STATE OF NATURE

ENGLAND

2023

RSPB Haweswater Nature Reserve,
Rosie Dutton (rspb-images.com)

Contents

Orange tip butterfly, Ben Andrew (rspb-images.com)

SUMMARY

England, like many regions worldwide, has experienced significant biodiversity loss. While the trends in nature reported here cover 50 years at most, these follow major changes to England's nature over previous centuries. As a result, England is now one of the most nature-depleted countries on Earth.

The main causes of biodiversity declines are clear. Evidence from the last 50 years shows that on land and in freshwater, significant changes in land management, particularly for agriculture, and climate change are having the greatest impacts on England's wildlife. At sea, the main pressures on nature are unsustainable fishing, climate change and damaging marine developments.

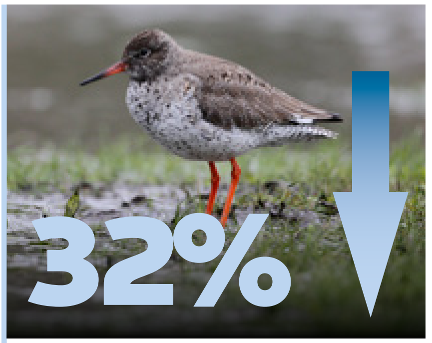
We also know many of the ways we can help struggling species. England has set ambitious targets to address nature loss through the Global Biodiversity Framework, the Environment Act 2021 and the associated Environmental Improvement Plan 2023. However, the response, investment, and prioritisation needed to reverse declines in nature are insufficient, given the scale and pace of the crisis. Despite some progress to restore ecosystems, save species, and move towards nature-friendly land and sea use, England's nature and wider environment continues to decline.

There are a variety of ways we can measure and describe how biodiversity is changing. Here, we include three: abundance, distribution and extinction risk. We assess these three measures for a large number of species and summarise the results. In this summary we present England-specific findings in most cases. With each *State of Nature* report, our methods for monitoring and measurement of nature loss are improved and refined.

We have never had a better understanding of the State of Nature and what is needed to fix it.

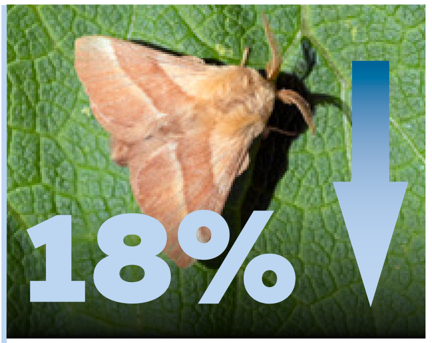
#STATEOFNATURE

Headlines



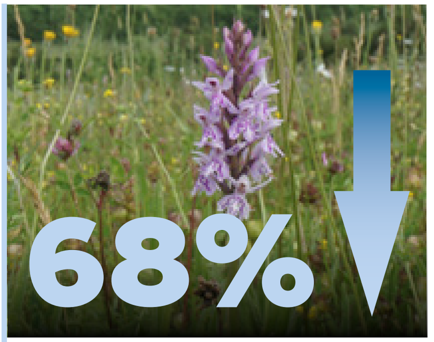
Average 32% decline in species' abundance

The abundance of 682 terrestrial and freshwater species has on average fallen by 32% across England since 1970. Within this general trend, 316 species have declined in abundance (46%) and 161 species have increased (24%).



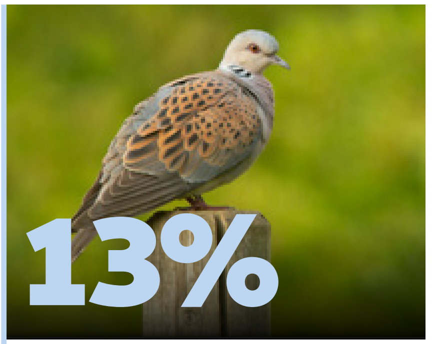
Average 18% decrease in the distributions of invertebrate species

The English distributions of 4,815 invertebrate species on average decreased by 18% since 1970. Stronger declines were seen in some insect groups which provide key ecosystem functions such as pollination (average 22% decrease in species' distributions) and pest control (40% decrease). Whereas insect groups providing freshwater nutrient cycling initially declined before recovering to above the 1970 value (average 50% increase).



Decreases in the distributions of over half of plant species

Since 1970, the distributions of 64% of flowering plant species and 68% of bryophytes (mosses and liverworts) have decreased across England, compared to increases of 18% and 22% of flowering plant and bryophyte species respectively. In contrast, many lichen species have shown a strong recovery since 1980, with 63% of species' distributions increasing, compared to 31% declining.



13% of species are threatened

Of 8,840 species in England that have been assessed using IUCN Regional Red List criteria, 13% have been classified as threatened with extinction from Great Britain.

Variable change in seabirds

The abundance of 11 regularly monitored species of seabird showed little change on average since 1986, with strong increases in Gannet numbers, but declines in several surface-feeding species such as Kittiwake. Importantly, these results pre-date the main impact of the current outbreak of Highly Pathogenic Avian Influenza.

What do our headlines mean?

This report focuses on three measures of biodiversity change: abundance (the number of individuals), distribution (the proportion of sites occupied) and extinction risk. These measures have been assessed for hundreds and in some cases thousands of species native to the UK, as the available data allow.

Our results show:

- The number of species that have increased or decreased in abundance or distribution over time
- The average change in abundance or distribution across species over time
- The proportion of species at risk of being lost from the country.

Fulmar, Richard Carlyon (rspb-images.com)

Redshank, Andy Hay (rspb-images.com); Lackey, David Kjaer (rspb-images.com); Common-spotted orchid, Patrick Cashman (rspb-images.com); Turtle Dove, Ben Andrew (rspb-images.com); Gannet, Katie Nethercoat (rspb-images.com)

Responding to the crisis

England was the first country to implement a legal target to halt nature's decline, under the Environment Act 2021. The changes set out in this report are therefore particularly significant, as they relate to the delivery of legal obligations.

The power of volunteers

It is through the collective efforts of thousands of people, most of whom are volunteers, that we can report on the state of nature. Without their efforts we could not understand the pressures on nature, nor whether our conservation actions to address these pressures have been effective.

Bluebell, Ben Andrew (rspb-images.com)

INTRODUCTION

With the Environment Act 2021, England became the first country to implement a legal target to halt nature's decline. This includes the Species Abundance Target to halt species declines by 2030 and exceed current species' abundance by 2042. The Act also set up a new independent governance and oversight body for England and Northern Ireland: the Office for Environmental Protection (OEP). This provides annual reviews of the UK Government's progress on its environmental targets.

Yellowhammer, Ben Andrew (rspb-images.com)

Nature needs space to live and flourish but around the globe we humans have decreased and diminished those spaces. Especially in the UK. The Biodiversity Intactness Index (BII) estimates the proportion and abundance of species that are present, compared to a baseline without human impacts. The global BII is 77%[1], substantially lower than the 90% estimated as necessary to keep within planetary boundaries for functioning ecosystems[2]. England has a BII of 41%, similar to the rest of the UK, but amongst the lowest in the world[3].

