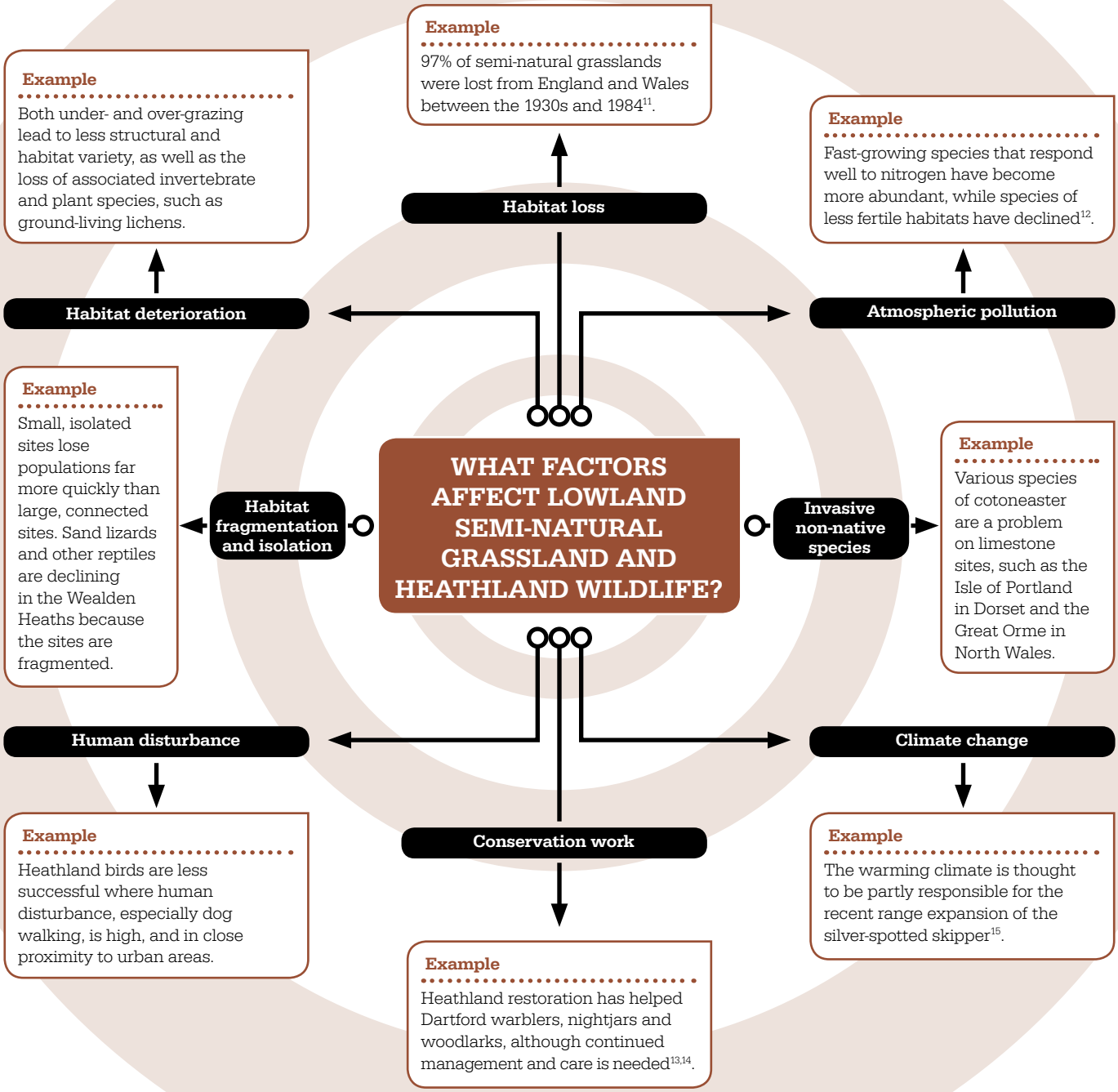


Why is lowland semi-natural grassland and heathland wildlife changing?

Agricultural improvement, including ploughing, draining, re-seeding and fertilising, was the major cause of habitat and species loss on grassland until the 1990s[4]. Heathland was also affected by urban development, mineral extraction and afforestation[1,10]. Recent declines in the majority of species are a result of other factors, including inadequate or inappropriate land management, atmospheric pollution, habitat fragmentation and, to a lesser extent, human disturbance and the spread of invasive species[4].

Some species have recovered thanks to targeted conservation efforts, including the creation of nature reserves and the improvement of protected areas, as well as the application of agri-environment and other land management schemes.

Climate change has allowed some species to move north, possibly masking some of the impacts of habitat loss, fragmentation and deterioration.



Case study

Restoring lowland heathland

The Tomorrow's Heathland Heritage programme was led by Natural England and involved 140 different organisations across the UK. Supported by the Heritage Lottery Fund, it ran from 1997 to 2010, and covered an area of 46,000 hectares. In that time, the project helped to restore habitat and create nearly 2,500 hectares of new habitat, aiding the recovery of threatened species including the woodlark, nightjar, silver-studded blue butterfly and sand lizard.

Saving lowland semi-natural grassland and heathland wildlife

Lowland semi-natural grasslands and heathlands have been the focus of conservation efforts in recent decades, due to their special importance for biodiversity. Much of this land is now designated as protected areas, including 70% of lowland calcareous grassland and 74% of lowland heathland. The recovery of some species has been a result of targeted conservation efforts, assisted by mechanisms such as the following:

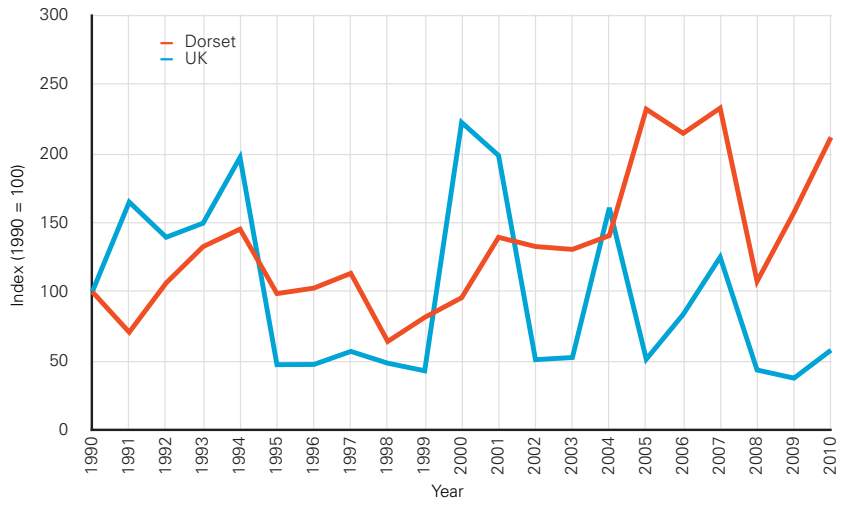
- ***Enhanced management of Sites of Special Scientific Interest (SSSIs) and other statutory protected areas.***
- ***Entry into, and enhanced management of, land in higher-tier agri-environment schemes.***
- ***Co-ordinated effort and partnership working locally and nationally, through the UK BAP and subsequent national biodiversity strategies.***
- ***Landscape-scale conservation projects, established to restore species' populations across a network of sites.***
- ***Designation and appropriate management of nature reserves and other land, as well as protection of sites in the planning system, including tackling the cumulative impacts of multiple proposed developments.***

Case study

Marsh fritillary butterfly

The recovery of the marsh fritillary in Dorset is a good example of a threatened species responding positively at a landscape scale to targeted land management. Butterfly Conservation has worked closely with Natural England (and its predecessors) since the 1980s to tailor management on Wessex downland sites for the butterfly. This has been achieved largely through payments to farmers under agri-environment agreements in the South Wessex Downs Environmentally Sensitive Area (and its successor Higher Level Stewardship). The butterfly has responded positively at 33 of 34 sites, and Dorset is now outperforming the rest of the UK, with a 278% increase noted from 1990 to 2010, compared to a 50% decline elsewhere[16].

Figure 11
Trends in marsh fritillary numbers in Dorset and the UK. Data from BC.



Adonis blue on horseshoe vetch

Common lizard

All six of the UK's reptile species, including the common lizard, can be found on heathlands.

Steve Knell

Mark Hamblin

Upland

"...the pleasantest manner of spending a hot July day was lying from morning till evening on a bank of heath in the middle of the moors, with the bees humming dreamily about among the bloom, and the larks singing high up overhead..."

Emily Brontë, from *Wuthering Heights*

The UK's uplands are the hills, valleys, moors and mountains that form a distinctive and beloved part of our countryside. Habitats range from pastures and hay meadows in valley bottoms, to more extensive areas of rough grass, heather moor, blanket bog, woodland and mountain summits. Nearly all of the world's heather moorland is found in the UK.

Despite their wild appearance, these habitats, shaped by altitude, aspect, soils and climate, have been influenced by man for thousands of years, through grazing, burning and forest clearance. Today, they are used, in places intensively, for pastoral farming, game shooting, forestry, drinking water collection, energy generation and nature conservation. Large areas are designated as protected sites, such as SSSIs, National Parks and Areas of Outstanding Natural Beauty (AONBs).

The uplands are home to a variety of specialist flora and fauna, including the mountain hare, golden eagle, golden plover, alpine saxifrage, mountain ringlet butterfly and bilberry bumblebee, alongside a wealth of rare bryophytes and lichens. Some of these are endemics, found nowhere else in the world, such as the northern prongwort, a liverwort which occurs only on Beinne Eighe National Nature Reserve in Scotland. The natural and cultural importance of uplands cannot be overestimated, but amidst this richness, land managers seek to make a living here, whilst remaining sensitive to the needs of wildlife and the environment.

Golden plover

Andrew Parkinson

- ***Our knowledge of the status and trends of many plants and animals in the uplands is poor, largely because of a lack of systematic and long-term monitoring.***
- ***Of 877 upland species for which we have information, 65% have declined and 35% have declined strongly.***
- ***118 upland plant species are on recent national Red Lists, including 85 moss and liverwort species. Fourteen upland moss and liverwort species are already extinct.***
- ***Historic and continuing changes in land use and management, including woodland clearance and atmospheric pollution, have resulted in habitat loss, degradation and fragmentation, and a loss of diversity at a range of scales.***
- ***Although some species thrive from intensive grazing and burning regimes, most species and habitats benefit from less intensive grazing and habitat management.***

The state of upland nature

By their very nature, uplands are challenging places to work in. Their climate, terrain and remoteness combine to make studying already elusive wildlife even more difficult. As a result, few long-term monitoring data exist. However, of the 877 upland species assessed, we know that 65% have decreased, and 35% have decreased strongly (see Figure 12).

Birds are particularly well studied compared to other groups, and we see some worrying trends. Many formerly widespread species, including the lapwing, curlew and whinchat, are suffering major declines[1], and several birds of prey are missing from parts of their natural ranges[2], although some birds, such as the raven, have increased. The charismatic mountain hare is declining too.

Worryingly, 66% of the upland invertebrates monitored are decreasing. Populations of 65% of upland butterflies, including the high brown and pearl-bordered fritillaries, have fallen largely due to habitat loss, change and fragmentation.

The UK's uplands contain vast areas of wetland (blanket peat bogs, flushes, seepages and springs, marshes and swamps), dwarf shrub heath (wet and dry) and upland hay meadows. There are also habitats that are now more localised, such as native pinewoods, and rare habitats such as oceanic heath, alpine heaths, inland rock habitats and late-lying snowbeds.


Mark Gurney (RSPB)

Snowdon lily

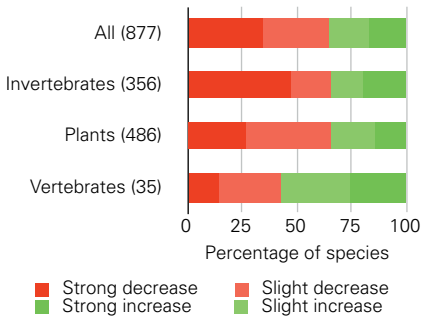
Many of these upland habitats support rare and localised species of flowering plants, bryophytes and lichens, such as the rigid buckler-fern and lady's slipper orchid found on limestone pavements, alongside unusual invertebrates such as the bog ant hoverfly (*Microdon mutabilis*) and the western mason bee (*Osmia parietina*).

Many upland flowering plants are at risk, with 178 species declining (67%), and 33 species (9%) Red Listed, including tufted saxifrage, oblong woodsia and Wales's iconic Snowdon lily (*Iili'r Wyddfa*), all plants "left behind" after the last ice age.

Although many mosses and liverworts appear to be expanding their range, 85 upland moss species are classified as Threatened and 14 species are extinct, including the white-mouthed extinguisher moss (*Encalypta brevicollis*).

Although we lack quantitative data on flies, spiders, amphibians, reptiles and bats in the uplands, we do know that a large number of midge and cranefly species can be found there. As in many other habitats, flies make up a high proportion of species diversity, with many specialists that exploit upland habitats and microhabitats such as flushes, blanket bogs and the margins of upland water bodies.

Figure 12
The proportion of upland species that are increasing or decreasing in each taxonomic group, measured by either population size or range over a period of up to 50 years. The values in brackets represent the number of species assessed.



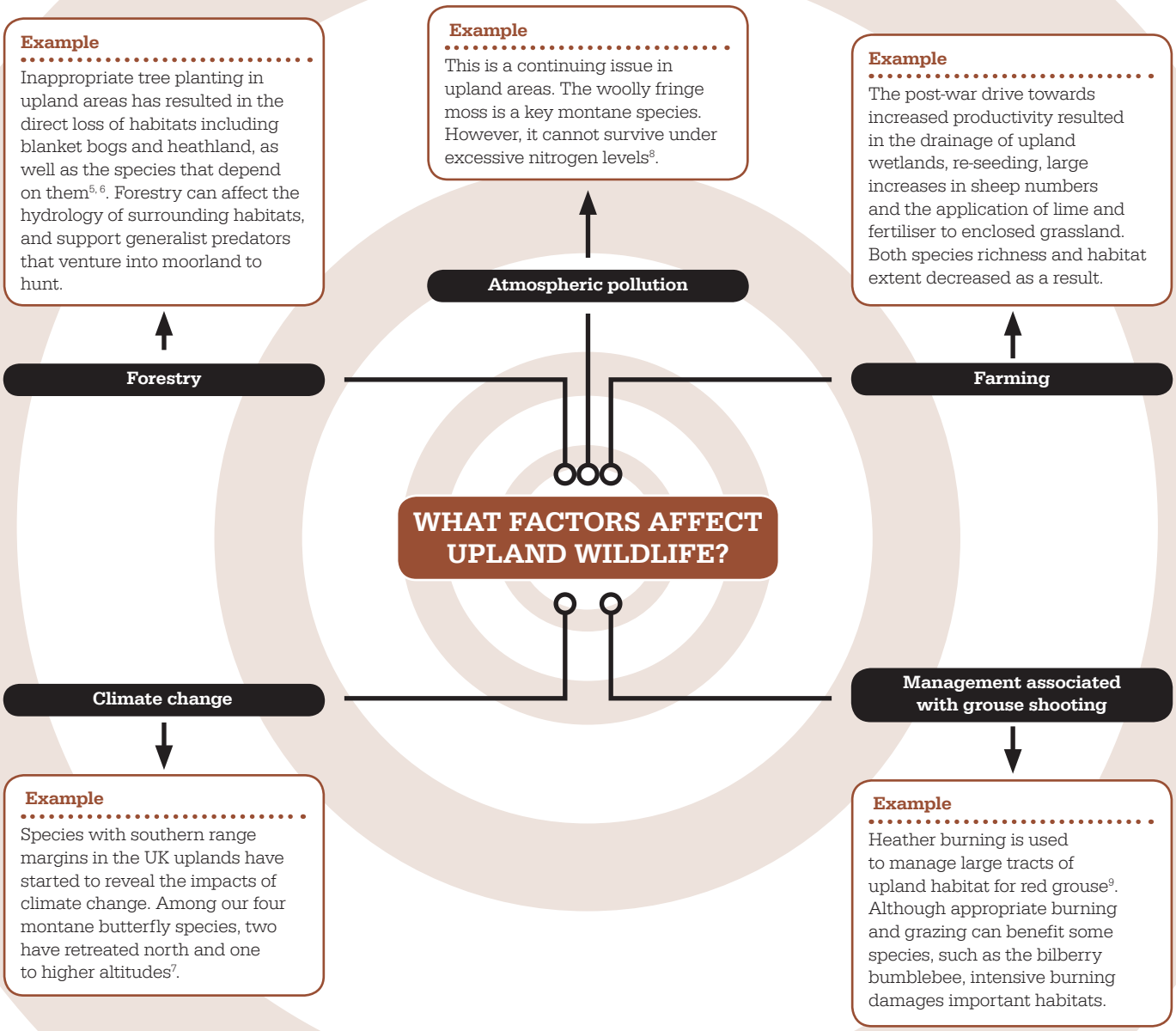
65% of upland butterflies have declined, largely because their habitat is being destroyed, changed and fragmented.

Why is upland wildlife changing?

No single factor is responsible for the changes we have seen to our upland nature. A combination of historic impacts and ongoing issues, including agricultural intensification, abandonment, afforestation and intensive grouse moor management, have played a part[3].

Following the outbreak of Foot and Mouth Disease in 2001, sheep numbers fell in the uplands. This reduced grazing pressure and a remarkable blooming was recorded across English uplands such as Cross Fell[4]. Rare plants such as yellow marsh saxifrage and alpine foxtail were recorded in previously unseen profusion, and the sheathed sedge was discovered in England for the first time – an indication of how our uplands could appear if managed more appropriately. Recent policy changes, including nature conservation measures such as agri-environment schemes and changes to farming systems, have further reduced numbers of sheep and other livestock in our uplands.

Upland land managers, particularly hill farmers, face economic pressure to change and intensify their management of enclosed land to increase productivity, as well as to abandon unenclosed rough grazing land. Yet many upland species need the varied vegetation associated with traditional livestock grazing. Agri-environment schemes can provide a lifeline for farmers wishing to maintain extensive cattle and sheep grazing – an often unprofitable farming system, but one that is vital to maintaining habitats like dwarf shrub heath and rough pasture. These habitats are important for a range of species, including the curlew, adder, bilberry bumblebee, tormentil mining bee (*Andrena tarsata*) and many butterflies.



Saving upland wildlife

A number of projects aim to tackle the issues threatening upland species and habitats; however, many of these projects are small in comparison to the vast area of our uplands.

Several collaborative projects are focusing on blanket bog, which has been lost to forestry in many places. Much of what remains is in poor condition, as a result of drainage, overgrazing, intensive burning and, in places such as the Peak District, historic atmospheric pollution. To tackle this, teams are blocking drains, removing trees, and restoring plants to areas of bare peat. Pioneering work is also underway to try to re-establish *Sphagnum* moss in areas where it has been missing for years[10]. We hope to see the return of golden plovers, dunlins and other upland wildlife to restored blanket bogs across the country.

In 2008, a project was launched in England to help combat the decline in twites. These small finches breed on open heather moors and upland pastures where they nest, before moving to coastal areas in winter. A lack of seed food across their range is a major factor in twite declines[11]. That's why the project team is working closely with farmers and landowners to help them secure grants to restore species-rich hay meadows, a vital, food-filled habitat for twites.

Birds aren't the only animals to benefit from targeted projects. The Two Moors Threatened Butterfly Project, a partnership between Butterfly Conservation and governmental organisations, aims to help marsh, high brown and heath fritillaries. The project encourages farmers to enter into agri-environment schemes on Dartmoor and Exmoor, and provides advice so that habitats can be restored and managed to meet the butterflies' needs. Between 2005 and 2011, the team provided advice on managing nearly 1,800 hectares of butterfly habitat. In one key site, the marsh fritillary population increased by over 1,000% and the number of occupied habitat patches tripled in five years[12], clear evidence that targeted projects can have a huge positive impact.

Case study

Upland grazing – striking the right balance

Many upland land managers are concerned by the spread of bracken, but several rare species rely on moorland edge habitats dominated by it. For instance, the pearl-bordered fritillary and high brown fritillary, two rapidly declining butterflies, both rely on bracken to survive. Their larvae feed on violets, which appear in abundance where bracken is found, and shelter in the warm microclimate created by bracken litter. When grazing, particularly by heavy-footed animals such as cattle and ponies, is stopped, bracken litter starts to build up, preventing violets from growing. Unless traditional low intensity grazing continues, the future of these two butterfly species is in doubt.

High brown fritillary

Richard Revels

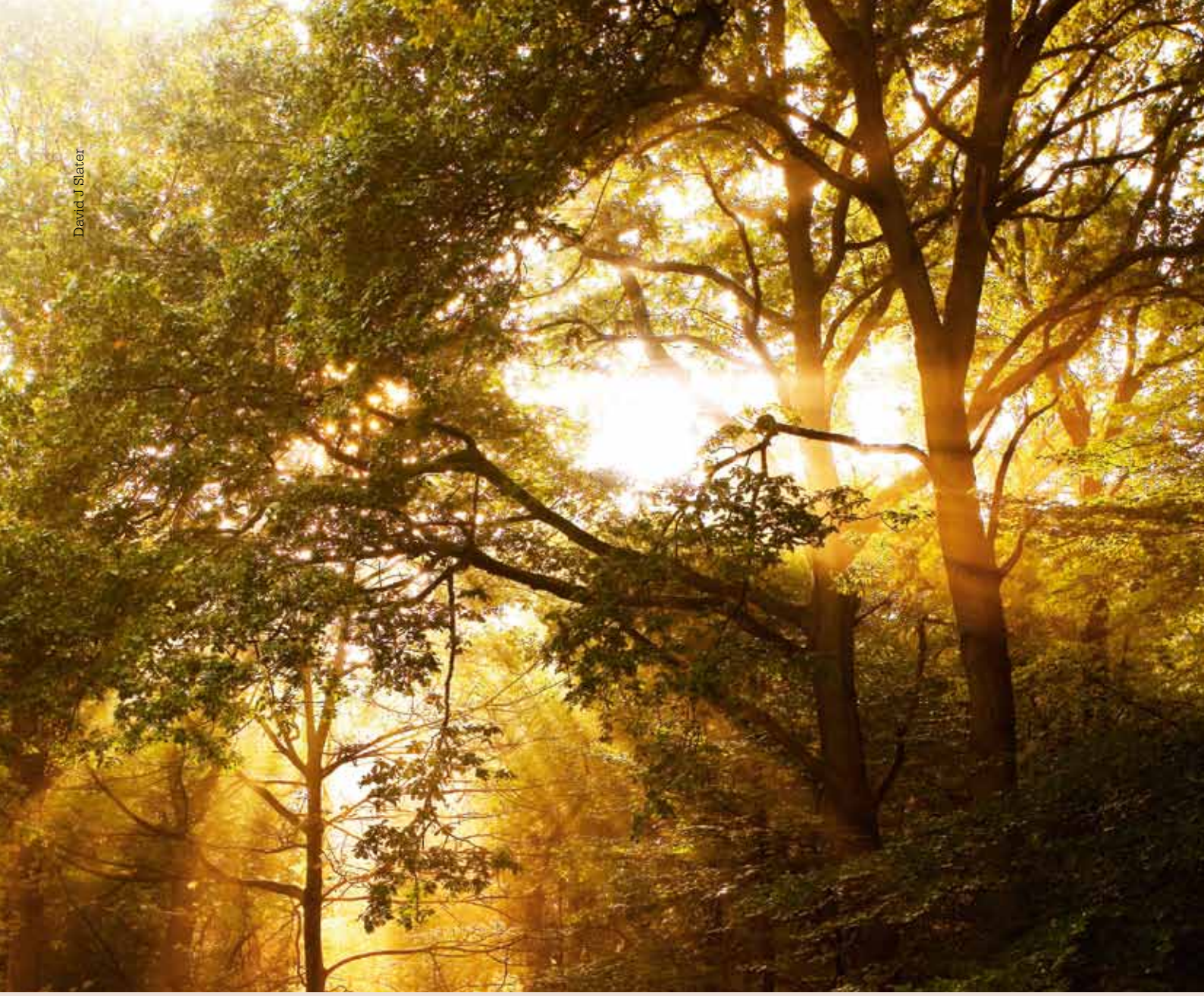
Highland cows in moorland

Jeroen Stel

Golden eagles and other animals are under threat from illegal killing, disturbance and intensive management practices.

Chris O'Reilly

Golden eagle



David J Slater

Woodland

"It is not so much for its beauty that the forest can make a claim upon men's hearts, as for that subtle something, that quality of air, that emanation from old trees, that so wonderfully changes and renews a weary spirit."

Robert Louis Stevenson, from *Essays of Travel*

Much of Britain was once covered by woodland, but now it covers just 12% of the land[1]. Nevertheless it is home to a spectacular variety of wildlife, and is cherished by people as a beautiful and important part of our countryside. In this report we take a broad view of woodlands, and include scrub, coppice, carr, copse, wood pasture and parkland, as well as plantation and semi-natural woodland, both coniferous and broadleaved.

Since 1945, the area of woodland has doubled in the UK[1], mainly as a result of trees planted for timber production. This has led to the dominance of coniferous species, particularly in Scotland, where they make up 81% of woodlands. In Wales, the figure is less, at 55%, and just 35% in England. More recently, from 1998 to 2007, the area of broadleaved woodland has increased by 7% in the UK[2], and existing broadleaved woodland has matured.

People have had a profound influence on woodland in the UK, and no truly pristine woods remain untouched by our activities. However, ancient woodlands are often home to special communities of plants and invertebrates that reflect the age of the wood and the long history of human management through activities such as coppicing. Irrespective of age, woodlands are highly valued; there are an estimated 250–300 million day visits to woodlands each year[2] and people feel passionately about the protection of woods and the wildlife they support.

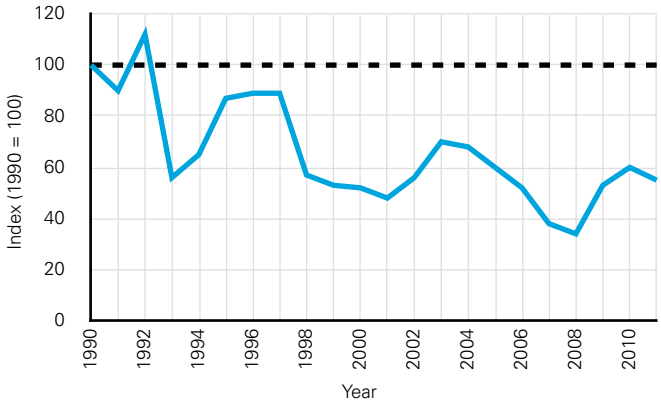


Figure 13
English woodland butterfly indicator[3]. Data from BC, CEH, Defra and JNCC.

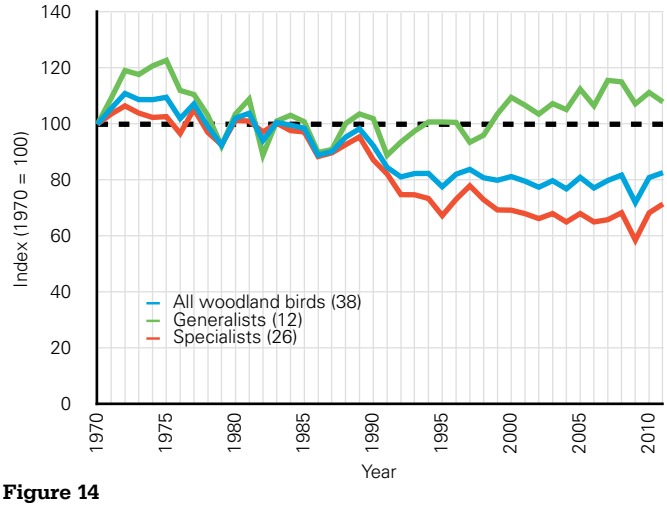


Figure 14
UK woodland bird indicator[4]. Data from the RSPB, BTO JNCC and Defra. Numbers in brackets are the number of species in each group.

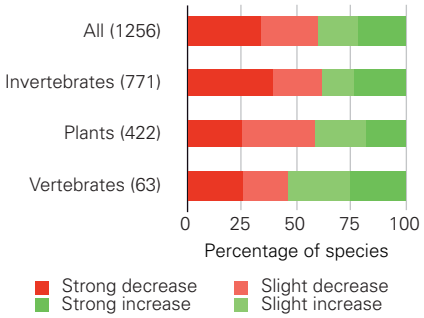
- ***The area of UK woodland has increased, mainly due to conifer planting, but woodland birds have been declining since the 1970s and woodland butterflies since the 1990s.***
- ***Of the 1,256 woodland species studied, 60% have decreased and 34% have decreased strongly.***
- ***11% of woodland flowering plants are on the national Red List: 30 species in all.***
- ***The declines of most woodland species are linked to changes in the structure of woodlands, due to increased grazing pressure by deer, changes to management practices and woodland ageing.***
- ***Some conservation action is focused on priority species, while other projects are designed to benefit a wider range of wildlife through sympathetic management.***

The state of woodland nature

The indicator for butterflies in English woodlands shows that woodland butterflies are declining (see Figure 13). Wider countryside butterflies within woodlands have declined by 43% since 1990[3] (a UK equivalent indicator has yet to be calculated).

The loss has been particularly severe for wood white and Duke of Burgundy butterflies, amongst others. Most declining species are now restricted to actively managed woodlands and habitats such as rides, glades and clearings.

Figure 15
The proportion of woodland species that are increasing or decreasing in each taxonomic group, measured by either population size or range over a period of up to 50 years. The values in brackets represent the number of species assessed.



There is also cause for concern about our woodland birds, which have declined by 17% overall since 1970[4] (see Figure 14). Woodland specialists have fared particularly badly, while more adaptable generalist species have increased. Since the declining species are found in a range of different woodland habitats, it is unlikely that the same change in woodland management or habitat is affecting them all. However, six of the declining species, including the nightingale and willow tit, all rely on younger woodland growth stages, so the reduction in coppicing and other active management in lowland woods is likely to have affected them. Most of the birds that have increased or remained stable, such as great spotted woodpeckers, are associated with mature woodland and may be benefiting from an increase in woodland coverage and the reduction in woodland management during the 20th century.

Our analysis shows that, of the 1,256 species assessed, more are decreasing (60%) than increasing, and 34% have decreased strongly (see Figure 15). Nearly two-thirds of the invertebrate species we have monitored are declining, as are 58% of flowering plants. News for vertebrates is better as they are evenly spread between the decreasing and increasing categories. Both of our native deer species, the red and roe, have increased substantially, leading to excessive grazing that damages woods. The increasing number of non-native deer is making matters worse.

Woodlands provide important habitat for many threatened mammals. These include the hazel dormouse, red squirrel, pine marten and all 17 species of bat resident in the UK[5]. Woodland features such as woodpecker holes and loose bark provide roosting sites for bats.

Of 262 woodland flowering plants assessed, 30 (11%) are on the national Red List. Some are considered Critically Endangered, including green hound's-tongue, which prefers open glades and rides in woodland. These features are gradually disappearing as woodland management has decreased.

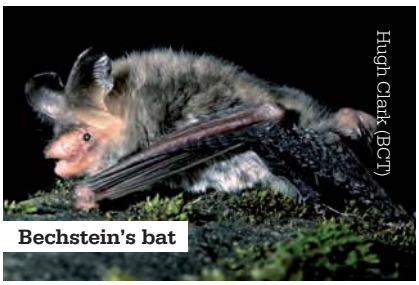
We know little about how invertebrates are doing, but it is clear that woodlands are important for them. Humid leaf litter and deadwood support a great range of species, including centipedes, woodlice and millipedes. Flies make up a huge proportion of the biodiversity in woods, both in terms of the number of species and their relative biomass. Beech woods are particularly important for rare flies and beetles, but other special species occur in Caledonian pine forest, Scottish aspen woods, old alder woods and northern birch woods. Many widespread moths that use woodland are declining. We know that 236 species have declined strongly over the last 40 years, and some rare and localised species such as the drab looper moth have declined severely.

Internationally important pasture woodland and veteran trees can be found in the UK, which provide habitat for scarce invertebrates and fungi that depend on dead and decaying wood. Several UK woodland types are also of high international importance for lichens, particularly those along the Atlantic fringe, the lowland wood-pasture and parklands of the New Forest, and the native Caledonian pinewoods of Scotland.

Case study

Bechstein's bat

Bechstein's bat is one of the UK's rarest bats, and is found almost exclusively in woodland. It relies heavily on mature deciduous semi-natural and ancient woodland, making it very sensitive to habitat fragmentation and intensive woodland management.

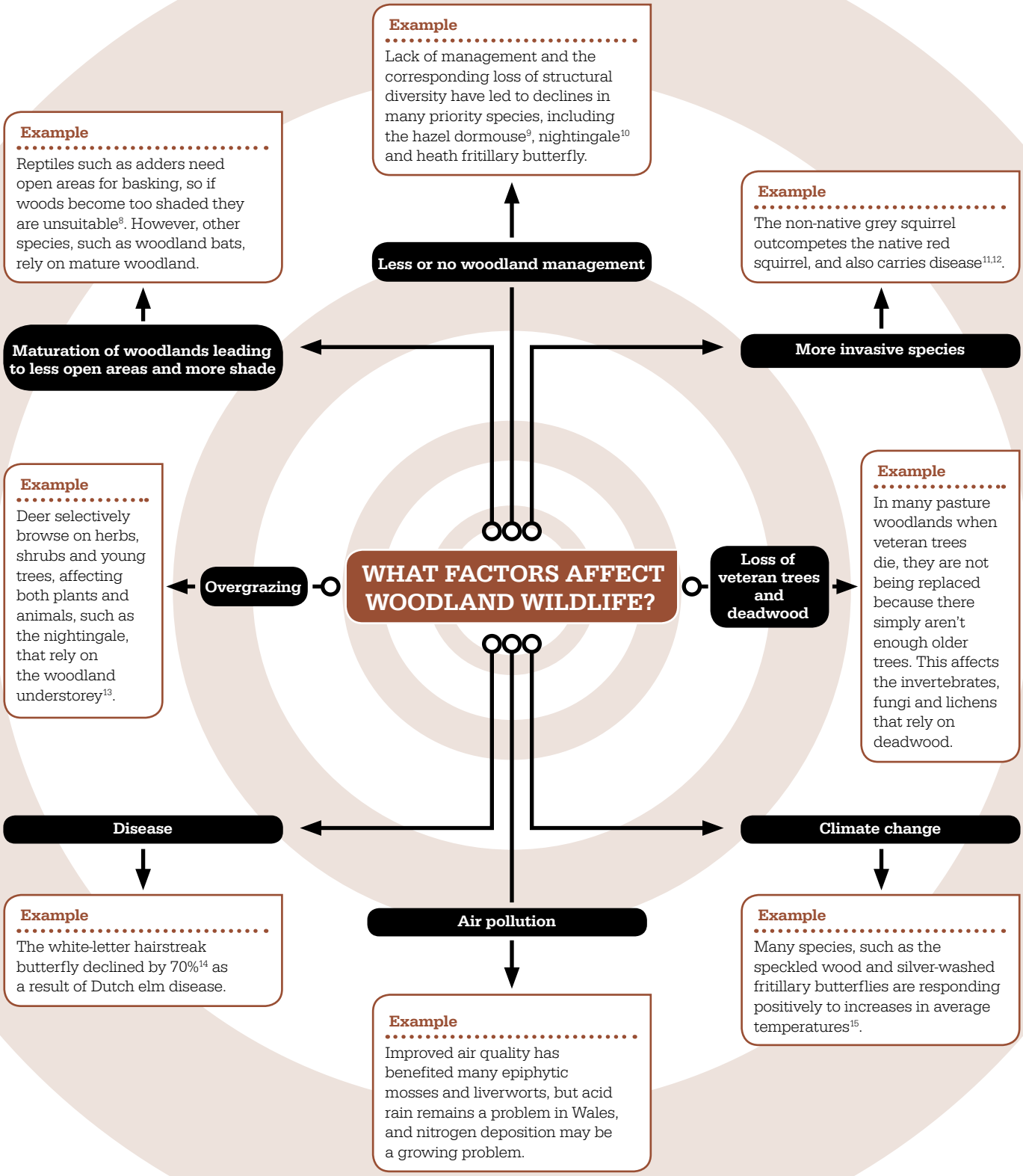


Bechstein's bat

The first systematic survey of the bat's distribution, from 2008 to 2011, revealed Bechstein's bats in new woodland sites in Buckinghamshire, Dorset, Kent, Gloucestershire, Somerset, and Worcestershire. This range extends much further north than previously thought, and includes the most northerly breeding population known in Europe[6]. Work is currently underway to help understand the needs of this species and ensure that woods are managed appropriately.