This affects us too. Nature plays a critical role in all aspects of our lives. Protecting and restoring healthy, functioning natural systems is essential, not only for nature's sake, but for humans as well[4]. A nature-depleted country is harmful to people's health and wellbeing, as well as our society and economy at large. The good news is that there are decades of successful conservation practice to draw upon, and for many habitats and species there is detailed evidence of which actions are effective. Simulations suggest that urgent action can 'bend the curve' of biodiversity loss, reversing some of the damage of recent decades[5]. If we are to halt and reverse biodiversity decline we need to not only increase our conservation and restoration efforts, but also tackle the drivers of loss, especially in relation to development and our food system[5]. That means making our food production more sustainable and nature-friendly and adjusting our consumption habits to reduce demand for products that drive the loss of nature. All of society needs to be involved in efforts to halt biodiversity loss. Encouragingly, as the recently launched People's Plan for Nature[6] shows, most people in the UK are deeply committed to protecting and restoring nature.

KEY FINDINGS

Terrestrial and freshwater

Change in species' abundance

The abundance indicator for 682 terrestrial and freshwater species, for which England-specific data are available, shows a decline in average abundance of 32% (Figure 1, Uncertainty Interval (UI): -42% to -21%) between 1970 and 2021. Over the last 10 years the decline was 7% (UI: -12% to -2%).

Within multispecies indicators like these there is substantial variation between individual species' trends. To examine this, we have allocated species into trend categories based on the magnitude of population change, over the long and the short-term periods.

- Since 1970, 316 species (46%) showed strong or moderate declines and 161 species (24%) showed strong or moderate increases; 205 species (30%) showed little change.
- In the last 10 years (2010–2020), 280 species (41%) showed strong or moderate declines and 246 (36%) showed strong or moderate increases; 151 species (22%) showed little change.

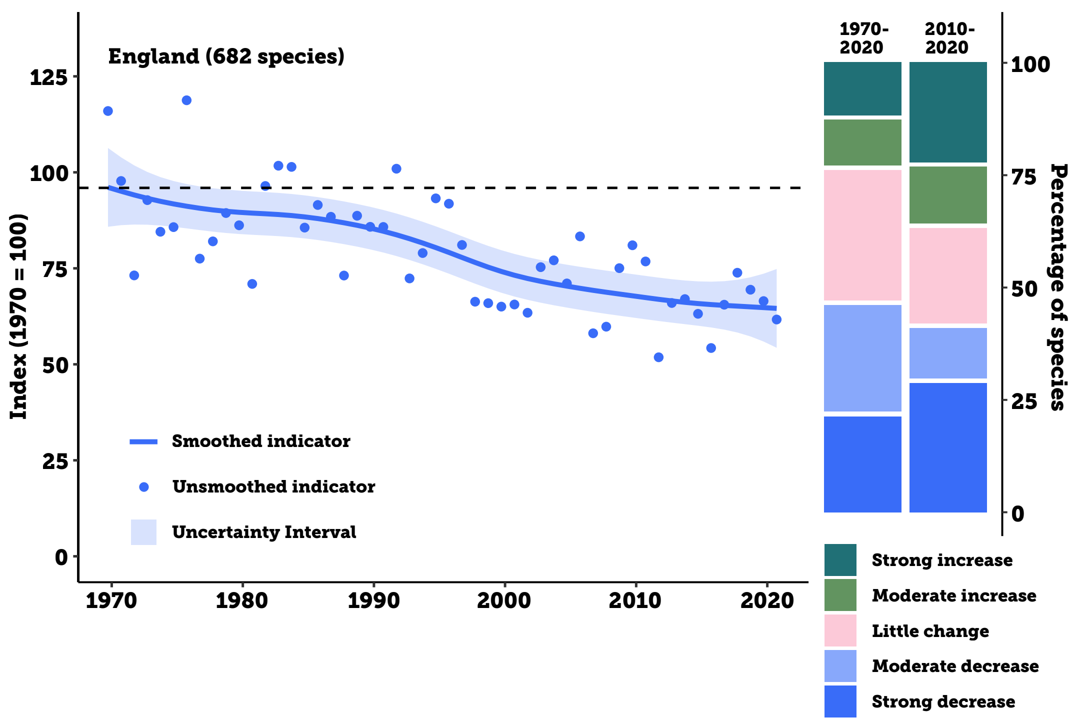


Figure 1: Change in average species' abundance for terrestrial and freshwater species in England, based on England-specific trends of birds (159 species), butterflies (55 species), mammals (15 species) and moths (453 species). The bar chart shows the percentage of species within the indicator that have increased, decreased (moderately or strongly) or shown little change in abundance (1970–2020: 682 species, 2010–2020: 677 species).

See page 40 to find out how to interpret this report

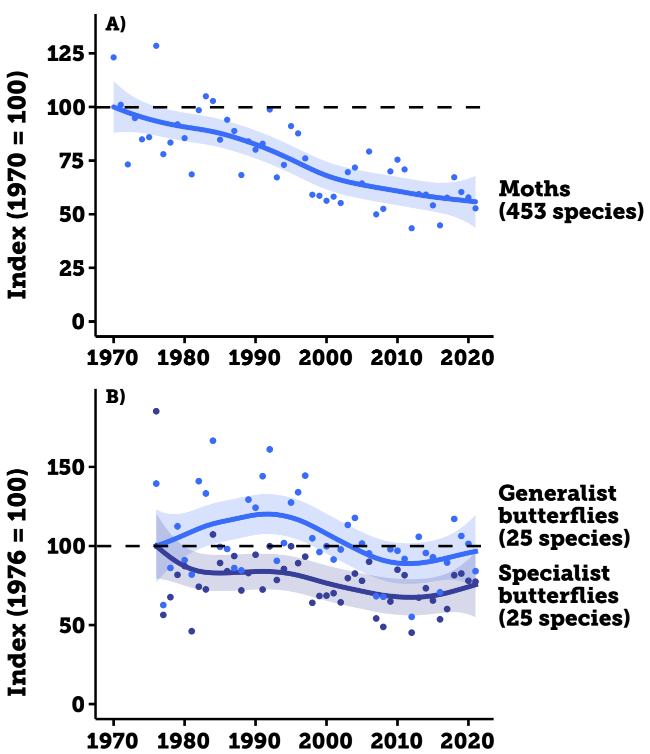
Species' abundance indicators by group

The composite nature of multispecies indicators means they can hide important variations in trends among both individual species and species groups. Here, to help better understand changes in the headline abundance indicators, we present it disaggregated into major species groups.

- The abundance indicator for 453 moth species starts in 1970 and overall shows a decline in average abundance of 44% (Figure 2A, UI: -56% to -32%).
- Specialist butterflies have declined by 25% (Figure 2B, UI: -45% to -4%) in the long term, but the majority of this decline was in the 1970s. Generalist butterflies have greater inter-annual variation but overall have remained stable (-4%, UI: -24% to +15%).