Why is woodland wildlife changing?

While the changes we have seen in woodlands are many and varied (see below), their effects are often similar, in that they change woodland structure, and it is often that change in structure that is bad for wildlife. Although recent climate change has had little effect on woodland structure and composition, mobile species, such as insects and birds, have moved with the conditions, and increasing temperatures have led to faster tree growth, changes in germination success and altered phenology in some areas. Despite recent reductions in emissions, nitrogen deposition and ozone levels are still above "critical loads" for habitats such as UK Atlantic oakwoods[7].



Case study

Understanding the potential impact of ash dieback


Katie Fuller (RSPB)

Ash tree

Chalara dieback is a serious disease of ash trees caused by the fungus Chalara fraxinea *(more correctly known as* Hymenoscyphus pseudoalbidus*) which has caused widespread damage to European ash tree populations. The disease was unknown in Great Britain until the first cases were confirmed in a tree nursery in Buckinghamshire in early 2012. By October, it had been confirmed in mature ash trees. Work is currently underway to determine how far the disease has spread*[16].

Ash trees are an important component of our native woodlands and hedgerows; they are a common hedgerow tree and the third most common species in broadleaved woodland, accounting for 13% of trees. Across all woodlands, they account for 5% of trees[1]*. They are important for fungi, invertebrates that need deadwood, and epiphytic lichens and bryophytes, although few species are totally reliant on ash. Large, mature ash trees, with their assorted cracks and hollows, also provide valuable nesting sites for many of our woodland birds, as well as roosting sites for bats. Ash-dominated woodlands also tend to be rich in plants, as they let in more light than oak woods, and tend to dominate on lime-rich soils.*

At this stage, it is very difficult to predict what impact the disease will have on woodland in the UK. We expect some losses both directly, as a result of food and habitat loss, and indirectly through the loss of associated communities. However, the increased volume and diversity of deadwood habitats may be beneficial in some circumstances.

Saving woodland wildlife

Woodlands and the species they support are conserved for a number of different reasons, including commercial timber, pulp and wood fuel production and game bird shooting, as well as for aesthetic reasons, recreation, and of course for wildlife. High priority species, such as the hazel dormouse, spreading bellflower and capercaillie, are often the focus of conservation efforts, but other programmes exist that aim to benefit a wider range of woodland wildlife via sympathetic management. Woodland Grant Schemes in England, Wales and Scotland provide financial incentives to encourage woodland managers to consider the needs of wildlife and manage woodlands accordingly. Statutory designations also help to ensure that woodlands are managed sympathetically, although the number of sites that hold such designations is low.


Danny Green

Hazel dormouse

Case study

Aspen hoverfly

The little-known aspen hoverfly is one of the UK's rarest insects. Found only in the Scottish Highlands, this insect has very specific needs: its larvae can only survive under the rotting bark of aspen trees. But a dead aspen tree will only provide a breeding site for the hoverflies for a couple of years, so populations rely on a steady supply of deadwood from year to year.

Finding suitable habitat is becoming increasingly difficult for the hoverflies, as aspen woods are lost to roads and developments, conifers are planted and deadwood is cleared from the forest floor. As a result, aspen hoverflies are known to survive at just eight sites.


Laurie Campbell

Aspen tree

The RSPB's Insh Marshes nature reserve is one of these key sites, and the area is carefully managed to maximise suitable habitat. Experimental work is also underway to find the best way to create and maintain the right kind of rotting conditions for hoverfly grubs[17]*.*

Increased grazing pressure from deer is affecting the structure of our woodland, and the species that live there.

David Norton

Red deer at dawn

Steve Knell

Coastal

"In every outthrust headland, in every curving beach, in every grain of sand there is the story of the earth."

Rachel Carson, from *Our Ever-Changing Shore*

Wrapped in a narrow ribbon around the UK, our coastal habitats are diverse and fragile. They include saltmarshes, coastal lagoons, mudflats, dunes, shingle, beaches, soft and hard rock cliffs and slopes, and the amazing machair habitat of north and west Scotland. Many blur the boundaries between coastal and inland habitats. For instance, coastal grazing marshes could be considered farmland, but also hold brackish ditches and sea walls that support special communities of wildlife.

The UK holds internationally important populations of many coastal species, such as the sea-aster colletes bee, a species found only in coastal areas around the North Sea. Some are endemics, found nowhere else in the world, such as the dune helleborine, which exists in just a handful of northern sites, and the even rarer Lindisfarne helleborine, named after its only known location. Many other specialist plants, invertebrates and birds depend on rare and vulnerable coastal habitats.

We discuss the fortunes of the UK's seabirds in the marine section of this report, but it is important to remember that they flock in huge numbers to our offshore islands, beaches and sea cliffs to breed in spring and summer. These "seabird cities" are some of the most impressive wildlife spectacles in the world.

Our islands' identity is closely bound to the sea, and our coastline is an important part of our heritage. A trip to the seaside is a national pastime, and the sights, sounds and smells of the coast are loved by people everywhere.


David Chapman (NHPA/Photoshot)

Yellow horned poppy

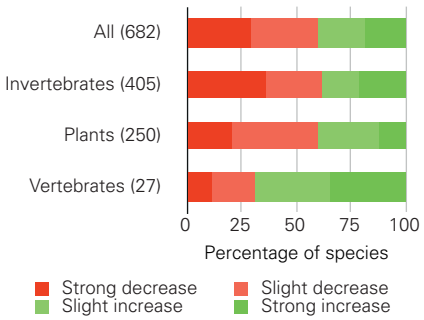
- ***The UK's coastline includes some of our most diverse and varied habitats, supporting many hundreds of specialist plants and animals that can be found nowhere else.***
- ***Of the 682 coastal species for which we have trends, 60% have declined and 29% have declined strongly.***
- ***13% of coastal flowering plant species are regarded as threatened with extinction in the UK.***
- ***Habitats such as saltmarsh support internationally important bird and invertebrate populations.***
- ***Huge areas of coastal habitat have been lost or damaged in recent history, due to coastal development, cliff stabilisation and changes to agricultural practices.***

The state of coastal nature

Although some species are faring well in our coastal habitats, overall the news is mixed: 60% of the 682 species for which we have quantitative trends have decreased, and 29% have decreased strongly (see Figure 16). However, we lack trends for many species, so care should be taken in generalising from these findings.

Twenty-five coastal flowering plant species appear on the national Red List, 13% of the total number of species assessed.

Figure 16
The proportion of coastal species that are increasing or decreasing in each taxonomic group, measured by either population size or range over a period of up to 50 years. The values in brackets represent the number of species assessed.




NHPA / Photoshot

Beachcomber beetle

We know that the decline of many species is due to the loss and deterioration of their habitat.

For example, the stabilisation of soft rock cliffs and sand dunes is likely to have led to the declines in some species of solitary bees and wasps[1]. 63% of the 680 rare invertebrate species associated with sand dunes rely on early successional habitats, such as bare or sparsely vegetated sand. These habitats are reduced when dunes become stable and fixed. Many species, including the large mason bee (*Osmia xanthomelana*) and the nomad bee (*Nomada sexfasciata*) are now restricted to very few sites in the UK.

61% of coastal invertebrates have declined.

Drainage, agricultural intensification and sea level rise have all resulted in the decline of birds that rely on coastal grazing marshes and saltmarshes. For instance, the number of redshanks breeding on British saltmarshes fell by 53% between 1985 and 2011[2,3]. However, the general trend is that coastal birds are increasing: in particular, several species of overwintering geese have benefited from changes to agricultural practices, as well as reduced persecution.

Various species of fly that live in coastal habitats have declined[4]. In many cases, rare species rely on specific coastal plants and are found in small-scale and transitional habitats such as coastal freshwater seepages, dune slacks, upper saltmarsh, saline lagoons and ditches.

One in six coastal plant species are declining strongly, including sea barley and slender hare's-ear. Many plant communities have also deteriorated or been lost completely, particularly those found on coastal dunes and shingle, upper saltmarsh and soft rock cliffs.

Some coastal plants and animals are adaptable, and can cope with habitat loss and change, but other species have more specific needs and are more vulnerable to change. The challenge is to identify which species are at risk, and ensure that their needs are met.

Case study

Development pressure on sand dunes

Sand dunes and shingle areas have little value for agriculture, but are prime sites for tourist developments, such as caravan parks. Such developments often result in the loss of rare invertebrates, lichens and the rich orchid populations of wet dune slacks. What wildlife does survive is often left marooned on dune "islands" in a sea of development. Building work also interferes with the dynamics of dune systems. In recent years, damaging developments have been given the green light at Sovereign Harbour in East Sussex, Foveran Links SSSI in Aberdeenshire and Carlyon Bay in Cornwall.


Ernie Janes

Sand dunes

Why is coastal wildlife changing?

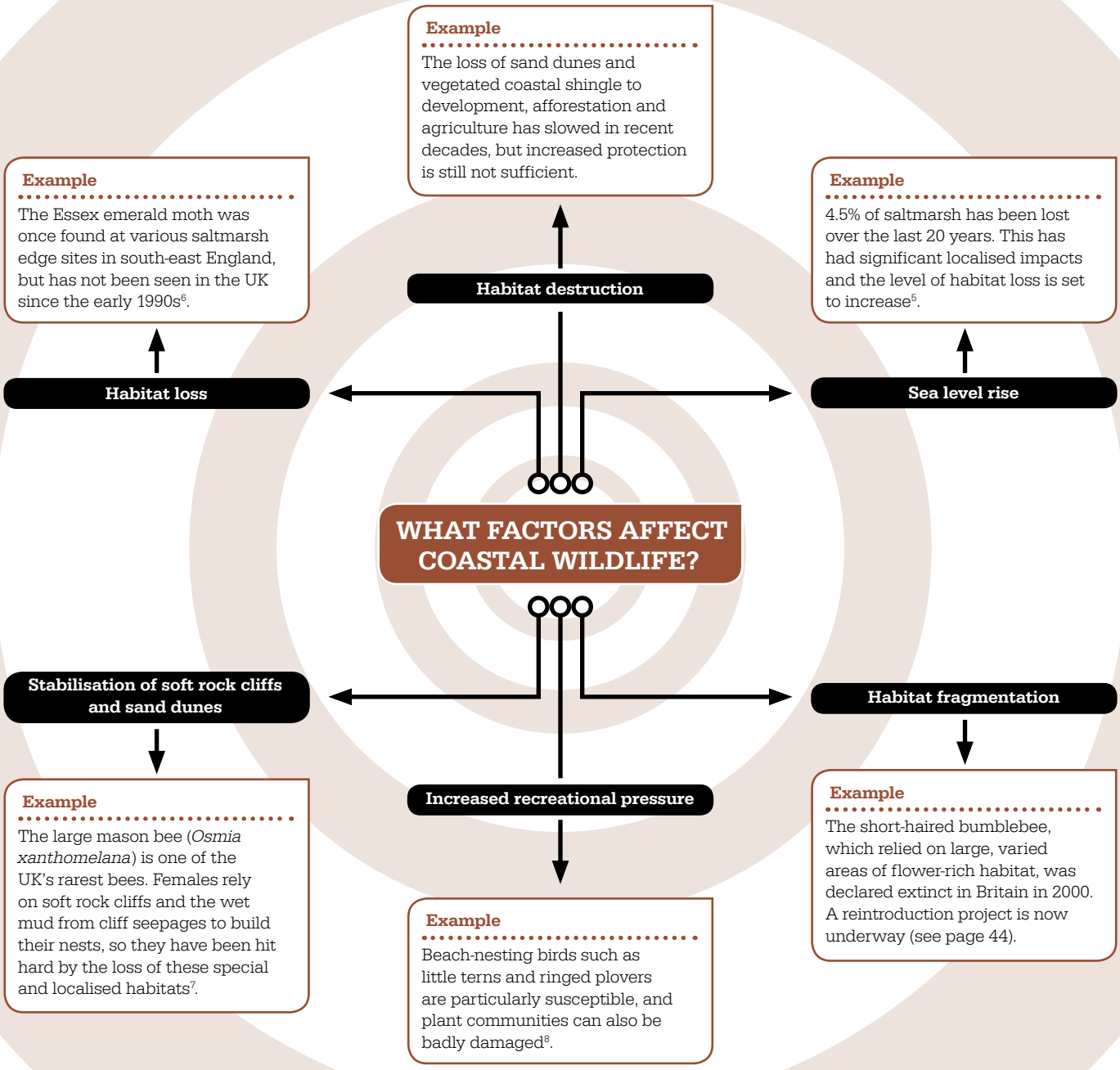
The widespread loss of coastal habitats through development, the creation of coastal defences and changing land use has had a huge impact on wildlife.

Since coastal habitats cover just 0.6% of the UK's land area[5], the development or loss of relatively small areas of habitat can have a disproportionately large impact on coastal wildlife.

Our southern coastline and other areas with high human populations or industrial activity have fared particularly badly. Even coastline that has been spared development has often deteriorated for other reasons, such as succession and scrub encroachment.

Sand dunes, as well as beaches, cliff top grassland and sea walls, are heavily used for recreation and suffer from trampling, disturbance, dog fouling and fly-tipping.

However, people have also had a positive impact on coastal habitats. Some past activities, such as salt production and even military activities have actually diversified coastal conditions, resulting in interesting plant and animal communities, with many rarities.



Case study

Natterjack toads

The natterjack toad is one of our rarest amphibians, found at just 60 sites across Britain. 90% of these are in coastal sand dunes and grazing marshes that provide suitable habitat for breeding and foraging[9]. However, the status of these sites is chequered: some are in a good state, but at others a lack of management or the loss of natural processes has led to a steady decline in natterjacks. Many sites are now dominated by tall, dense vegetation that is unsuitable for natterjacks and shifts the conditions in favour of competitors and predators. Targeted agri-environment funding has helped to maintain some sites, in particular through appropriate grazing regimes, and such positive conservation action gives hope for the future.

Chris Dresh (ARC)

Natterjack toad

Saving coastal wildlife

Andy Hay

Old sea wall at Nigg Bay, Highland

Despite all the threats to the British coastline, there are many encouraging examples of sensitive management, habitat creation and enhancement, especially within National Parks and AONBs. Many important and iconic coastal sites are managed by conservation organisations and are very popular tourist attractions, including Kenfig in Bridgend, Bempton Cliffs in Yorkshire, Studland in Dorset and Rye Harbour in East Sussex. At these sites, and others like them, it is important to balance the needs of visitors with those of the wildlife that lives there.

Numerous coastal habitat creation and enhancement schemes are currently underway, or in the pipeline, including partnership projects at Medmerry in West Sussex, Freiston Shore in Lincolnshire, Wallasea Island in Essex and Nigg Bay in Highland. Carried out carefully, these schemes will create coastal sites that can support many rare and threatened species. The need for landscape-scale coastal management is increasingly apparent and driving a more co-ordinated approach to what happens on the coast and adjoining farmland and river valleys.

Case study

Reintroduction of the short-haired bumblebee

Once widespread across the south of England, the short-haired bumblebee was last seen in the UK at Lydd, near Dungeness in 1988. By 2000, it had been declared extinct in the UK. But in 2012, 89 queen bees were taken from Sweden, under licence, as part of an ambitious reintroduction project. Following quarantine, 51 of the bees were released into flower-rich meadows at the RSPB's Dungeness nature reserve and it is hoped that they will flourish thanks to ongoing habitat management. More bees will be released here for at least three or four years to help build up a viable population.

Jesper Mattias

Short-haired bumblebees before release

Genevieve Leaper

Sea thrift on a cliff top

Sea cliffs and cliff tops can support vulnerable communities of plants and invertebrates.

Ernie Janes

Freshwater and wetlands

"Water is the driving force of all nature."

Leonardo da Vinci

Freshwater and wetland habitats – our ponds, lakes, rivers, streams, ditches, canals, reservoirs, reedbeds, fens and marshes – occupy just 3% of the UK's land surface[1], but support around 10% of our species. These include characteristic wildlife such as great crested newts, otters, Atlantic salmon and fairy shrimp, as well as pollution-sensitive stoneworts, bladderworts, dippers, kingfishers and several thousand invertebrate species. Although freshwater habitats receive more protection now than ever before, many are still in a poor condition and the wildlife that lives in them must cope with a barrage of threats, from pollution and water extraction, to invasive non-native species and climate change[2].

As well as being home to a wealth of wildlife, the UK's freshwater habitats regulate flooding, disperse pollutants, provide water for our domestic, industrial and agricultural activities, and have immense recreational and cultural value. Some are also internationally important; many of Western Europe's lowland valley mires are found in the New Forest, for example[3].