Map-winged Swift Moth,
Robert Conn (rspb-images.com)

- The abundance indicator for common breeding birds declined by 16% (Figure 2C, UI: -20% to -13%). The England Wild Bird Indicator shows that within this group farmland birds have suffered particularly strong declines of on average 59%[122].
- Rare and colonising bird species (those with less than 1,000 pairs) showed on average a strong increase in abundance between 1973 and 2019 (Figure 2D, 255%; UI: 222% to 289%). This increase was driven by the rapid recovery of some species from very low numbers and the arrival of colonising species. At a UK level, species in the rare and colonising group make up just 0.01% of the total number of individual birds in the UK[123].
- Wintering waterbirds show on average an increase of 67% (Figure 2D, UI: 51% to 83%) between 1975 and 2019. The indicator rose rapidly in the 20th century but has since steadily declined. Some of the changes may be explained by species' wintering ranges shifting in response to climate change, resulting in changes in the proportion of each population that winters in the UK.
- The abundance indicator for 15 mammal species starts in 1998 and overall shows no change in average abundance (Figure 2E, 4%; UI: 0% to +9%). Within this average, some species have declined strongly, such as Hazel Dormice, whereas some bat species are slowly recovering from previous declines at the national scale. Compared with other taxa the trend data is relatively short and so will not capture long-term trends.



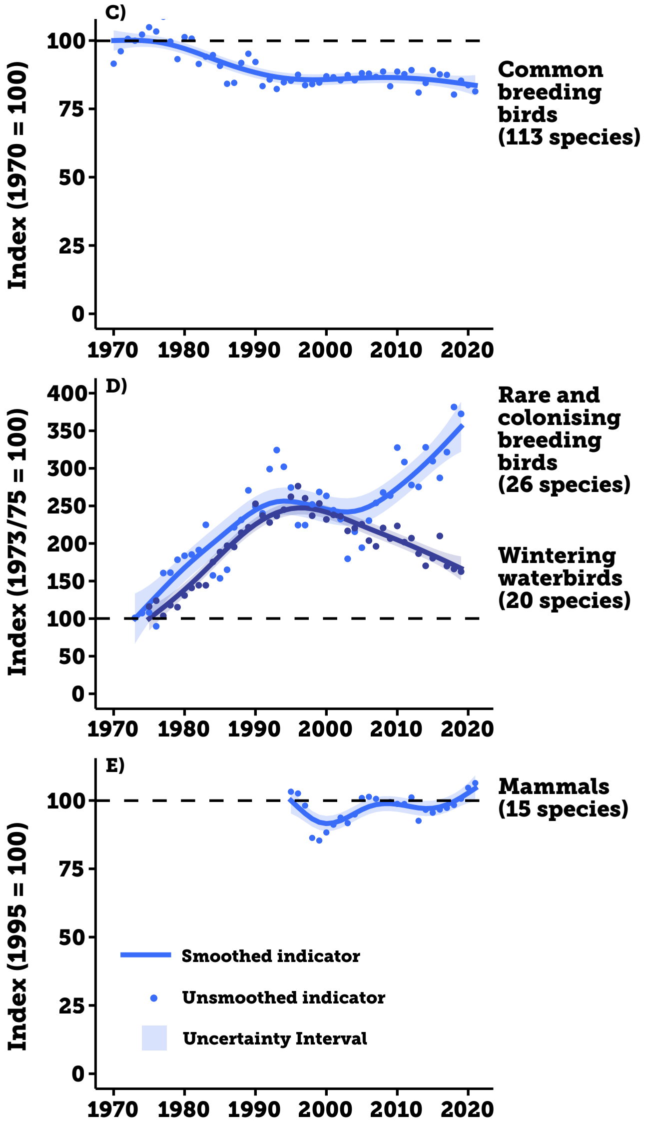


Figure 2: Change in average species' abundance for terrestrial and freshwater species in England by rarity, level of specialism or taxonomic group.


Median Wasp, Grahame Madge (rspb-images.com)

Change in priority species

One measure of the success of conservation action is whether populations of priority species have stabilised or recovered. The England Priority Species Indicator[124], (Figure 3) shows changes in the relative abundance of priority species in England for which data are available. Priority species are defined as those appearing on the priority species list for England (Natural Environmental and Rural Communities Act 2006 – Section 41). In England there are 943 species and subspecies on the priority species list. The priority species were highlighted as being of conservation concern for a variety of reasons, including rapid decline in some of their populations.

Like the species' abundance indicator described above (Figures 2,3) the England Priority Species Indicator includes birds (44), butterflies (21), mammals (6) and moths (78). Seabirds are the only marine species included in this indicator and there is insufficient data to include most invertebrates and any plants or fungi. By 2018, the indicator had declined by 82% (UI: -83% to -81%) of its base line value in 1970 (Figure 3). Within this change 7% of species increased in abundance and 83% showed a strong or weak decline. This decline continued in the final five years of the indicator.

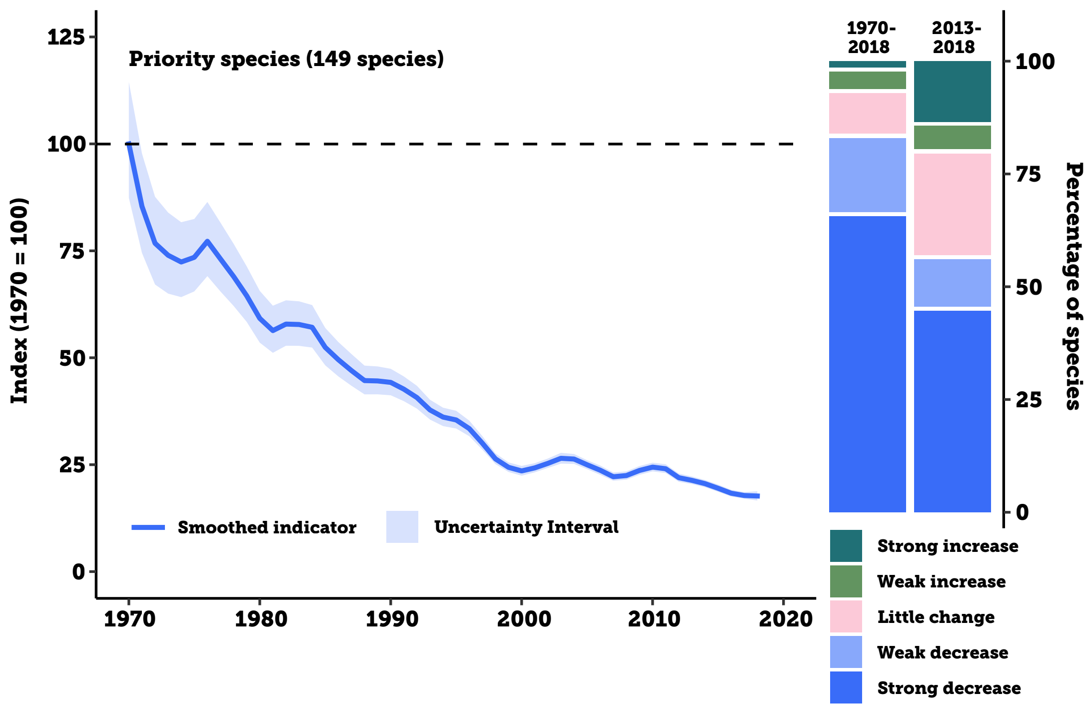


Figure 3: England biodiversity indicators: 4A. Status of priority species: relative abundance[124]. Change in average species' abundance of priority species in England, 1970 to 2018. The bar chart shows the percentage of species within the indicator that have increased, decreased (moderately or strongly) or shown little change in abundance. Source: gov.uk/government/statistics/england-biodiversity-indicators

Change in species' distribution

Plants and lichens

The distribution indicator for 1,348 vascular plant species shows a decline of 19% (Figure 4A, UI: -23% to -16%) between 1970 and 2019. Within this change, the distributions of three times as many species decreased (64%) compared to those that increased (18%). The distributions of 18% of species showed little change. Species adapted to low nutrient conditions and species of arable land have shown strong declines.

On average, bryophyte species' distributions have decreased by 35% (Figure 4B, UI: -37% to -33%). Within this average, 68% of bryophyte species decreased in distribution, compared to 22% of species whose distribution increased and 10% that showed little change. Some bryophytes have benefited from reduced sulphur dioxide air pollution, but this has not been sufficient to stabilise species' distributions[130].

The distribution indicator for 1,437 lichen species, with England-specific data, showed a strong increase in average distribution of 80% between 1980 and 2021 (Figure 4C, UI: 60% to 102%). Within this average, 31% of species decreased, 6% showed little change and 63% increased in distribution. In many parts of the UK, lichens were very badly impacted by historic industrial pollution, England being the worst affected[115]. Reductions in sulphur dioxide pollution are allowing some species to recover. However, ongoing high levels of nitrogenous air pollution mean that recovery is skewed towards species that can tolerate this.

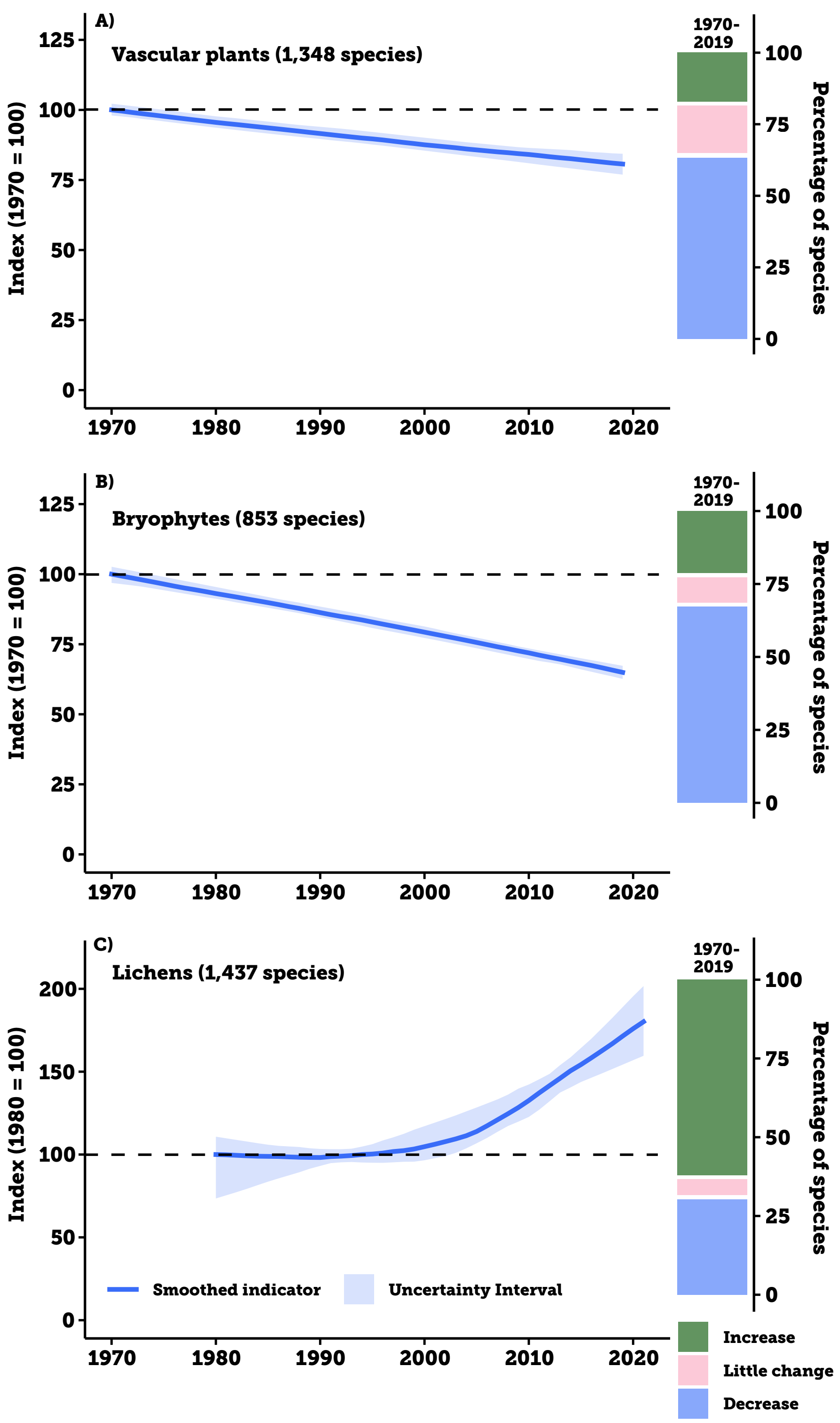
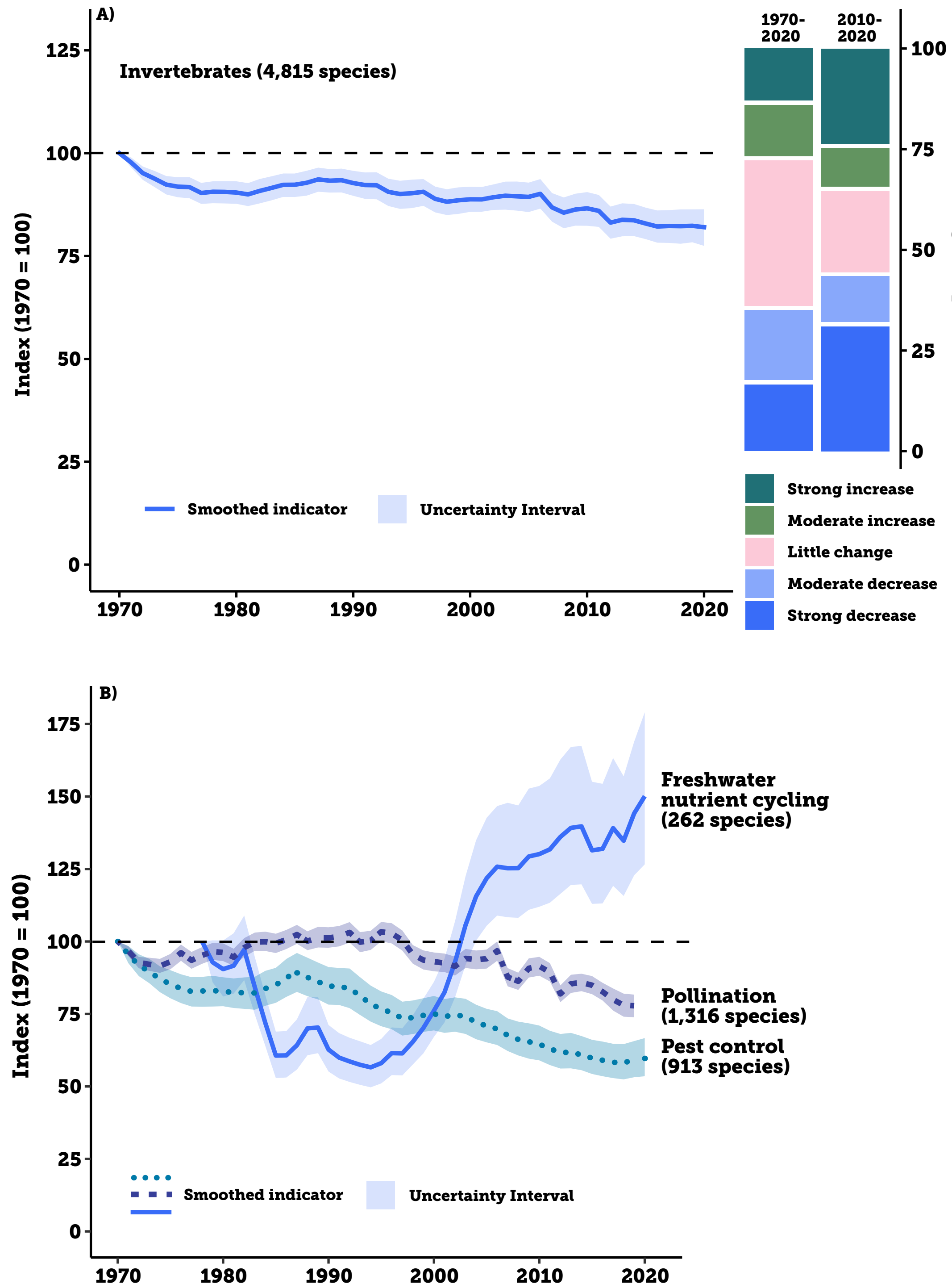