Our freshwaters are the most intensively monitored parts of the natural environment, although monitoring focuses mainly on water quality and flow at a network of river sites and a few large lakes. The monitoring of smaller water bodies is patchy, even though these habitats make up most of the water network and provide homes for the majority of species. Birds are well studied, but reliable information on the status of other wildlife is limited to a few species, such as the otter, and the commoner invertebrates and plants of headwater streams. We lack reliable trends for most conservation priority species in freshwater, such as the great crested newt, but efforts are underway to rectify this problem.

New Zealand pygmyweed invading a New Forest pond

- ***57% of freshwater and wetland species for which we have sufficient data have declined, and 29% have declined strongly.***
- ***Many characteristic freshwater species have declined significantly over the last 50 years, including the Atlantic salmon[4], water vole[5] and frogbit.***
- ***One in ten species of the freshwater and wetland plants assessed are on recent national Red Lists. Some species, such as the freshwater pearl mussel, are threatened with global extinction[6,7].***
- ***Birds such as the bittern[8] have benefited from habitat creation and restoration work. Thanks to local reintroduction schemes and action to reduce river pollution, otters have made a comeback[9].***

The state of freshwater and wetland nature

Overall, slightly more freshwater species have declined than increased over recent decades. Some river birds, such as dippers and kingfishers, show declines, but 74% of freshwater and wetland birds are increasing. These include widespread species such as the mallard, recent colonists such as little egrets, and species such as ospreys which are recovering from earlier declines, thanks to conservation efforts.

An indicator based on trends in 26 freshwater and wetland birds (see Figure 19) is used as a measure of freshwater biodiversity[10]. There are marked differences in the trends of birds in different habitats, although some are based on only a few species.

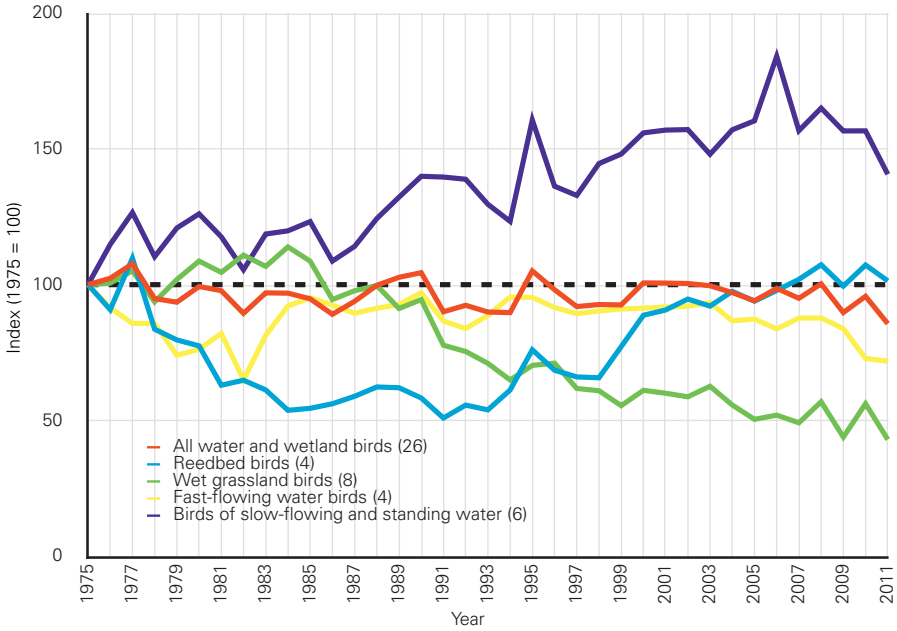
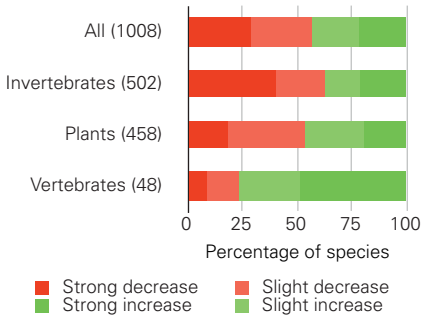


Figure 19
The UK indicator for freshwater and wetland birds[10]. Data from the RSPB, BTO, JNCC and Defra. The numbers in brackets refer to the number of species in each group.

Figure 17
The proportion of freshwater and wetland species that are increasing or decreasing in each taxonomic group, measured by either population size or range over a period of up to 50 years. The values in brackets represent the number of species assessed.



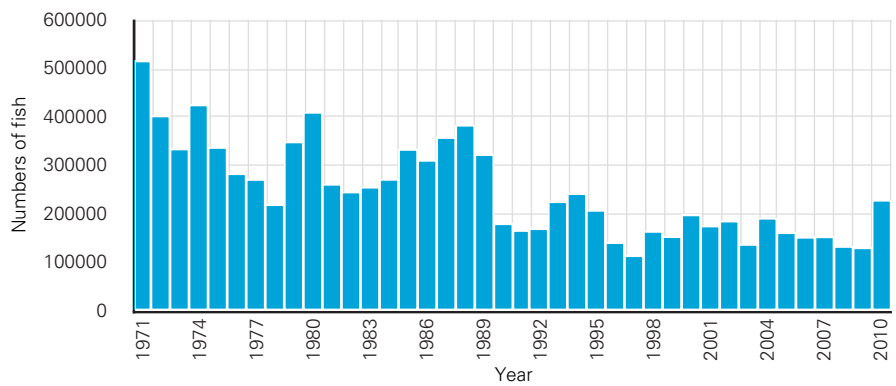
The wetland plants included in this report were split almost equally between those declining (54%) and increasing (46%) in range (see Figure 17), although aquatic plants may be faring worse. Many declining species, such as frogbit, are associated with small pools on farmland, which are prone to eutrophication and in-filling.

A recent assessment of our native fish suggested that 40% were declining, with nearly all of those increasing (40%) doing so at least partly due to stocking – the process of releasing fish, often captive-reared, into water courses[11]. Losses of European eel have been so great that it is considered Critically Endangered globally[7,12], and although Atlantic salmon have returned to some rivers (including the Tyne and Mersey, but not the Thames), they remain at an all-time low (see Figure 18)[4].

Many freshwater invertebrates are also struggling: 64% of wetland moths have declined in the last 40 years, and 44% have declined strongly.

Of the 849 freshwater and wetland plant species assessed in recent national Red Lists, 86 are threatened with extinction in the UK. Some groups uniquely associated with wetland habitats, such as stoneworts, dragonflies and water beetles have also been assessed recently. Stoneworts are a unique group of algae with hard mineral walls around their cells, which can be up to 20cm long – the largest cells known to science. Sadly, almost 40% of UK stonewort species are considered threatened[13].

Figure 18
The estimated pre-fishery abundance of Atlantic salmon in England and Wales[4,14]. Data from ICES.

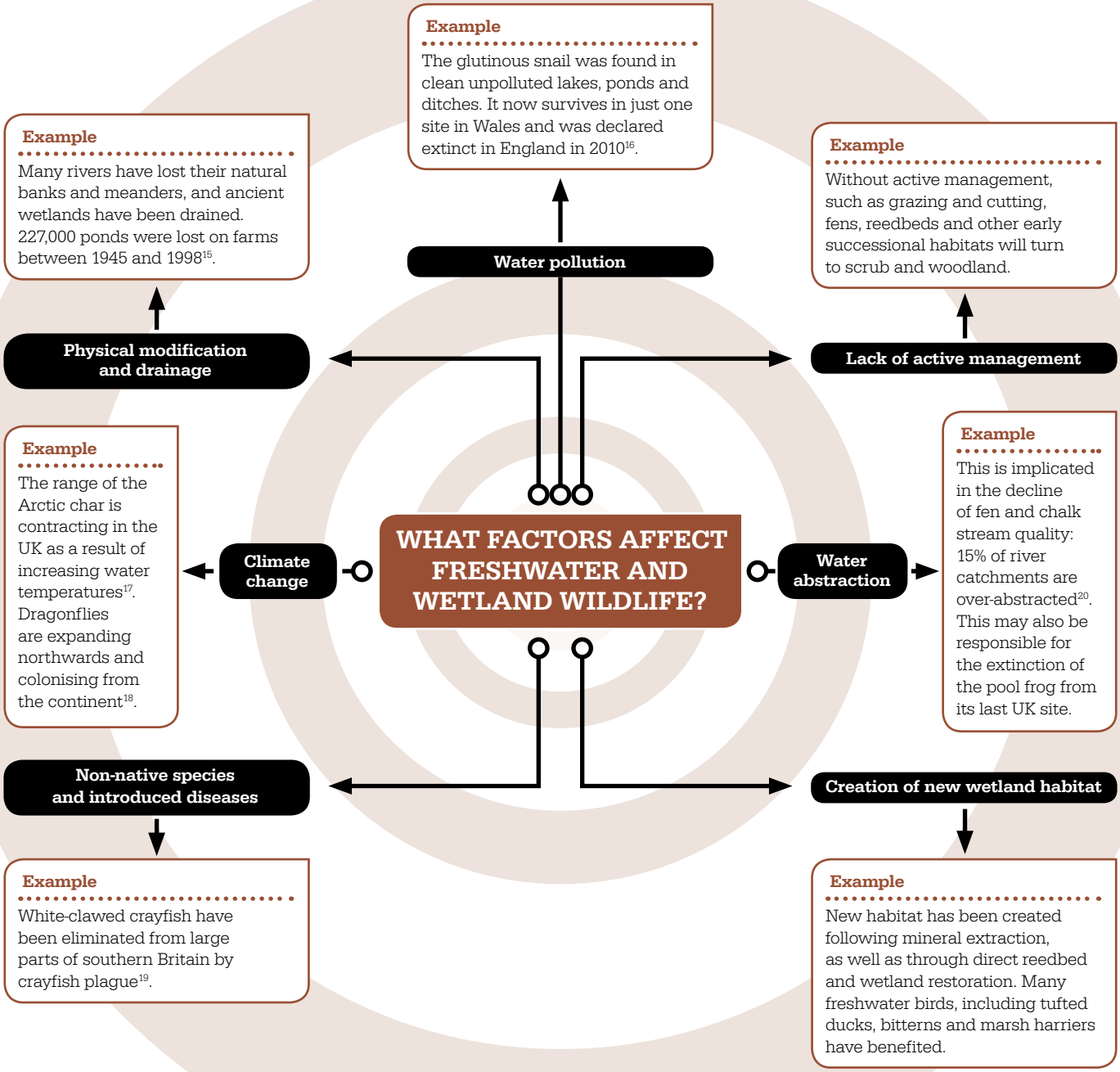


Why is freshwater and wetland wildlife changing?

It could be argued that freshwaters are affected by more threats than any other part of the natural environment. The few exceptions tend to be in well-protected catchments, such as more remote upland areas or small, non-intensively managed catchments that are isolated from the influences of farming and urban areas.

The main causes of change in freshwater habitats are summarised below. Substantial efforts to control these impacts have been in progress for around 100 years, but mitigation has often proved difficult and in some cases has shown little benefit. Problems such as diffuse nutrient pollution from farmland run-off are particularly difficult to tackle. Many freshwaters face more than one problem, and this probably underlies the loss of most wildlife.

In addition, habitat fragmentation caused by the absence of clean water from large parts of the landscape makes many scarcer species very vulnerable to extinction locally or nationally.



Case study

Underwater treasure

NHPA/Photoshot

Freshwater pearl mussels

The freshwater pearl mussel, one of the most threatened molluscs in the world, is a fascinating species that can grow to 15cm long and live for more than 100 years.

It has suffered huge declines in England and Wales in the last 40–50 years, but Scotland retains globally important numbers, with perhaps half of the world's viable populations[6]. But even there, declines continue: between 1970 and 1998, it is thought this species was lost from two rivers every year.

There are many reasons for the decline, including sedimentation, pollution by nutrients, heavy metals and pesticides, water abstraction, river engineering and competition from non-native species such as the American signal crayfish. The decline in salmon, which act as larval hosts, has also affected these mussels.

In addition, freshwater pearl mussels are collected illegally, although much work is underway to combat what is perhaps the greatest problem for this threatened species.

Saving freshwater wildlife

Freshwater habitats receive some of the most intensive and expensive conservation measures to control pollution, manage habitats and respond to threats. There are many well-documented examples of badly damaged rivers being improved as a result of sewage treatment, although many river systems remain damaged. Following a decline in acid rain, we have seen the first signs of recovery in freshwater habitats[21], but there is still a long way to go.

Agri-environment schemes include many measures to protect freshwater habitats. However, evidence of their effectiveness is currently limited. Early evidence does suggest that better control of the problems associated with livestock farming, such as slurry pollution, is helping habitats to recover.

Creation of new ponds and wetland habitat for freshwater wildlife such as bitterns, great crested newts and nutrient-sensitive water plants seems to be particularly successful.

Compared to many other habitats, functioning and wildlife-rich wetlands can be restored or created in a relatively short time. For instance, at Loch Leven, long-term nutrient management has allowed the number and diversity of aquatic plants to increase, providing better habitat for fish and birds[22].

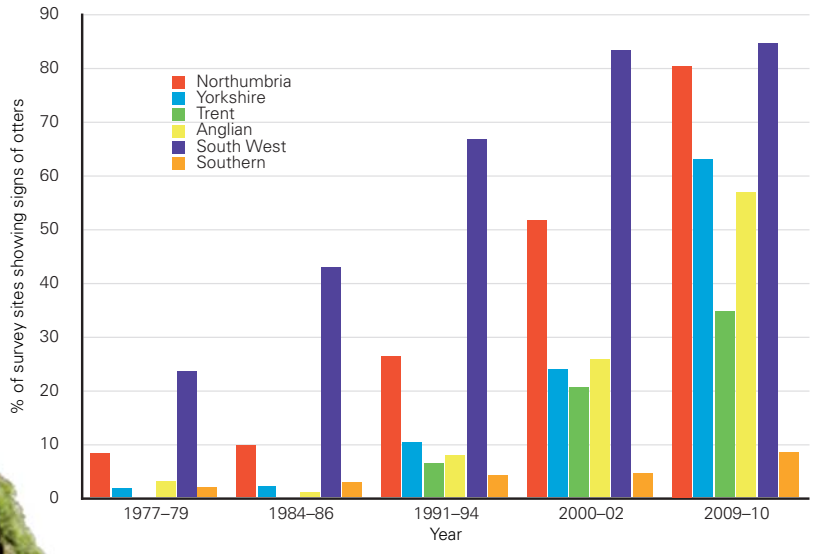
Freshwater habitats are often isolated and so are vulnerable to the impacts of invasive non-native species. Establishing early warning and rapid response systems to deal with newly-established introduced species is critical to protect these habitats in the future.

Case study

Otters bouncing back

Otters are a true conservation success story. Once widespread across the UK, they suffered a dramatic decline during the 1950s and 1960s, in part due to pesticide pollution. Following concerted conservation effort, including the withdrawal of damaging chemicals, sympathetic habitat management and local introductions, otters have bounced back and reclaimed most of their former range[9] – to date the only freshwater species to do so. In 2011, otters were discovered on the Medway and Eden rivers in Kent, a milestone which marked their return to every county in the UK[23].

Figure 20
Otters have increased substantially in England over the last 30 years – one of the few examples of a freshwater or wetland species to reclaim its range. Data from EA.



Kingfisher

Jeroen Stel

Common frog

Mark Sisson

Freshwater wildlife must cope with a barrage of threats, from pollution to invasive species and climate change.

Paul Hobson (FLPA)

Urban

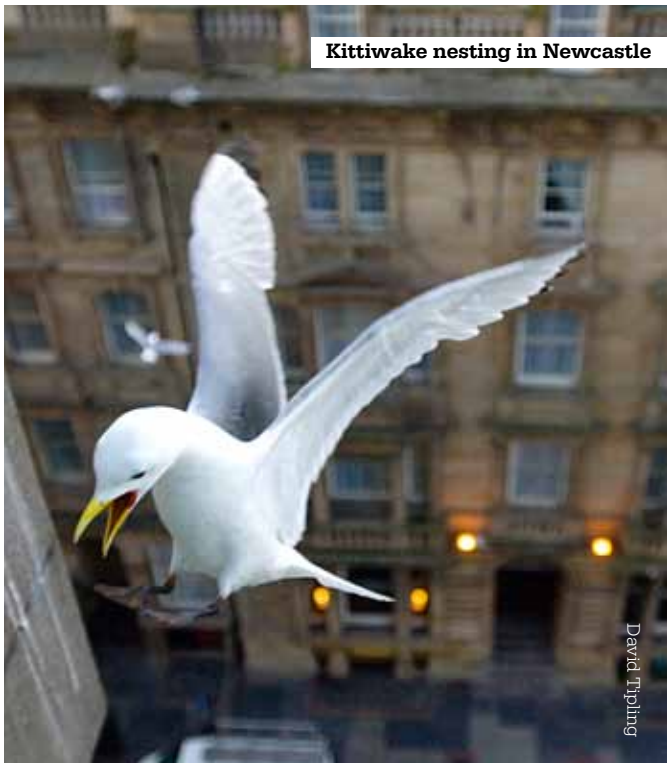
"... it came to me that Hyde Park... has always been, in spirit, a stretch of the countryside; and that it links Londons of all periods together most magically by remaining forever unchanged at the heart of the ever-changing town."

Dodie Smith, from *I Capture the Castle*

There are many different ways to define "urban areas", but a sensible definition suggests that about 9.5% of the UK is urbanised – a figure which ranges from 3% in Scotland and Northern Ireland, to nearly 15% in England[1]. Urban areas contain about 80% of the human population[2], with densities varying widely both within and between urban areas. Obviously, urban areas contain buildings, roads and other elements of the built environment, but also – crucially for wildlife – open spaces such as parks, woodlands, playing fields, gardens and allotments. Within this section we also consider brownfield land that has been previously developed and then abandoned, and the rich wildlife it can support.