Figure 4: Change in average species' distribution for A) vascular plants, B) bryophytes and C) lichens in England. The bar chart shows the percentage of species within the indicator that have increased, decreased or shown little change in distribution.

Figure 5: Change in average species' distribution for A) terrestrial and freshwater invertebrates in England. B) Insect species grouped by ecological function (pollination, pest control and freshwater nutrient cycling). The bar chart shows the percentage of species within the indicator that have increased, decreased (moderately or strongly) or shown little change in distribution.



Invertebrates

The distribution indicator for 4,815 terrestrial and freshwater invertebrate species, for which England-specific trends are available, shows a decrease in average distribution of 18% between 1970 and 2020 (Figure 5A, UI: -23% to -14%). Within this change, since 1970, 36% of species showed strong or moderate decreases and 27% showed strong or moderate increases; 37% showed little change.

In the last 10 years (2010–2020), 44% of species showed strong or moderate decreases and 35% showed strong or moderate increases; 21% showed little change.

To help understand these patterns more clearly, species groups were categorised by the ecological functions they provide (Figure 5B[116]). Some groups provide more than one function and so are included in more than one indicator.

- Pollinating insects (bees, hoverflies and moths), which play a critical role in food production, show an average decrease in distribution of 22% (UI: -26% to -18%) since 1970.
- Insect groups (ants, carabid, rove and ladybird beetles, hoverflies, dragonflies and wasps) that predate species which damage food crops showed a precipitous average decline in distribution of 40% (UI: -46% to -33%) since 1970.
- The average distribution of species providing freshwater nutrient cycling (mayflies, caddisflies, dragonflies and stoneflies) saw an initial decline followed by a strong recovery ending 50% (UI: +27% to +79%) higher in 2020 compared to 1978. This pattern may in part be related to changes in river water quality[117] but although many measures of water pollution have improved over the past few decades, significant water pollution issues remain, in particular in catchments linked to intensive agriculture[131]. The UK version of the indicator starts in 1970 and also shows declines during the 1970s, so the initial declines observed here do not include changes prior to the late 1970s.

Turtle Dove, Ben Andrew (rspb-images.com)

Extinction risk

Here we break down the IUCN Red List assessments for Great Britain to show, for those taxa known to occur (or have previously occurred) in England, the proportion that qualify for each of the standard threat categories, by broad taxonomic group. Taxa assessed as Critically Endangered, Endangered or Vulnerable are formally classified as threatened. Only assessments formally approved by the commissioning statutory nature conservation body have been included.

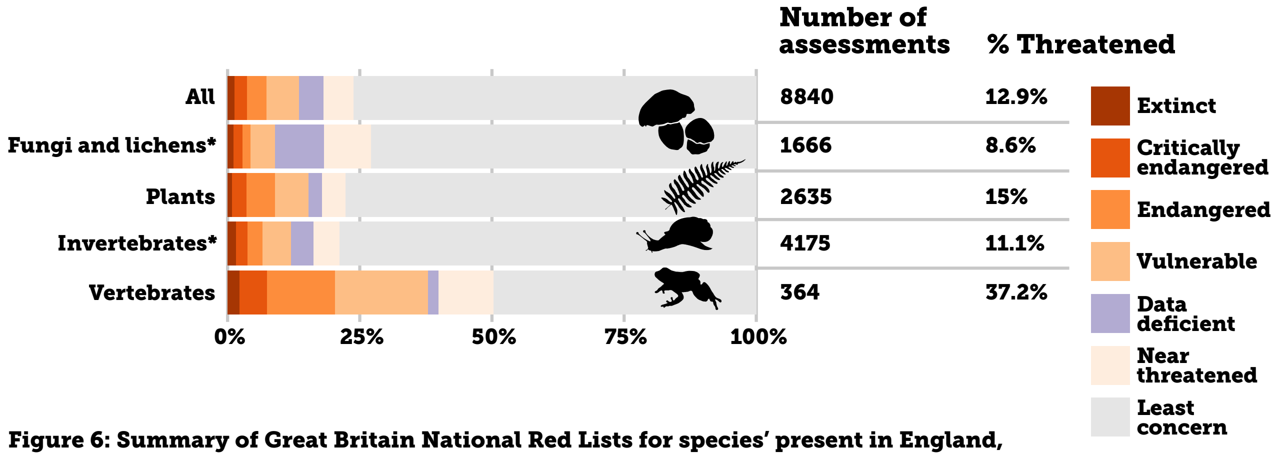


Figure 6: Summary of Great Britain National Red Lists for species' present in England, showing the proportion of assessed species in each Red List category, by broad taxonomic group. *At a Great Britain level only selected invertebrate groups have been assessed and less than 1% of fungi species.

Since the 2019 *State of Nature* report, the number of taxa formally assessed using the IUCN Regional Red List process[118], and known to have occurred in England, has increased from 7,615 to 8,840. Of the extant taxa, for which sufficient data are available, 1,076 (12.9%) qualify as being threatened and are therefore at risk of extinction from Great Britain (the scale at which Red List assessments are made)(Figure 6). Of the different taxonomic groups, 383 (15.0%) plants, 128 (8.6%) fungi and lichens, 130 (37.2%) vertebrates and 435 (11.1%) invertebrates qualify as threatened. We cannot, at present, assess whether extinction risk is changing over time because the vast majority of species have only a single Red List assessment. Natural England plans to repeat Red List assessments on a decadal basis and use them to produce a Red List Indicator to assess how extinction risk is changing over time[125]. This will be used to measure progress against the Environment Act 2021 target (relating to England only) to *"reduce the risk of species' extinction by 2042, when compared to the risk of species' extinction in 2022"*[126].

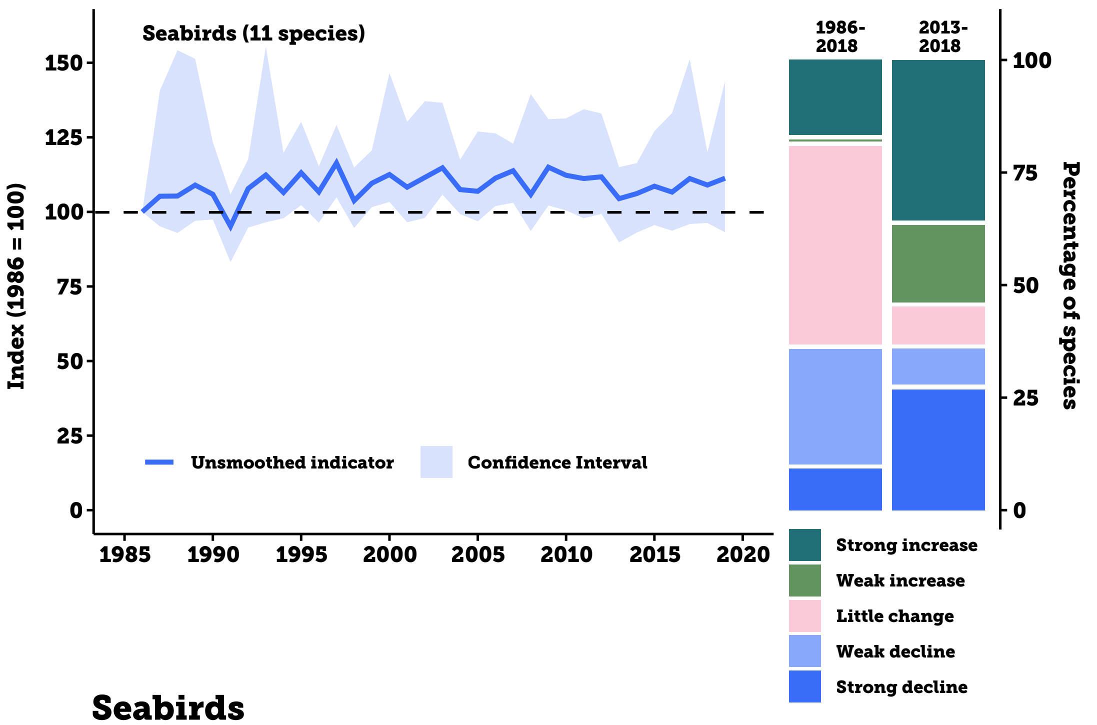
Marine

Change in species' abundance

Seabirds

The abundance indicator for 11 seabird species in England[122] starts in 1986 and overall shows little change in average abundance (Figure 7, 11%; UI: -7% to +44%). In the short term, the index increased by 4% between 2013 and 2018. Gannet abundance has increased rapidly, which has had a marked positive effect on the indicator. The five species that forage on the surface of the sea, for example Kittiwake, declined on average by 22%, in contrast to the four species that forage by diving, which increased on average by 168%.

These changes were measured prior to the recent and ongoing outbreak of Highly Pathogenic Avian Influenza.

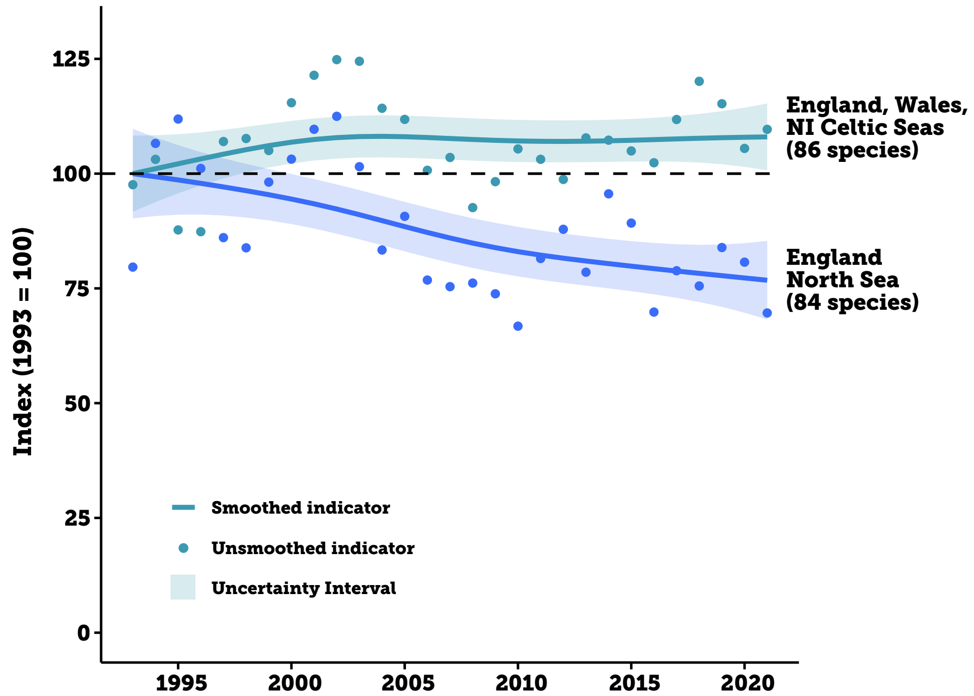


Seabirds

Figure 7: England biodiversity indicators: Seabirds. Change in average species' abundance[122] of breeding seabirds in England 1986 to 2019. The coloured line with shading shows the smoothed trend and associated uncertainty interval (95% Uncertainty interval), the points show the underlying unsmoothed indicator. The bar chart shows the percentage of species within the indicator that have increased, decreased (weakly or strongly) or shown little change in abundance. Source gov.uk/government/statistics/england-biodiversity-indicators