The built elements of urban landscapes provide little in the way of habitat for wildlife, but some species, such as the house sparrow, swift and several bats, rely on buildings for nesting and roosting sites. Some of these bats are rare or threatened, including greater and lesser horseshoe bats and grey long-eared bats. It is the space around buildings that provides opportunities for most species, and the extent and management of that space makes the difference between sterile, lifeless cities and those with wildlife that can enrich people's lives.

Our gardens are obvious spaces for nature, but allotments, cemeteries, playing fields and parks, derelict pockets of land and even old stone walls are equally important and can support rich communities of wildlife. Belfast's parks are home to red squirrels, kittiwakes nest in Newcastle and otters swim through Edinburgh. The UK's urban areas have the potential to hold a wealth of wildlife, if we give nature a chance.



Kittiwake nesting in Newcastle

However, an obvious pressure on urban wildlife is the need to house an expanding human population[3]. Following the Second World War there was a trend towards suburbanisation, with sprawling cities and new towns. In the 1980s, attention focused on developing brownfield sites and open spaces within urban areas, squeezing our urban wildlife even further.

- ***Urban wildlife plays a crucial role in enriching people's lives: without it, many people would have no access to nature and all the benefits it brings.***
- ***The UK's increasing human population means more pressure on urban green spaces, and less room for wildlife.***
- ***Of the 658 urban species for which we have data, 59% have declined and 35% have declined strongly. Invertebrates are doing particularly poorly in urban environments with 42% (183) showing strong declines.***
- ***Despite the fact that brownfield sites provide important refuges for a diverse range of wildlife, including many rare and threatened invertebrates, they are often viewed as ripe for development and receive little protection.***

Case study

Pollution in urban environments

Lichens are sensitive barometers of air quality: their presence or absence indicates levels of atmospheric pollutants such as sulphur dioxide and nitrogen oxides. In 1970, at the height of industrial sulphur dioxide pollution, only nine species of lichen could be found within a 16km radius of Charing Cross in central London. Remarkably, a 2004 study[4] found 72 species of lichen on oak trees in London parks, a striking resurgence in response to decreased sulphur dioxide emissions.

The state of urban nature

Relatively few species are urban specialists. Most are generalists that can be found in greater numbers in other habitats such as woodland or farmland. However, a few species are genuinely associated with humans, and urban areas provide substitutes for the habitats they would have used before modern cities developed. These include the house fly, several house spiders, and clothes moths. In other cases, wildlife occupy the remaining fragments of natural sites that have been swallowed up by cities.

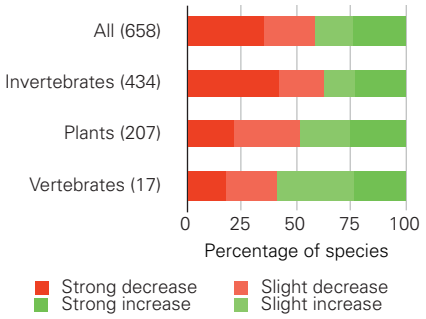


Figure 22
The proportion of urban species that are increasing or decreasing in each taxonomic group, measured by either population size or range over a period of up to 50 years. The values in brackets represent the number of species assessed.

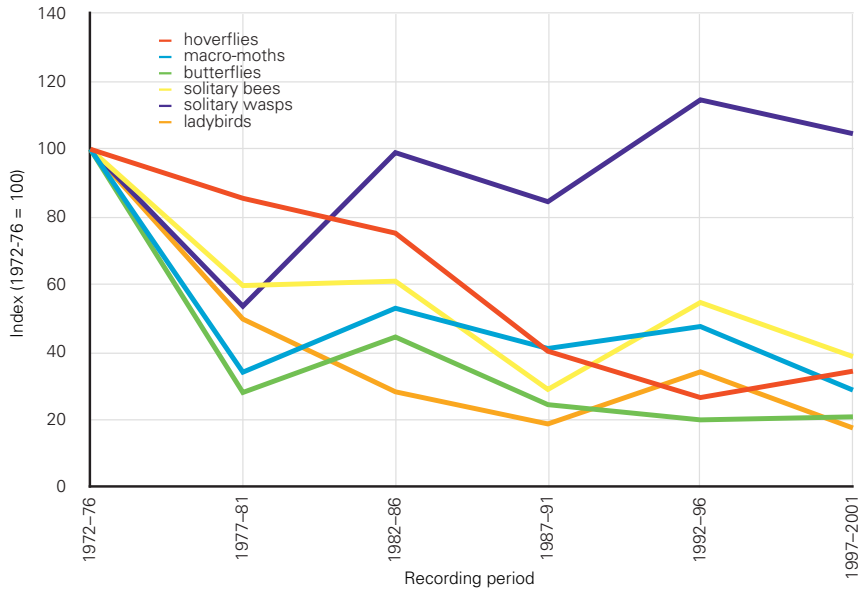
The UK's urban areas have the potential to hold a wealth of wildlife, if we give nature a chance.

Case study

Wildlife on our doorsteps

During Jennifer Owen's remarkable and comprehensive 30-year study of the wildlife in her garden, she found more than 2,600 species, with many more unidentified[5]. Although we cannot generalise from this one site, her study demonstrates the sheer wealth of wildlife that can exist on our doorsteps. Worryingly, Dr Owen recorded substantial declines in five of the six invertebrate groups she recorded throughout the 30-year study. She put this down to habitat loss within the local landscape.

Figure 21
Trends in invertebrate groups monitored for 30 years in Jennifer Owen's Leicester garden. Data from Dr J Owen and RHS[5].



For some species, urban areas are becoming more important due to the loss of suitable habitat elsewhere – garden ponds may be refuges for amphibians such as common frogs, toads and newts, for example.

Four of the six truly urban birds have declined, and two – the house sparrow and swift – have declined dramatically. Numbers of house sparrows have plummeted by more than two-thirds since the 1970s.

However, urban flowering plants are bucking the trend: more species have increased their distribution in recent decades than have declined, presumably because the amount of suitable substrate has increased with the expansion of urban areas and the transport network. The number of native plant species associated with urban areas is, however, much lower than in other habitats – the exception being former farmland wildflowers, such as cornflower and corn cockle, which are now found only in urban areas as a result of amenity sowing.

Relatively few urban species have been included in national Red List assessments: only four species (4%) of urban flowering plant and 19 species (5%) of urban moss and liverwort have been classed as Threatened.

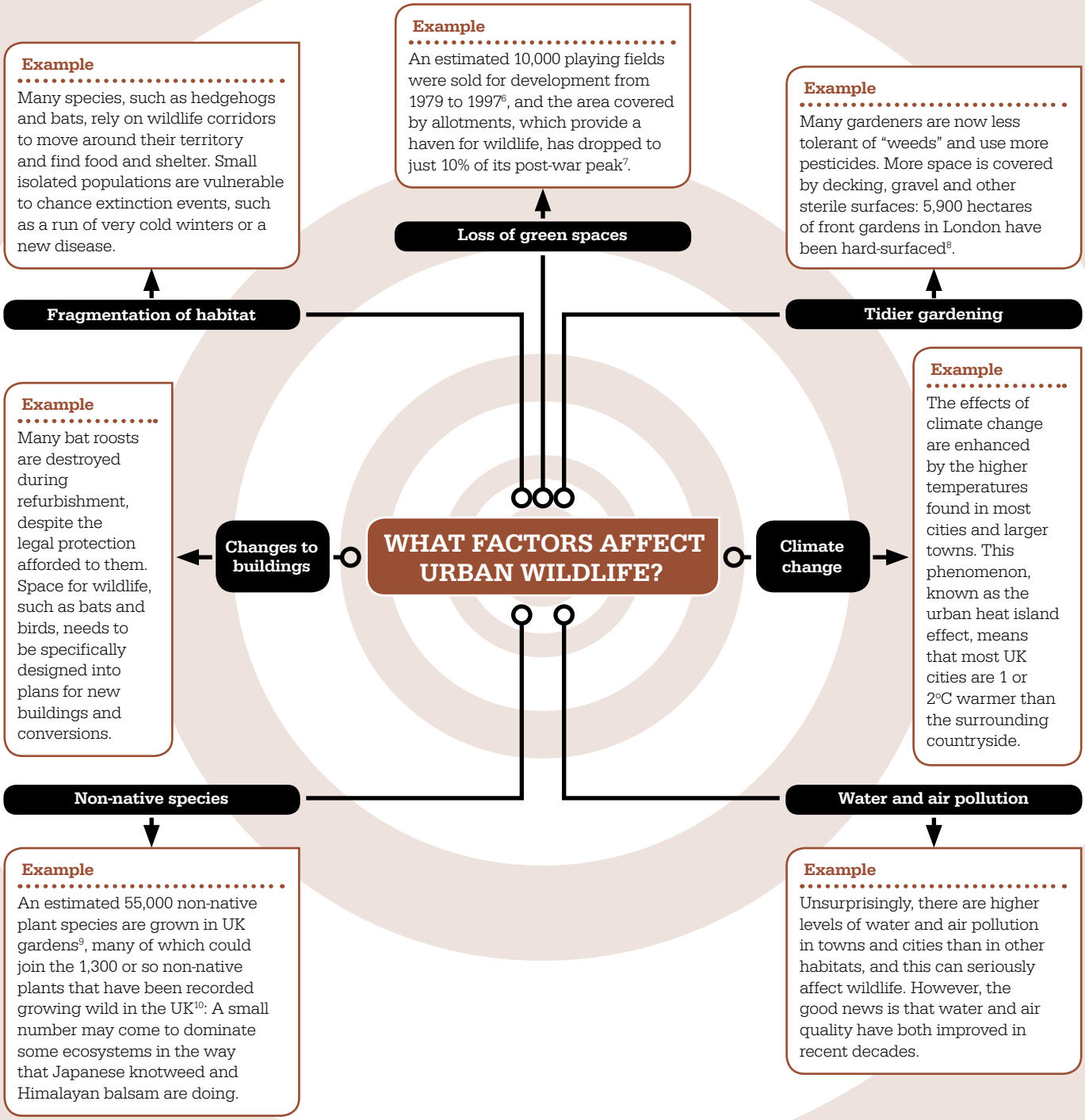
Why is urban wildlife changing?

As the human population has increased, the amount of green space in urban areas has declined, along with the wildlife that relies on it.

Loss of even low-value habitat can have a huge impact on wildlife, as it often acts to connect larger patches of important habitat. Without these connections, even good quality green space can fail to support healthy populations of many species such as hedgehogs, bats and slow-worms.

Urban wildlife often finds refuge in small and vulnerable habitats. For example, old walls can support important plant communities and colonies of bees and wasps, such as the hairy-footed flower-bee, wool carder-bee and red mason-bee, but they are vulnerable to demolition or unsympathetic restoration.

Changes in the way humans live – our housing designs, building standards and gardening fashions – can have unintended but sometimes sweeping impacts on the nature around us, and the needs of wildlife are often low down on the list of urban priorities.



Case study

Living roofs

With increasing development in cities, space for nature is under pressure. One solution is to create living roofs. These consist of a waterproof membrane topped with a growing medium. Vegetation is then either planted or allowed to colonise naturally, producing patches of open habitat.

Not only can living roofs help a range of wildlife[13], they also have benefits for ecosystem services such as water management, energy efficiency and pollution control. An estimated 26,000 hectares of green roofs could be created in London, an area equivalent to 28 times the size of Richmond Park[14].

Case study

Urban treasure

Peregrine falcon

Peter Cairns

Some unexpected species can flourish in urban habitats. Peregrines now breed in every UK county, using building ledges as nest sites in many cities. This offers people an unprecedented opportunity to see one of our most impressive predators.

The value of urban nature

David Tipling

Children playing amongst bluebells

Contact with nature has many proven physical and mental benefits. Since more that 80% of the UK's population live in urban areas, it is essential that people living there are provided with sufficient opportunities to experience nature – it may be the only chance they get. One estimate suggests that access to quality green space would save the NHS £2.1 billion pounds annually, because of the health benefits it provides[11].

It is clear that people need nature, but the reverse is also true – we need to inspire the next generation of conservationists to tackle the ongoing problems faced by wildlife. The only way to do this is to help people experience, explore and understand the natural world, because people won't protect what they don't know and love.

Worryingly, today's children have less contact with nature than ever before. The loss of urban green spaces, coupled with cultural changes and the rise of technology, means that many children rarely play outside. As a result, they are better at identifying Pokémon characters than common wildlife[12].

Even the most unlikely urban green spaces can provide encounters with fascinating wildlife, such as the striking lime hawkmoth caterpillar. Bearing a blue horn, it can be found wandering urban pavements in search of a suitable place to hide and pupate, eventually emerging as a beautifully-patterned moth. It is chance encounters with such creatures that can spark a lifetime's enthusiasm for nature.

Some rarities can survive in the most unlikely places. For example, one of the few remaining sites where the field wormwood can be found is on an industrial estate in Brandon, Norfolk. A few miles away, three rare speedwells grow side-by-side on a garden bank. Isleworth Ait, an island nature reserve in the Thames, managed by London Wildlife Trust, supports populations of the two-lipped door snail and the German hairy snail, both amongst our rarest molluscs.

The renovation or demolition of older buildings reduces roosting opportunities for many bat species that rely on buildings as roosts, such as this rare grey long-eared bat.

Hugh Clark (BCT)

Grey long-eared bat

Robert Brook (Alamy)

Brownfield

Derelict, disused and unloved, many brownfield sites are viewed as ripe for development, but these abandoned areas often provide a much-needed refuge for important wildlife. Great crested newts, slow worms, common lizards and black redstarts all make their home in the mosaic of different habitats found there.

Around 15% of nationally rare and scarce invertebrates have been found on brownfield sites, including 50% of rare solitary bees and wasps, and 35% of rare carabid beetles[15], and some are found nowhere else in the UK[16]. Brownfield sites can also support a range of important flowering plants, mosses and lichens – often including species that are declining in the wider countryside, such as the exquisite bee orchid.

Studies in the Midlands suggest that the best brownfield sites even match ancient woodlands in terms of the number of species, especially rare ones, found there[17,18,19].

The value of brownfield sites

Brownfield sites tend to have nutrient-poor soil, which prevents dominating plant species from taking hold. As a result, nectar-rich flowers flourish, providing hoverflies, bees and butterflies with nectar and pollen. Patches of open ground heat up in the sun, providing perfect basking conditions for reptiles, while burrowing and ground-nesting invertebrates make the most of the bare soil. The diverse mosaic of different habitats, all found within a relatively small area of brownfield land, are essential for many invertebrates as they have different habitat requirements at different life stages.

Case study:

A powerhouse for nature

Will George (RSPB)

Brown-banded carder bee

An old power station might not be the first thing that springs to mind when you think of places to see rare wildlife, but it has been suggested that West Thurrock Marsh in Essex is one of the most important sites for biodiversity in the UK, with over 1,400 species recorded so far, including many rare species[17,18,19]. Unfortunately, its many invertebrates, such as the brown-banded carder bee and distinguished jumping spider, are threatened by the partial development of the site.

Case study:

Back from the brink

Small ranunculus moth

Neil Bowman (FLPA)

Brownfield habitat has been extremely important for the spread of some formerly rare species, such as the small ranunculus moth. This species had disappeared from Britain by the early 20th century, but has now recolonised an area of North Kent and spread as far north as Yorkshire.

As the countryside becomes steadily more degraded for wildlife, due to agricultural improvement and development, brownfield sites are becoming increasingly important. They provide refuges for wildlife, and link areas of more traditional habitat. However, although individual brownfield sites can support an incredible diversity of plants and animals, key populations at small, isolated sites can be vulnerable to extinction – that's why the overall network of brownfield areas, which allow wildlife to move around the landscape, is so important.

Saving brownfield nature

Although greenfield land can be less valuable for wildlife, it is often passed over for development in favour of brownfield sites. Since 2008, around 50% of high wildlife value brownfield land in the Thames Gateway has been lost[20].

Brownfields lack statutory protection; there are only two SSSIs designated for their brownfield invertebrates in the UK. Although organisations such as Buglife and the Wildlife Trusts have carried out research and campaigned to protect biodiversity-rich brownfield sites, we still have a long way to go.

The best brownfield sites match ancient woodlands in terms of the number of species, especially rare ones, that are found there.

Graham Eaton

Marine

"To stand at the edge of the sea, to sense the ebb and flow of the tides...is to have knowledge of things that are as nearly eternal as any earthly life can be."

Rachel Carson, from *The Edge of The Sea*

The UK is truly a maritime nation, defined by and dependent on the relationship with its ever-changing seas and coasts. The UK's marine area (excluding the UKOTs) extends to more than 850,000 sq km – that's over three times the area covered by land[1]. Our marine habitats contain a variety of species of international importance, including 26 species of breeding seabirds, at least 60 wintering waterbird species, 13 regularly occurring species of marine mammal and even the leatherback turtle.

There are also the little-known benthic habitats on the sea bed, each supporting fascinating communities of wildlife. Most people are unaware that the UK's seas have coral reefs, yet slow-growing *Lophelia* coral grows in deep water off the Scottish coast. Another surprise may be that two species of seahorse can be found in seagrass and seaweed beds in shallow offshore waters – the spiny seahorse is found as far north as Shetland.

We rely on the seas around the UK for transport, food, recreation and, increasingly, for the generation of energy. All of these activities put pressure on the marine environment, pressure that is added to the increasing impact of climate change and the consequences of land-based activities, such as pollution. However, despite its importance for wildlife, our knowledge of the state of our seas is poor – a consequence of the difficulties of studying life below the waves. This lack of knowledge hampers our ability to assess the impact of man's activities.