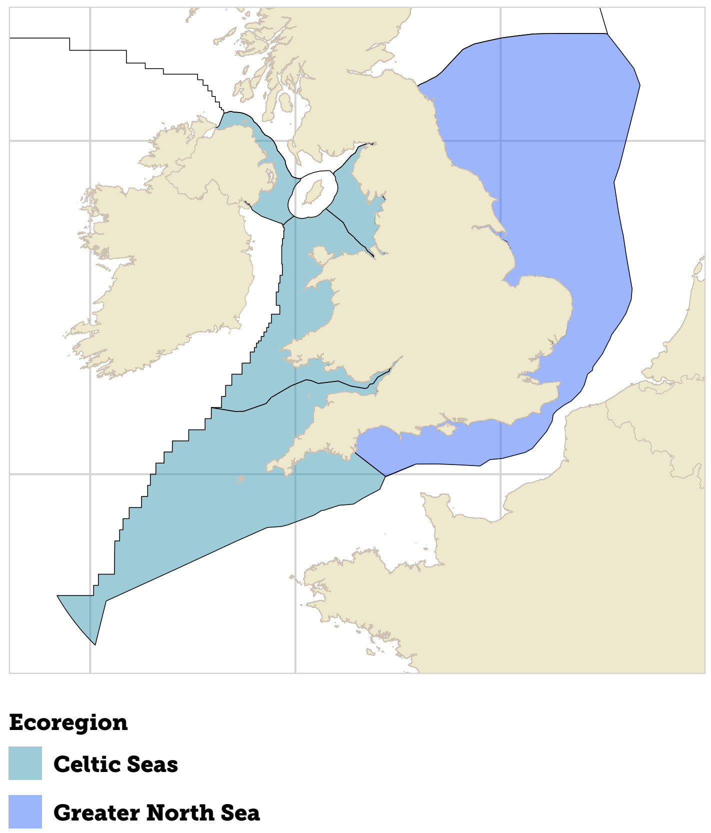
Demersal fish

The abundance indicator for the English North Sea declined by 23% since 1993 (Figure 8, UI:-32% to -15%). There were insufficient data within the English Celtic Seas to produce a robust abundance indicator for demersal fish, so here we present an indicator using data from the Wales, England and Northern Ireland Celtic Seas component of the UK Exclusive Economic Zone (EEZ). Between 1993 and 2022 the indicator increased by 8% (UI: 1% to 15%), potentially indicating the recovery of some species from previous declines.



Demersal fish

Figure 8: Change in average species' abundance for demersal and bathypelagic fish species in the English, Welsh and Northern Irish Celtic Seas and the English Greater North Sea from 1993 to 2021.



Pressures

Nature continues to be under pressure in England. Although it is difficult to compare the multitaxa species' abundance indicators for each country, due to the different time periods they cover, the average decline in species' abundance of 32% in England (Figure 1), is considerably greater than for the UK (19%).

Many of the pressures and recent changes in them described for the UK remain pertinent for England. Intensive management of agricultural land, largely driven by policies and incentives since WWII, has been identified as the most significant factor driving species population change in the UK[119]. As agricultural land constitutes 69% of England's area[127], these changes have had a major detrimental impact on its biodiversity. By 2021, the England farmland bird index had fallen 59% below its 1970 level[122] and our distribution indicators for species' providing pollination services and pest control services both saw substantial declines (Figure 5). Vascular plants associated with arable land and those adapted to areas of low soil fertility, such as semi-natural grasslands, have shown the greatest declines since the 1950s, largely due to changes to agricultural practices[121]. Steps are being taken towards more sustainable and nature-friendly farming. The extent of farmland under agri-environment schemes has rapidly increased in recent years[128], but measures of farmland biodiversity have not yet stabilised or begun to recover.

Persistently high levels of ammonia air pollution remain a major pressure for bryophytes and lichens in England, with ammonia levels above the critical threshold for bryophytes and lichens across 94% of England[132]. Only in Northern Ireland is this issue worse, with 100% of land affected. Declines in sulphur dioxide pollution have allowed some bryophytes, including many epiphytes, to recover and has also likely played a role in the average increase in distribution seen in the lichen distribution indicator (Figure 4).

At a UK scale climate change was found to be the second most important driver of species change and it is likely that this is also the case in England[119]. The abundance of hundreds of moth species has declined substantially in England in the last 50 years and climate change has been highlighted as a major pressure on moth populations[120]. Whilst it is likely that the net impact of climate change on moth abundance in England is negative, it is also likely to have supported increases in other species, as well as impacting species phenology (the timing of seasonal events).

Climate change and overexploitation have been highlighted as the key long-term pressures on marine life in the UK[114] and these likely remain true at an England level. Added to these are the more recent potential pressures from marine renewable energy development. Although critical to plans to mitigate climate change, ambitious targets to upscale renewable energy generation at sea[129] also have the potential to negatively impact marine life, if not planned, managed and monitored sensitively. Steps are being taken to do this with the Marine Spatial Prioritisation Programme.


Oystercatcher, David Norton (rspb-images.com)

CONSERVATION RESPONSE

Global nature recovery targets

In 2018, the UK Government published the 25 Year Environment Plan (25YEP), setting out a long-term vision for environmental policy in England. Following on from this, the Environment Act 2021 laid the foundation for the establishment of the Environmental Improvement Plan 2023 (EIP23). The UK Government is legally required to publish annual progress reports, and to produce a revised EIP every five years to keep policies up to date.

The EIP23 contains an extensive list of goals and policy pledges, the most important of which are legally binding. For England, these are:

- To halt the decline in species' abundance by 2030, and then by the end of 2042 increase species' abundance so that it is greater than in 2022 and at least 10% greater than in 2030
- To restore or create more than 500,000 ha of wildlife-rich habitat by 2042, alongside our international commitment to protect 30% of our land and ocean by 2030 (the '30x30' target). There is an interim target to restore or create 140,000 ha of wildlife-rich habitats outside protected sites by 2028, compared to 2022 levels
- To improve the Red List Index for England for species extinction by 2042 compared to 2022 levels
- To increase tree canopy and woodland cover from 14.5% to 16.5% of total land area in England by 2050, with a new interim target to increase this by 0.26% (equivalent to 34,000 ha) by 2028
- For 70% of designated features in Marine Protected Areas (MPAs) to be in favourable condition by 2042 with the remainder in recovering condition, and an interim target of 48% of designated features to be in favourable condition by 2028, in line with the trajectory required to achieve the long-term target.

England is also party to a new set of international biodiversity targets under the Convention on Biological Diversity (CBD). In December 2022, the CBD agreed the Kunming-Montreal Global Biodiversity Framework[7] (GBF). It confirmed a global mission to halt and reverse the loss of nature by 2030, and achieve recovery by 2050, so that nature will thrive, 'sustaining a healthy planet and delivering benefits essential for all people'. The GBF includes four outcome-oriented goals to achieve by 2050, covering protection and restoration of ecosystems, species and genetic diversity, as well as the sustainable use of biodiversity, the equitable sharing of benefits arising from biodiversity, and resource mobilisation. These are underpinned by 23 targets to achieve by 2030, falling under three headings:

1) Reducing threats to biodiversity

2) Meeting people's needs through sustainable use and benefit sharing

3) Tools and solutions for implementation and mainstreaming

To support the delivery of these goals and targets England has committed to developing and implementing 48 Local Nature Recovery Strategies and to delivering legally binding targets to restore nature. In this report, we have grouped the international GBF targets into five broad areas:
Improved species status; Nature-friendly farming; and sustainable forestry and fisheries; Protected areas, Ecosystem restoration, Nature, climate and people.