Trawler off Jura, Argyll

Genevieve Leaper

- ***UK seabirds have had mixed fortunes since 2000, with some species showing sharp declines. Harbour seals have also declined significantly, especially in Scotland.***
- ***The state of UK fish stocks has improved recently, but overall, 75% of EU fish stocks continue to be overfished. Skates and rays are no longer viable commercial species in many areas.***
- ***There is increasing evidence that climate change is affecting the breeding success of UK seabirds, particularly in Scotland.***
- ***Coastal water quality at a national level greatly improved in the late 20th century, due to urban waste-water treatment. However, agricultural run-off remains an issue in some areas.***

The state of marine nature

Here we provide a brief overview of how marine species are doing, but for a more comprehensive analysis, please refer to the UK-wide marine assessment *Charting Progress 2*. Similar assessments are available for Scotland, Northern Ireland and the Isle of Man.

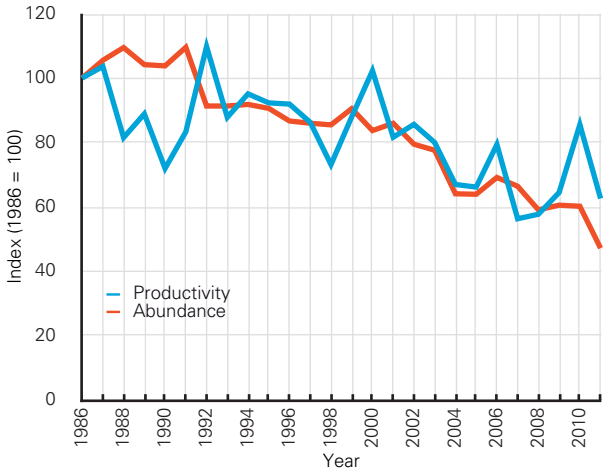
We lack the necessary evidence on abundance to develop long-term trends for many marine species. For example, for most regions we do not know trends for our 11 regularly occurring species of cetacean, although we do know in some cases that declines have occurred. However, all recent assessments paint a mixed picture of nature under varying, but often severe, pressure from human activities.

Since 1996, harbour seals have declined by 31% in Scottish waters, particularly around Orkney (which showed a 66% decline) and northern Scotland, due to a combination of factors including pollution, disease, prey availability and competition with grey seals[2]. From the 1950s to the 1990s, grey seal pup production increased consistently, but it is no longer increasing in some regions[1].

As the threat from human hunting progressively reduced, and seabirds began to exploit fisheries discards, the number of seabirds breeding in the UK increased from around 4.5 million in the late 1960s to 7 million by the end of the 1990s. However, this figure masks considerable variation between species. Roseate terns, herring gulls and Arctic skuas have all declined by more than half within the last 40 years. In 2004, 2005 and 2007, the breeding success of 21 seabird species was at its lowest level since the mid 1980s (see Figure 23).

Seabirds nesting in Scotland have fared particularly badly, with sharp declines for species such as the Arctic skua. The kittiwake has declined substantially (by 41% since 2000), whereas populations of other widespread species, such as the guillemot and razorbill, appear to have remained relatively stable. Evidence suggests that for many species, including the kittiwake, declines are caused by changes in sandeel availability, at least in part due to factors related to climate change.

Figure 23
Breeding seabird indicator for Scotland[3]. While Scotland-specific indicators show clear declines, the overall UK seabird indicator shows little or no overall change since 2000[4]. Data from the RSPB, BTO, SNH and JNCC.



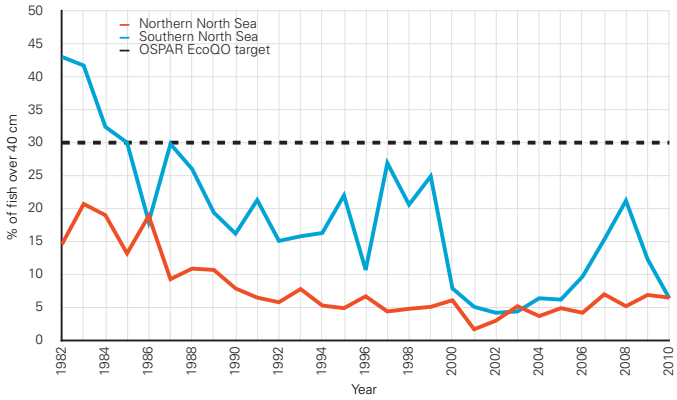


Figure 24
The proportion of large fish (more than 40 cm long), by weight in the North Sea from 1982 to 2010. The proportion of large fish in a catch is a measure of the health of the fish populations. This measure declined dramatically during the 1980s and 1990s, but has levelled off more recently and shows little or no change since 2000[5]. Data from Marine Scotland and CEFAS.

There is evidence that sub-tidal marine sediment habitats have been damaged over large areas by fishing activity, in particular by bottom-trawl and scallop dredge gear. Such activities can have huge impacts on bottom-dwellers such as the ocean quahog, a remarkable bivalve mollusc that can live for 500 years. At a more local scale, these activities also damage sensitive features, such as maerl beds and seagrass, that shelter a range of wildlife.

Finally, sharks, skates and rays face continuing declines and are severely depleted all around the Scottish coast, in part due to overfishing[2]. Elsewhere, most commercial fish stocks around the UK remain depleted (see Figure 24), though there have been improvements in stocks of certain species in the last 5–10 years[6]. Historically, however, national and international fish landings are a fraction of the highs in the 1960s and 1970s, and generally smaller than in the early 20th century. The problems of overfishing and discards are being discussed as part of the reform of the EU Common Fisheries Policy.

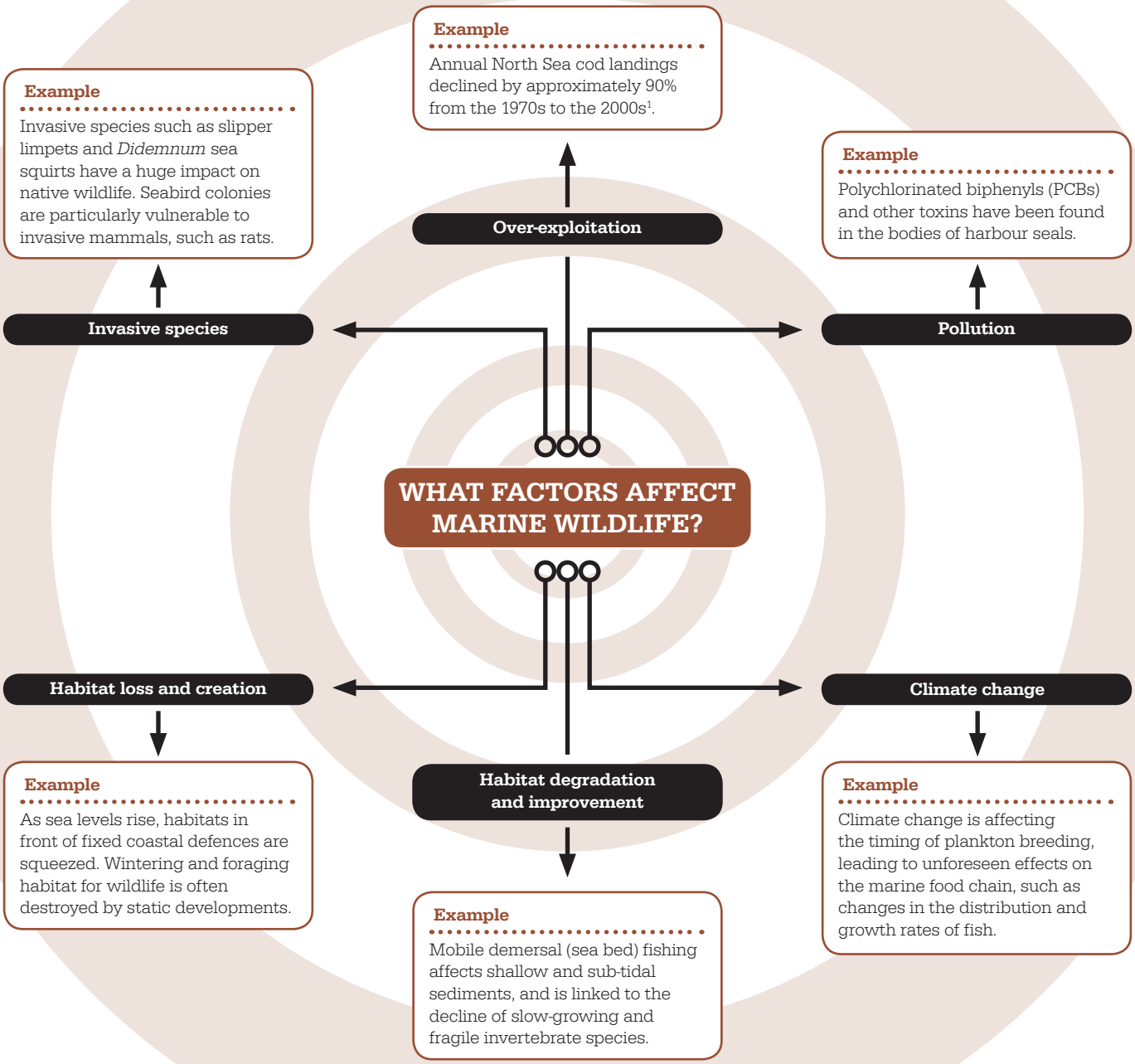
The continuous plankton recorder has been monitoring plankton in UK waters since 1931[7]. These small plants and animals form the base of our marine food webs and play a pivotal role in the ecosystem by regulating larval fish stocks. Since 1950, there have been substantial changes to the main animal group within the plankton – copepods. The total abundance of copepods has declined markedly, and the species present are changing as the sea warms. Already, these changes are negatively affecting fish species, such as cod, as well as seabirds.

Why is marine wildlife changing?

Changes in the temperature, circulation and salinity of oceans have a huge impact on the function and structure of marine ecosystems, and the habitats and species within them. For example, sea-surface temperatures around the UK have increased in the last 25 years, resulting in changes to the distribution and abundance of plankton and fish stocks. These changes have had serious knock-on effects on the breeding success of seabirds, to the extent that some, like the Arctic skua, could even be lost as UK breeding species within the next 25 years.

At a smaller scale, there are almost no areas of pristine marine biodiversity left around the UK, as a result of increasingly intensive human pressures. Not only are fewer fish caught today compared with 20th century baselines, but they are also significantly smaller and they mature at a younger age. This is because the relative abundance of small and early maturing species increases as a result of overfishing.

Plastic pollution is a persistent problem in all areas. There have been significant recent improvements in water quality, however, due to the treatment of land-based discharges and international laws on marine pollution from ships.



Razorbill

Steve Knell

Saving marine wildlife

Positive management of marine habitats is far more challenging than on land. As a result, much work is targeted at preventing harmful impacts from human activities, often by implementing relevant policies.

We urgently need an ecologically coherent network of Marine Protected Areas (MPAs), which will allow the marine environment room to recover. We are currently going through a historic phase in marine conservation, with the designation of national networks of MPAs around the UK, to support the protection provided by European legislation. These are long overdue.

The siting of these MPAs relies heavily on knowing where marine wildlife occurs: not an easy task given the difficulties of studying biodiversity at sea. However, recent developments in tracking individual birds using lightweight tags has provided a much more detailed picture of how seabirds use these areas, and is also redefining our knowledge of the distance some species are travelling to find food – up to three times further than previously thought, in some cases.

Most of the problems faced by marine wildlife are a result of increased human pressure.

Case study

Following seabirds at sea

FAME (Future of the Atlantic Marine Environment) is the largest seabird tracking study ever undertaken, part-funded by the EU Regional Development Fund. The study, led by the RSPB, involves seven different partners, working in five different countries. In the UK, scientists work at five sites along the Atlantic coast (Fair Isle and Orkney in Scotland; Colonsay in the Hebrides; Bardsey Island in Wales; and the Isles of Scilly) and concentrate on five seabird species: fulmar, shag, kittiwake, guillemot and razorbill.

Knowing where and why seabirds forage is crucial in designating Marine Protected Areas (MPAs) across the north-east Atlantic. This knowledge can also influence the placement of offshore developments such as wind farms, and inform research into the impact of climate change on marine food chains. Excitingly, by relating the distribution data from seabird tracking to oceanographic features, it is possible to see not only where birds are foraging, but why birds are foraging in these areas.

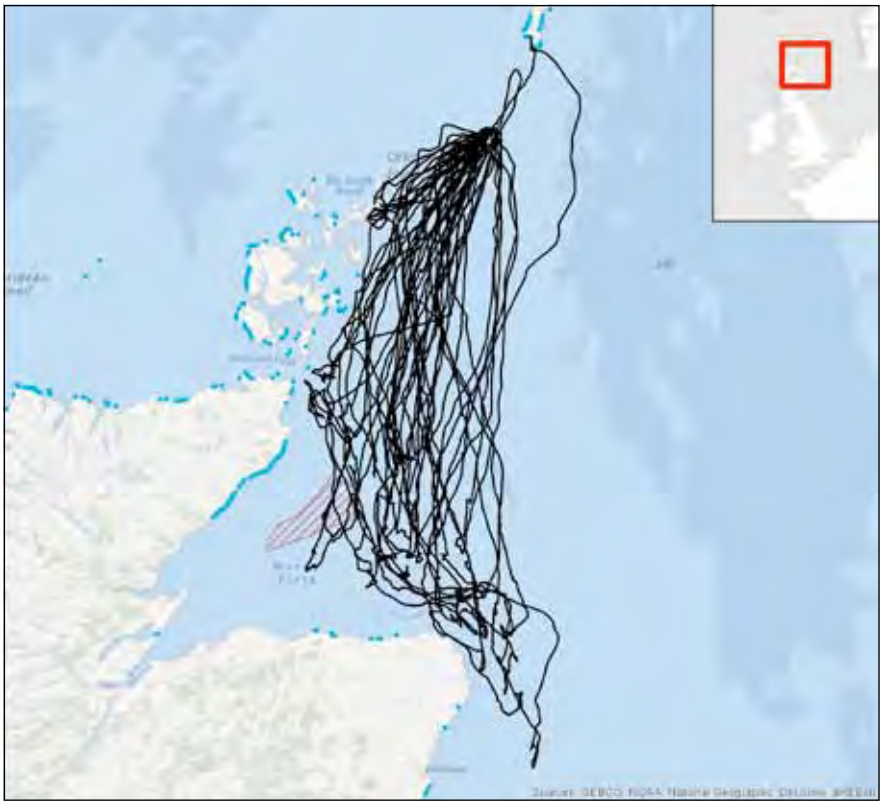


Figure 25
Map showing the movements of 23 razorbills tracked from Fair Isle in 2011. Data from the RSPB.

To find out more about the FAME project, please visit ***www.fameproject.eu***

Harbour seals have declined by nearly a third in Scottish waters, as a result of pollution, disease, competition with grey seals and a lack of food.

Guy Rogers

Harbour seal pup sleeping

Roger Tidman

UK Overseas Territories

The UK has 14 Overseas Territories (UKOTs), scattered around the world, from Europe to the Caribbean, to the South Atlantic. They include hundreds of small islands, as well as the British Antarctic Territory, which has a land area six times the size of the UK. The marine area under their jurisdiction is immense, and includes pristine coral reefs as well as the frozen seas of the Antarctic.

Our Overseas Territories are incredibly diverse socially, economically, geographically and ecologically, but they are home to a relatively small human population. For example, the Pitcairn Islands support more endemic species than their entire human population – there are 53 resident Pitcairn Islanders and more than 70 endemic species. Local communities are highly reliant on biodiversity for their livelihoods and quality of life. Fisheries and nature tourism underpin many Territories' economies, mangroves and coral reefs provide protection from hurricanes and rainforests help guarantee freshwater supplies.

Outstanding importance

The UKOTs are home to an incredible array of species, from elephant seals and penguins in the South Atlantic territories, to iguanas and parrots in the Caribbean. Their outstanding global importance for biodiversity dwarfs that of the UK itself. At least 180 endemic species of plant (including many endemic genera), 22 endemic birds, 34 endemic reptiles and amphibians[1] and 685 endemic terrestrial invertebrates have already been described in the Territories – 16 times the number in the UK. However, there are gaps in our knowledge, so many more endemic species could still lie undiscovered.

In addition to their many endemics, the Territories host significant numbers of seabirds and other fauna, including a third of the world's breeding albatrosses. Their unique habitats are internationally important, and include the world's largest and most pristine coral atoll – the Great Chagos Bank in the British Indian Ocean Territory. There are 81 Important Bird Areas (IBAs) recognised in the UKOTs[2], and work has begun to identify important areas for plants and other biodiversity.

Under threat

Even with the limited knowledge that we have, it is clear that much of the unique biodiversity of the UKOTs is under severe threat: over 90 species are now classified as Critically Endangered globally, compared with just four species in the UK[3]. The last recorded global extinction in the UKOTs, of the St Helena olive tree, occurred as recently as 2003[4]. However, at present, few of the areas most important for biodiversity in the UKOTs have any level of legal protection; development and invasive species still threaten many sites.

We have only limited data on the threat status of many species in the UKOTs. In Pitcairn[5], work for the 2008 IUCN Global Red List indicated that only 146 of 466 known species had been assessed. Of these 146 species, one was Critically Endangered, 10 were Endangered, and 31 were Vulnerable. Fifteen of the species assessed were endemics and all of these were globally threatened.

Case study

Tackling non-native species

Invasive non-native species are a particular concern in the UKOTs and tackling them is a key conservation priority. To date, a number of projects have assessed the impacts that particular introduced species have had on native wildlife in the UKOTs. In some cases, the feasibility of eradication projects has also been examined, although few eradications have yet been attempted. Work is currently underway to identify the most suitable islands and sites for vertebrate eradication programmes across 11 of the UKOTs, with the aim of producing a priority list for vertebrate eradications by taking into account their benefits, feasibility and sustainability.

On Ascension Island in the South Atlantic, introduced cats had caused the loss of millions of breeding seabirds since the 19th century. The seabirds that remained were restricted to small offshore stacks and ledges that cats could not reach. In 2002, the RSPB began a project to eradicate feral cats and by 2006 the island was declared feral cat-free, making Ascension the largest inhabited island to have been cleared of feral cats.

Since then, seabirds have begun to spread back onto the main island, with species such as the masked and brown booby, and brown noddy, responding particularly quickly[6]. In December 2012, two pairs of the endemic Ascension frigatebird were discovered nesting on the main island for the first time in 180 years – an important milestone and testament to the power of conservation.

Kevin Schafer (NHPA/Photoshot)

Ascension frigatebird

Case study

Kew's UKOTs Online Herbarium

Most UKOTs lack a complete botanical inventory and many have outdated baseline taxonomic information. To resolve this problem, the Royal Botanic Gardens Kew is working with other worldwide herbaria and organisations within the UKOTs to put together the UKOTs Online Herbarium.

This virtual herbarium allows internet-based access to digitised geo-referenced herbarium specimens from Kew's collection, together with associated data, field images and key botanical literature. More than 17,000 specimens have been digitised so far, linking 10,000 species names so that Territory-specific checklists can be generated.

Kew's UKOTs Programme is also producing a preliminary checklist of UKOT plants that, when complete, will allow scientists to make an accurate assessment of the status of these plants. To access the UKOTs Online Herbarium, visit ***http://herbaria.plants.ox.ac.uk/bol/UKOT/Home/Index***

The UKOTs are home to an incredible array of species, but many are threatened with extinction.

Black-browed albatross

On St Helena, of an estimated 400+ endemic terrestrial invertebrates, only two have been assessed against Red List criteria. For higher plants, the picture is slightly better – of 46 endemic species, 23 have been assessed, but 21 are globally threatened, and two no longer occur in the wild.

Action brings hope

Species such as the bastard gumwood, the St Helena neglected sedge and the Ascension Island parsley fern have been snatched back from the very brink of extinction thanks to inspiring conservation work. Many organisations including the St Helena Government, the St Helena National Trust, the Ascension Island Government Conservation Department and the Royal Botanic Gardens Kew have been involved. Just a few individuals of each species remain in the wild, so they are now being cultivated and their future is more secure. Nevertheless, they remain Critically Endangered and their habitat is still under threat from invasive species.

Despite conservation work in the UKOTs, huge challenges still remain. In the Turks and Caicos Islands, the national tree – the Caicos pine – is faced with local extinction due to the introduction of an invasive insect pest that has devastated the unique Caicos pine forests[7]. On Gough Island, breeding seabirds such as the endemic Tristan albatross are suffering huge and continuing declines due to predation by introduced house mice[8]. Elsewhere, albatross populations continue to decline because of long-line fishing.

Improving our knowledge

The ability to assess accurately the state of the UKOTs' biodiversity is a crucial step towards effective conservation. Our current knowledge is patchy, so it is vital that we fill these gaps with improved monitoring and research. During 2013, the RSPB will use Foreign & Commonwealth Office funding to produce species lists and gauge the number of species that have not been assessed for the global Red List – an important step towards a better understanding of our UKOTs.

Just one individual of St Helena's endemic bastard gumwood tree survives in the wild.

Hand-pollinating the bastard gumwood tree

Colin Clubbe (Royal Botanic Gardens, Kew)

Derek Middleton (FLPA)

Extinctions and colonisations

You will probably be aware of some of the flora and fauna that have become extinct in the UK over time, from striking mammals such as wolves, which were wiped out by around 1680, to delicate flowers like summer lady's tresses, which had disappeared by 1959. However, keeping a close track on losses in recent years is surprisingly difficult. Fewer than 50 species have been declared extinct in the UK since 1970, but this underestimates the true number, because we know so little about much of our native wildlife. It is usually easier to detect the arrival of a new species than the final disappearance of a threatened species.

In better studied groups, we know that 1–2% of species have been lost from the UK – far too many. Thankfully, very few UK species have become globally extinct: most can still be found elsewhere in their range. However, this is not always the case. One of the most high-profile global extinctions of a UK species involved the great auk, a large flightless seabird that once nested in large colonies on our northern coasts. The species was driven to extinction by the mid-1850s as a result of centuries of intense human exploitation – it now provides a powerful lesson in just how much damage people can cause.

Other lost species include the interrupted brome, a plant which was last recorded in the wild in Cambridgeshire in 1972 (but later reintroduced to three sites). We can only hope that other UK wildlife thought to be globally extinct may yet be found in other places, like the Ivell's sea anemone, which was only ever known in one lagoon in Sussex.

Since 1970, hundreds of species previously unknown in the UK have been found here. Some of these are long-established members of our native wildlife that had simply eluded detection before, such as the Alcathoe bat, which was not found until 2010[1]. Such additions reflect advancements in our understanding and technology, but they do not tell us much about what is happening to our flora and fauna. However, there are a large number of species that are new arrivals to the UK, some of which have colonised naturally – for example, over 27 species of moth have colonised the UK since as recently as 2000, many feeding on non-native plants[2].

Not all colonisers have arrived naturally though. Many new plants, fungi and animals have been imported – either accidentally or deliberately – from all over the world. This process started a long time ago with Neolithic farming; a surprisingly high proportion of the UK's wild flowers, including many of our most familiar species such as the common poppy and snowdrop, are "archaeophytes" (introduced pre-1500) or "neophytes" (introduced after 1500). Arable land and brownfield sites are often dominated by these plants. Whilst many of these introductions are harmless, some non-native species have a devastating effect on our native wildlife. The number of non-native species arriving as a result of human actions is increasing, and their impact on other wildlife is intensifying.

Case study

Non-native crayfish invasion

The American signal crayfish was introduced to the UK in 1976. As elsewhere in Europe, its appearance resulted in a devastating decline in native crayfish, because it carries a water mould that kills them[3]. It also affected fish stocks and damaged habitat.

Another five non-native crayfish species are now found in the wild in the UK, putting further pressure on our native white-clawed crayfish, which has disappeared from much of its former range and continues to retreat ahead of the northward spread of alien species.

Some new species have colonised the UK naturally, but many species have been accidentally or deliberately introduced.

Case study

Starry Breck lichen

The rare starry Breck lichen was known in just a few places in the Breckland of East Anglia. It was last seen around 2001, and now seems to have disappeared completely[4]. Despite being fully protected by law, this species probably declined because of changes in its habitat. Unsuitable grazing and enrichment from nitrogen pollution are thought to have contributed to its demise. These factors still threaten other species in Breckland and throughout the UK – if we do not act, some may go the same way as the starry Breck lichen.

Case study

Wetland colonists

Until the 1990s, the little egret was a rare vagrant to Britain, but breeding began in 1996 and now there are more than 700 breeding pairs[5]. However, the fortunes of other wetland species have been mixed.

The historical destruction of the East Anglian Fens and other large marshlands caused the extinction of species such as the marsh fleawort[6] and large copper. Intensive draining since the 1940s has seen many local populations of wetland species disappear throughout the UK. But it's not all bad news.

There has been a rise in the number of new wetlands, including reservoirs, flooded quarries and sites created especially with conservation in mind. Many wetland species are good dispersers and have quickly taken advantage of these new habitats. Others, such as egrets and dragonflies, seem to be spreading as the climate changes[5,7]. Large, connected wetlands are likely to be an important resource for new colonists to the UK.

Case study

The pool frog: neglected native or undesirable alien?

The pool frog was found at a single site in East Anglia until the mid-1990s, when its population declined and then went extinct. Just at that time, researchers started questioning the long accepted wisdom that it was an introduced species, and realised – too late – that it had been a native species with a common origin to pool frogs found in Scandinavia[8].

In 2006, the species was reintroduced to a single site and there are plans to bring the species back to other sites in its former East Anglian range.

Tony Gent (ARC)

Pool frog

While imported species are a cause for concern, the natural arrival of new colonists is more welcome. A surprising number of animals that have been expanding their range in Europe have crossed the Channel or the North Sea and established themselves in Britain. Just as it is hard to tell how many species have been lost from the UK, it is also difficult to know how many have colonised. Is a species a new arrival, or just previously overlooked? Did it arrive naturally, or was it introduced? With species such as the tree bumblebee and French wasp, it is hard to tell, but for species from further afield with poor dispersal abilities, it is more obvious that they must have hitched a ride. Only those species for which we are able to make these distinctions appear in the figure below.

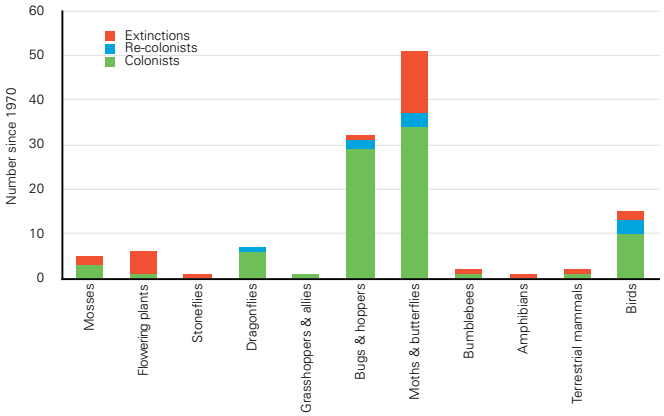


Figure 26
The number of species in various groups colonising naturally, re-colonising or becoming extinct since 1970[9–13].

Some newly-arrived species seem to be responding to changes in the climate, moving north from continental Europe, often in combination with another factor like a food plant being more widely grown. The more mobile species, such as moths, dragonflies, birds and bugs, have been able to take advantage of these new conditions. A few mosses and liverworts, which are often thought of as immobile, are also rapidly colonising Britain, probably dispersed by spores on the wind.

Less mobile organisms have not been able to cross the sea without human assistance, although many are managing to exploit our commercial activities and transport systems. No snails, slugs, reptiles or amphibians have colonised the UK naturally in the last 40 years. Only one mammal, Nathusius's pipistrelle, has become established[14], and perhaps only one plant, the small-flowered tongue-orchid, has arrived naturally (and even that is debated)[6].

Fungi, through their airborne spores, are likely to spread further than flowering plants, but we do not yet have full knowledge of the rate at which fungi are colonising the UK.

Little egret

The little egret used to be a rare sight in the UK, but now there are over 700 breeding pairs.

Ernie Janes

Robert Pickett (NHPA/Photoshot)

Unsung heroes of conservation

Picture the scene. It's after midnight, and a lone policeman driving home along the north Norfolk coast road notices a mysterious, bright light shining out on the wild windswept marshes that shelter the land from the North Sea behind. He can think of no innocent explanation, and several that are less than innocent. After calling in back-up, he and his colleagues head out to apprehend the smugglers, poachers or ravers. They are perplexed, however, to come across half a dozen people staring intently into a wooden box. What on earth are they doing? The box is filled with moths...

For over 200 years, amateur naturalists have been investigating the birds, plants, bugs and every other form of life that shares the country with us. For most of these enthusiasts, their primary motivation has been simple curiosity and fascination with the natural world. This world is indeed fascinating, and incredibly diverse. Most people have no idea that they share the UK with 4,000 species of beetle, 7,000 species of fly or 17,361 species of fungus. A detailed study of most British gardens would reveal hundreds of different types of moths. And our countryside is surrounded by seas full of enormous numbers of species even less well known than those on land.

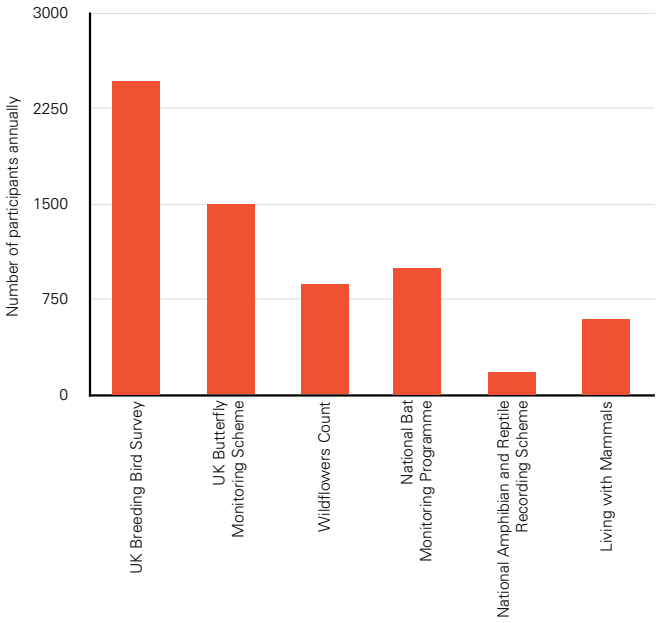


Figure 27
Participation in different wildlife recording schemes. Data from ARC, BC, BCT, BTO, Plantlife, PTES and the RSPB.

As this report demonstrates, the biodiversity of the UK is changing rapidly. What few people realise is that we owe most of our knowledge of these changes to amateur wildlife recorders[1]. These "citizen scientists" range from the most expert entomologists to those recording the comings and goings of their garden birds. What ties them together is simply that they record what they see and send these records off to be used. Another important group of volunteers then gets down to work checking and collating these records, either through a network of Local Record Centres or through local and national recording schemes and societies. The observations are combined into larger and larger databases, totalling hundreds of millions of records; many, including some that underpin the analyses of trends in this report, are available through the National Biodiversity Network at www.nbn.org.uk. This information can then be analysed for patterns and trends, which tell us about the state of the UK for wildlife[2].

It's easy to become blasé about the efforts of volunteer wildlife recorders, but their collective achievements are staggering. For example, between 2007 and 2011, over 17,000 volunteer birdwatchers tramped over about a quarter of the land surface of Britain and Ireland to help compile the latest Bird Atlas, and nine million records were compiled for the last Plant Atlas. The UK is a world leader in this type of public involvement in wildlife monitoring, which would cost many millions of pounds if it had to be paid for professionally.

Wildlife recording takes many forms. For well-known groups, notably birds, butterflies and bats, monitoring programmes are highly sophisticated, with carefully planned sampling and statistical analyses allowing a great deal of confidence to be placed on the resulting trends and other insights. Most species, however, can be identified by relatively few people. For example, there are about 8,000 species of parasitic wasp in Britain, but there are probably fewer than 10 people who could name more than 10% of them. Figure 27 above shows the variation in the number of people recording and monitoring some of the UK's main species groups. We know a lot about the status and trends of species that attract high volunteer interest, but for species groups with fewer enthusiasts we know much less.

We would like future *State of Nature* reports to be even more comprehensive than this one, and to do that we need to nurture recording for the more obscure, less celebrated elements of the UK's nature. However, even basic distribution mapping can be enormously valuable, revealing overall range extent, habitat associations and hotspots of importance for priority conservation action.

Worryingly, there are signs that people are becoming increasingly disconnected from nature[3]. But scratch beneath the surface and there is a huge interest in nature – almost every child is interested in animals, at least when young. How can we bring this interest even further into the mainstream? What can we do through our schools, for example, to help city kids learn the pleasures of getting muddy while hunting for bugs? This is one of the big challenges we need to tackle if we wish to continue our tradition of volunteer wildlife recording. If we can inspire the next generation, we will create a huge force for nature.

Why is the UK's nature changing?

Nature is in a state of flux in the UK: there have been rapid changes in the status of our flora and fauna, driven by changes in the way we manage our land and seas. Here we highlight some of the factors that have had the greatest impacts, both good and bad, on our environment. Most factors affect some species positively and others negatively, but on balance, the overall effect will usually be skewed in one direction. For example, improving water quality benefits the majority of species, but is detrimental to those that are adapted to nutrient-rich or polluted conditions.

Conservation action

The pressures on the UK's nature have grown, but conservationists have risen to the challenge. Conservation no longer involves just "protection", but also habitat creation and restoration, species reintroductions and translocations, and campaigning for better policies and legislation. As ever, the massive task of saving nature is hampered by a lack of resources.

Loss of semi-natural habitats

Following massive losses in the 20th century, only fragmented pieces of semi-natural grassland and heathland remain. Development, poor management and disturbance still threaten these fragments of habitat, and wildlife here is isolated and vulnerable.

Urbanisation

To prevent the loss of farmland, development has often been concentrated within urban areas, resulting in the loss of green spaces and brownfield sites that act as refuges for wildlife. For many people, urban wildlife provides their only contact with nature: without it, how can we expect them to care about its survival?


Roy Waller (NHPA/Photoshot)

Retheesh


Andy Hay


Eleanor Bentall

Fisheries management

Overfishing in the north-east Atlantic has depleted many fish stocks, damaged food chains and had knock-on effects on other biodiversity.

Wetland creation

Vast swathes of UK wetlands have been lost in the past, however the extent of lowland water bodies has increased significantly in recent years, due mainly to the restoration of mineral workings.

Improved water quality

Although many rivers and other freshwater bodies remain polluted, water quality has improved over recent decades as a result of work to address acidification, organochlorines and sewage discharges.

Climate change

Climate change is already affecting UK wildlife in a number of ways, particularly in marine and upland environments. In the future, the changing climate is expected to become an ever more dominant driver of change. Although some species will benefit, the overall impact is likely to be negative. How negative depends on how successful we are at reducing global greenhouse gas emissions.

Afforestation

Tree cover has doubled in the UK since the Second World War. However, much of this consists of conifer plantations of limited benefit to wildlife. Some generalist woodland species have benefitted from increased tree cover, but a lack of active management has resulted in homogenous woodland structure unsuitable for more specialist species.

Illegal persecution

Wildlife crime remains an issue. The freshwater pearl mussel is threatened by illegal collection, the illegal removal of plants such as orchids continues and hen harriers and other raptors are killed throughout the UK due to perceived conflicts with game hunting interests.


Andy Hay


Andy Hay


Mark Hamblin


Richard Revels

Agricultural intensification

The intensification of farming has had far-reaching and ongoing impacts on wildlife. The loss of meadows, hedgerows and ponds, the increased use of pesticides, the abandonment of mixed farming, changes in cropping and the intensification of pastoral farming have all had a significant impact. However, if properly designed and funded, agri-environment schemes give farmers the opportunity to help our farmland nature to recover.

Upland management

Intensive management has damaged our uplands in many ways. Bogs and mires have been drained and habitat damaged by intensive burning for managed grouse populations. Overstocking has led to heavy grazing pressure and negative impacts on wildlife.

Invasive non-native species

The rate at which non-native species are arriving and establishing in the UK is increasing across habitats. We cannot predict accurately which of these might damage native species and habitats, but some will. The introduction of new plant and animal diseases is just one threat posed by non-native species movements, which could have serious implications for UK nature.

Methods

This section outlines the data sources and methods used in this report. There are two types of data presented: trends in species' abundance or distribution, and an assessment of species' extinction risk following IUCN guidelines on National Red Lists. Summaries of both types of information are presented in the "Facts behind the headlines" section and in each habitat chapter. In addition, we present a new Watchlist Indicator on priority species, generated from abundance trends for some of the species deemed to be of conservation priority in the UK.

TRENDS IN ABUNDANCE AND DISTRIBUTION

For this analysis, we collated as many datasets as possible on changes in the abundance or distribution of species across the UK. Many of these datasets are derived from annual or periodic surveys, but we also included trends based on the opportunistic recording data collected by National Recording Schemes, covering many taxonomic groups[1]. A full list of the datasets included in the analysis is given in the table (right).

Our analysis was in two parts. First we allocated each species for which we had a trend in abundance or range into one of four categories, according to the criteria below. Secondly, we collated information about which habitats each species was associated with: a species may be included in the assessment for more than one habitat. This allowed us to assess how many species within a taxonomic group, within a habitat, or overall, were increasing or decreasing.

The figures are colour-coded to show the proportion of assessed species that were slightly increasing, strongly increasing, slightly decreasing or strongly decreasing. In total, we had assessments of trend for only about 5% of the UK's species of plants and animals, but this proportion varied between different taxonomic groups and habitats.

Species' trends: abundance

The datasets we report on cover a variety of time periods from 1960 onwards. In order to be able to compare species trends assessed over different time periods, we calculated both the **total change** over the period assessed and the **annual change**, in either relative or absolute abundance**.**

Total change:
Abundance (final year) / Abundance (first year)

Average annual change:
Percentage annual change in abundance over the time period monitored. This was assumed to be constant over the monitored period.

We placed each species into one of the four trend categories using these definitions:

Strongly increasing:
The estimate of **total change** is two or greater, meaning that the population has doubled over the time period monitored, OR if the **annual change** is more than 0.0281, the rate of change that would lead to a population doubling or more over 25 years.

Slightly increasing:
Total change and **annual change** are greater than zero, but the species does not meet the criteria for strongly increasing.

Strongly decreasing:
The estimate of **total change** is 0.5 or less, meaning that the population has halved over the time period monitored, OR the **annual change** is less than -0.0273, the rate of change that would lead to a population halving or more over 25 years.

Slightly decreasing:
The estimate of **total change** and **annual change** are less than zero, but the species does not meet the criteria for strongly decreasing.

We did not use statistical tests of significance in defining trends into the four categories above.

Species' trends: distribution

For many taxonomic groups, data are not available to assess changes in abundance over time; however, data are available about their distribution. This is primarily in the form of atlases and from national and local biological recording schemes.

Atlases

Two atlases of flowering plants have been produced and for each species an index was calculated assessing the change in distribution at the scale of 10 km atlas grid squares[2]. This index is a relative measure of change and does not tell us by how much a species' distribution has changed in absolute terms, because of the need to take into account changes in recording effort over time. We placed each species into one of the four trend categories using the definitions below. The cut-offs at ±0.5 follows Preston *et al* 2003[3].

Strongly increasing:
Plant Atlas Change Index of 0.5 or greater

Slightly increasing:
Plant Atlas Change Index of between 0 and 0.5

Slightly decreasing:
Plant Atlas Change Index of between 0 and -0.5

Strongly decreasing:
Plant Atlas Change Index of -0.5 or less

Data Type	Higher Group	Group	Number of species covered	Monitoring Scheme/ Dataset	Years
Abundance	Vertebrates	**Birds**	198	Common Bird Census-Breeding Bird Survey Joint trends[4,C], Wetland Bird Survey[5,C], Rare Breeding Birds Panel[6,D]	~1970–2011
				Breeding Bird Survey[7,B]	1995–2010
				Seabird Monitoring Programme[8,C]	1986–2011
				Statutory Conservation Agency/RSPB Annual Breeding Bird Scheme[9,C]	Various
		Bats	10	National Bat Monitoring Programme[10,A,E]	1997–2011
		Other mammals	8	Breeding Bird Survey Mammal Data[7,B], Mammals on Roads (in BTO research report *Monitoring Hedgehogs*[11,B]), National Dormouse Monitoring Programme[12,C]	~1995–2011
		Amphibians	1	Natterjack Toad Monitoring[13]	1990–2009
	Invertebrates	**Carabid beetles**	68	Environmental Change Network[14,B]	1994–2008
		Butterflies	56	United Kingdom Butterfly Monitoring Scheme[15,B]	1976–2011
		Moths	8	Butterfly Conservation unpublished data	2000–2011
			337	Rothamsted Insect Survey – light trap network[16,A]	1968–2007
Distribution	Invertebrates	**Moths**	331	National Moth Recording Scheme	1970–2010
		Ladybirds	42	National Ladybird Recording Scheme	1970–2010
		Aquatic invertebrates	145	Countryside Survey[17]	1998–2007
		Bees, wasps and ants	382	Bees, Wasps and Ants Recording Society	1970–2010
	Plants	**Flowering plants**	1309	Plant Atlas Change Index[2]	1962–1999
		Bryophytes	253	British Bryological Society	1970–2010

A: In some datasets, both **total change** and **annual change** were already estimated and were used without further manipulation.
B: In other datasets, one of these, plus information about the study duration, was available and could be used to estimate the other.
C: A third group of datasets contain annual estimates for each species and **total change** and **annual change** were calculated from these.
D: The mean of the last five years and the mean of the first five years were used instead of the first and last years, in order to smooth between-year variation.
E: Most bat species are monitored using two survey methods. We took the average long-term change per species and calculated the associated mean average annual change.

Methods (cont.)

Biological recording data

National recording schemes collect data on a vast array of taxonomic groups, from slime moulds to spiders. However, it can be difficult to use these datasets from opportunistic records to assess changes over time, as recording effort varies across the UK and over time. Several statistical techniques are now available to help control for these biases, and three of these, Frescalo[18], list length[19] and mixed model[20] were used here to measure change in distribution at a 1 km grid scale for selected groups. An average of the three *z*-scores obtained from the three methods was used to place each species into the four trend categories as follows:

Strongly increasing:
Species with a statistically significant positive *z*-score

Slightly increasing:
Species with a non-significant positive *z*-score

Strongly decreasing:
Species with a statistically significant negative *z*-score

Slightly decreasing:
Species with a non-significant negative *z*-score

Habitat associations

Since most species use more than one habitat, they were assigned to more than one in our analyses. As a result, the habitat-specific information does not add up to the overall information. We defined the habitat associations of the following taxonomic groups:

Flowering plants[2]
Bryophytes[21]
Birds[22]
Butterflies
Bats[23]
Moths[24]
Bees, wasps and ants[25]
Lichens[26]
Mammals[27]
Carabids
Ladybirds

NATIONAL RED LISTS

At a global level, the IUCN co-ordinates the process of assessing which species are threatened with extinction and have developed assessment criteria to make the process as transparent and consistent as possible[28]. These criteria are based on a variety of parameters, including the rate of change in species abundance or distribution, total population size and the number of populations. How threatened a species is may vary across its range and often regional or national Red Lists are produced, documenting which species are threatened at different spatial scales.

In the "Facts behind the headlines" section, we have brought together all the national Red Lists, for either the UK or Great Britain, that have been produced using the latest guidelines from the IUCN, as well as those produced using older "Red Data Book" type assessments that were done before the more recent IUCN guidelines were available, or non-IUCN criteria. Red Lists for the following taxonomic groups were included:

Flowering plants[29]
Mosses, liverworts and hornworts[30]
Stoneworts[31]
Lichens[32]
Dragonflies[33]
Butterflies[34]
Flies (families Nematocera, Aschiza and Empidoidea)[35]
Water beetles[36]
Birds[37]
Crustaceans[38]
Molluscs[38]
Various insect groups[39]
Spiders[40]

In the habitat chapters, we report only on flowering plants and bryophytes as these have up-to-date Red Lists and published accounts of habitat associations.

WATCHLIST INDICATOR

Between 1995 and 1999, 577 species were identified as priorities for conservation, under the UK BAP. The list was reviewed in 2007, and doubled in length to 1,150 species. This list has been superseded by priority species lists for the UK's four nations individually, but remains a good indication of species that have been conservation priorities in the UK since the 1990s and remain so now.

We have developed a new Watchlist Indicator, showing the overall trend in population of 155 conservation priority species – about 13% of those listed as UK BAP priorities. The species included were all those where information was available on changes in population abundance over time, and do not represent a random sample of those on the UK BAP list.

Annual estimates of relative abundance were available for 51 birds[4–9], 77 moths[16], 19 butterflies[15] and eight mammals[7,10,11,12]. For many of these species, data were available from the 1970s to the present day. However, for some species, the time series available was substantially shorter.

In order to combine the species into a composite indicator, we first scaled the data for each species so that the estimate for each year was expressed as a proportion of the estimate in the first year. The composite index shown in the report is the geometric mean of the scaled species-level data. The index has been adjusted to take into account the different starting years for different species, with "new" species entering the index scaled to the overall index value for the year of entry. The 95% confidence intervals around the composite index were generated by bootstrapping the species-level trend data.

CAVEATS

The datasets presented in this report are a summary of the information available: this is the first time that these data have been brought together and assessed as a whole. However, the datasets have not been selected to reflect a representative sample of UK species, either within or between taxonomic groups or habitats. This means that we should be cautious about extrapolating findings beyond the species assessed. Additionally, although there are numerous studies investigating the underlying reasons for these changes in abundance or distribution, it is difficult to interpret the observed patterns for many species.

Here we have put together datasets collected using different methods, measuring different aspects of species status on a variety of spatial scales and analysed using different statistical techniques.

There are two points to note about this. Firstly, how a species has been monitored – the method, effort and extent of surveying – can influence whether the results were suitable for our analyses, and indeed the species' trend itself. Whether trends in abundance or range are reported can be influential. For example, when a widespread species begins to decline, changes in abundance may be detected before changes in distribution. Conversely, increases in distribution in an already widespread species may be difficult to detect. The scale at which trends in range are measured can also be influential, with range loss at a fine spatial scale not detected if mapping is done at a coarser resolution.

Many of the monitoring schemes that produce the datasets included in this report have a wide range geographically, but may not have sufficient sampling density locally to pick up changes in localised or particularly rare species. As a result, trends for relatively few of these species are reported. Our measures of the balance of increasing and decreasing species may therefore be biased towards the more common, widespread and generalist species.

Secondly, although official guidelines are used to produce national Red Lists, there is room for variation in interpretation of these guidelines and so there are small differences in the way different authors have compiled the national Red Lists summarised here. This is particularly true in defining which species are not threatened (of Least Concern).

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Common blue damselfly

Mark Eaton (RSPB)

Partners

This report has been produced by a new partnership of 25 organisations involved in the recording, researching and conservation of nature in the UK and its Overseas Territories.

These include a wide spectrum of conservation charities, between them caring for all elements of our wildlife and habitats; recording societies that embody expertise on a wide range of taxonomic groups, including our best and least known wildlife; and research organisations responsible for gathering and analysing data that advances our knowledge of the UK's nature.

Amphibian & Reptile Conservation
www.arc-trust.org

Association of British Fungus Groups
www.abfg.org

Bat Conservation Trust
www.bats.org.uk

Biological Records Centre/Centre for Ecology & Hydrology
www.ceh.ac.uk

Botanical Society of the British Isles
www.bsbi.org.uk

British Bryological Society
www.britishbryologicalsociety.org.uk

British Lichen Society
www.britishlichensociety.org.uk

British Mycological Society
www.britmycolsoc.org.uk

British Trust for Ornithology
www.bto.org

Buglife
www.buglife.org.uk

Bumblebee Conservation Trust
www.bumblebeeconservation.org

Butterfly Conservation
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Conchological Society of Great Britain and Ireland
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The Mammal Society
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Marine Biological Association
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Marine Conservation Society
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National Biodiversity Network (NBN)
http://data.nbn.org.uk

People's Trust for Endangered Species
www.ptes.org

Plantlife
www.plantlife.org.uk

Pond Conservation
www.pondconservation.org.uk

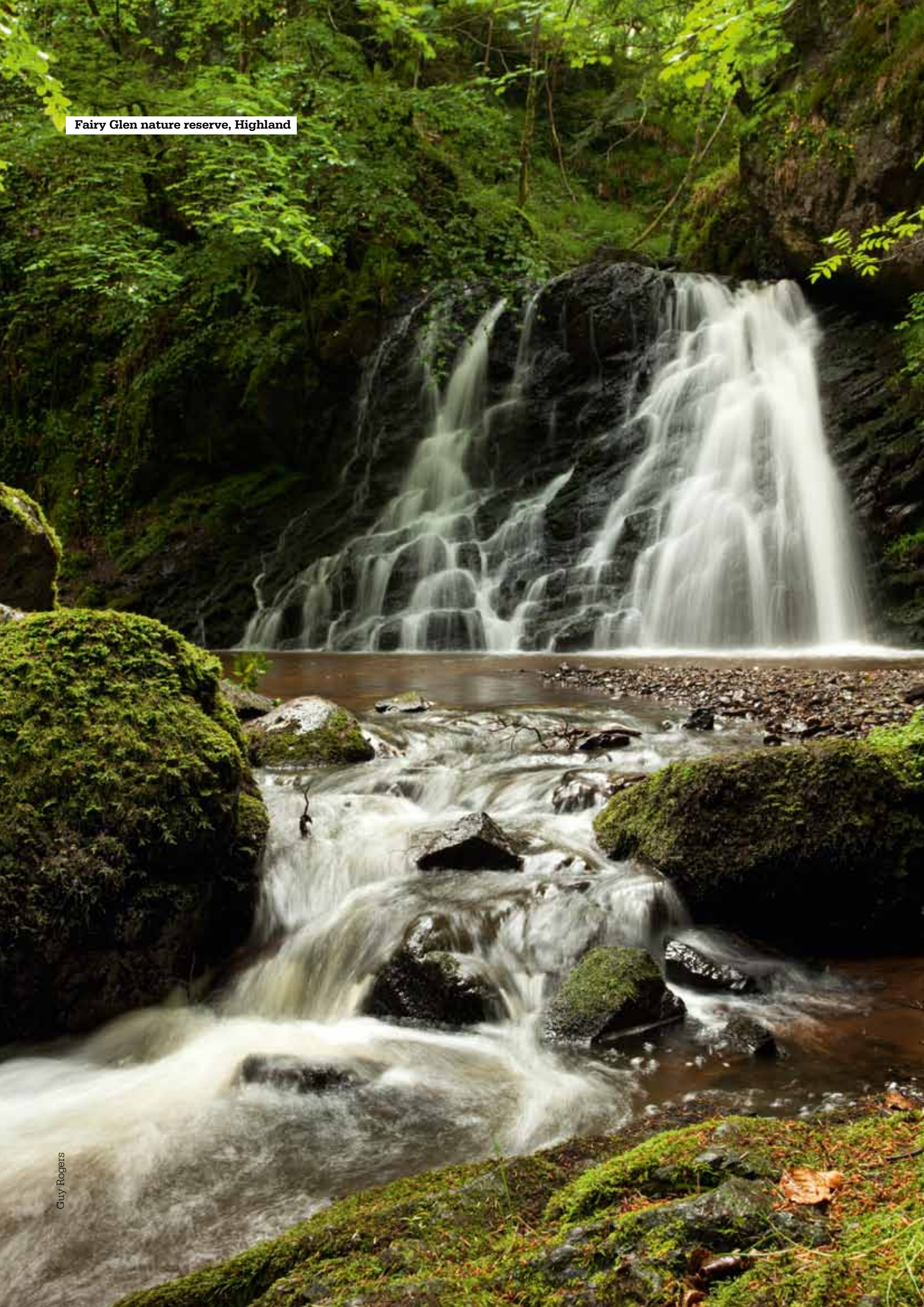
Rothamsted Research
www.rothamsted.ac.uk

Royal Botanic Gardens, Kew
www.kew.org

Royal Society for the Protection of Birds
www.rspb.org.uk

Wildfowl & Wetlands Trust
www.wwt.org.uk

Wildlife Trusts
www.wildlifetrusts.org



Fairy Glen nature reserve, Highland

Guy Rogers


recycle
Mixed Sources
FSC

The *State of Nature* report is a collaboration between the 25 UK conservation and research organisations listed below:

amphibian and reptile conservation

Botanical Society of the British Isles

BTO

buglife

Bat Conservation Trust

BRC Biological Records Centre

Bumblebee Conservation Trust

WWT

The Mammal Society

bms

Butterfly Conservation
Saving butterflies, moths and our environment

Kew
Royal Botanic Gardens

marine conservation society

Plantlife
people's trust for endangered species

Rothamsted Research

NBN

rspb giving nature a home

wildlife trusts

Pond Conservation
For life in fresh waters

state of nature

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Andy Hay