Global Goals for 2050

Goal A:	Goal B:	Goal C:	Goal D:
Outcomes for ecosystems, species and genetic diversity	Sustainable use and nature's contributions to people	Equitable sharing of benefits from genetic resources	Means of implementation, including finance

2030 Mission

To take urgent action to halt and reverse biodiversity loss to put nature on a path to recovery for the benefit of people and planet

Global Targets for 2030

Reducing threats to biodiversity	Meeting people's needs	Tools and solutions
Target 1: Spatial planning	**Target 9:** Sustainable use of wild species	**Target 14:** Mainstreaming
Target 2: Ecosystem restoration	**Target 10:** Sustainable production	**Target 15:** Business action
Target 3: Protected areas	**Target 11:** Nature's contribution to people	**Target 16:** Sustainable consumption
Target 4: Recovery of ecosystems, species and genetic diversity	**Target 12:** Urban environment	**Target 17:** Biosafety
Target 5: Overexploitation	**Target 13:** Access and benefit sharing	**Target 18:** Subsidy reform
Target 6: Invasive non-native species		**Target 19:** Financial resource mobilisation
Target 7: Pollution		**Target 20:** Capacity building
Target 8: Climate change		**Target 21:** Knowledge and data sharing
		Target 22: Indigenous peoples and local communities
		Target 23: Gender

State of Nature chapters	Core targets
Improved species status	Goal A, T4
Nature-friendly farming, and sustainable forestry and fisheries	T10
Protected areas	T3
Ecosystem restoration	T2
Nature, climate and people	T1, T8, T12

Figure 9: Summary of the goals and targets agreed within the Kunming-Montreal Global Biodiversity Framework and how these targets are discussed within this report.

Improved species status

Numerous species have benefited from conservation, including the Large Blue Butterfly through a successful reintroduction, various bat species from legal protection of roost and hibernation sites, and Bittern in revitalised reedbeds. However, many previously common and widespread species are continuing to decline in England. While halting and reversing biodiversity decline is vital, it is only the first step towards achieving a healthy environment with resilient species populations, thriving habitats and functioning ecosystems.

Preventing extinctions, and halting or reversing declines in abundances and distributions, requires both targeted actions for specific species, and broad measures to improve environmental quality and tackle drivers of nature loss. The Global Biodiversity Framework commits parties to: halt human-induced extinctions of threatened species; achieve a ten-fold reduction in risk and rate of extinction; maintain genetic diversity and increase the abundance of native wild species to healthy and resilient levels by 2050; and protect 30% of land and seas by 2030[7]. In England, under the Environment Act 2021 and the EIP23, there is a legally binding target to halt declines in average species' abundance by 2030, and then by the end of 2042 to increase species abundance so that it is greater than in 2022 and at least 10% greater than in 2030, alongside restoring or creating more than 500,000 ha of wildlife-rich habitat by 2042.

RSPB Rainham Marshes Nature Reserve, Sam Turley (rspb-images.com)

These targets will require conservation actions covering scales from local to international, and at levels from genes to ecosystems. A suite of complementary actions is available, including creating protected areas, changing habitat management, restoring lost or degraded habitat, improving connectivity among populations, eradicating invasive species, carrying out species reintroductions and other conservation translocations, and introducing supportive legislative policies. However, conservation action is often monitored at a site or project level. Hence it remains challenging to understand the impact of conservation on species' populations, particularly for widespread species, and to determine the scale at which interventions should be applied to meet and exceed national and international targets.

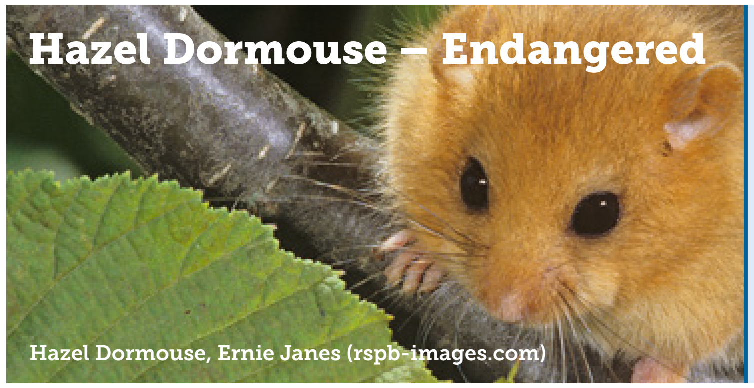
Action – how is species conservation being conducted in England?

Many effective conservation tools have been developed in recent decades. Figure 10 presents examples of a range of interventions including targeted actions, such as conservation translocations, habitat restoration or management, wider landscape interventions, like agri-environment schemes, and legislative change, providing an enabling policy framework. The species reflect a variety of biomes, taxonomies and life histories, with conservation actions implemented at a range of spatial scales by landowners, charities, government and the public. These examples focus on a single conservation action; however, in most cases more than one type of action will be needed to fully restore species' populations. Equally, actions designed to favour one target species often have beneficial impacts on others.

Ecosystem restoration and landscape-scale conservation have a central role in tackling the nature and climate emergency. Multispecies conservation projects that embody this concept include Back from the Brink[8] and the Solent Seascape Project[9] in England. These partnerships operate at multiple sites and tackle an array of conservation challenges including habitat loss, invasive species impacts and disturbance. These partnerships benefit threatened target species across multiple taxa. Moreover, they engage local communities, connecting people with nature. Back from the Brink involved 59,000 people, including over 10,000 who learnt new skills and nearly 4,000 who volunteered their time. Similarly, the Zoological Society of London has been working alongside local residents to restore nearly 40 km of waterways in the River Thames catchment since 2000. This has generated multiple benefits for nature, but has also resulted in better water quality, reduced threat from flooding, and supported the wellbeing of people involved in the project and the wider community. This project has now been repeated at other sites throughout England.

> ***"There is a legally binding target to halt declines in average species' abundance by 2030"***

Figure 10: Species examples showing the range of conservation interventions for a range of taxa.

Species and Great Britain Red List status	Population change	Conservation actions	Conservation actions and impact
Hazel Dormouse – Endangered  Hazel Dormouse, Ernie Janes (rspb-images.com)	**51%↓** decline in Britain since 2000	**Conservation translocations**	Hazel Dormice are slow breeders and, being predominantly arboreal, unable to easily recolonise lost areas. Reintroductions of captive-bred animals can restore species to regions from which they have gone locally extinct. Since 1993, 1,078 Hazel Dormice have been released into 25 woodlands in 13 counties. This species recovery programme has expanded the northern edge of the species distribution, and driven landscape-scale habitat restoration efforts, such as planting hedgerows and reinstating woodland management.
Water Vole – Endangered  Water Vole, Ben Andrew (rspb-images.com)	**47%↓** decline in abundance in England 1998/99-2016[43]	**Invasive species control**	Waterlife Recovery East has been coordinating efforts across Norfolk, Suffolk and Cambridgeshire to eradicate non-native American Mink to protect Water Vole populations. Extensive trapping began in 2021. The 700 smart traps send alerts to a central hub, reducing the amount of volunteer monitoring effort required. The mink population declined by 71.5% in the first year, and Water Vole numbers have begun to recover.
Twaite Shad – Vulnerable  Twaite Shad, Jack Perks (rspb-images.com)	**29%↓** decline in abundance in Britain 2008-2020[10]	**Fish ladders**	Unlocking the Severn, the largest project of its kind in Europe, is reconnecting Twaite Shad to over 150 miles of spawning habitat by creating four fish passes around otherwise impassable weirs[11]. Shad were seen spawning upstream of the third pass in the year after construction, as have Sea Lamprey, another threatened species. There have also been wider benefits for other fish within the Severn, with 25 different fish species recorded swimming through the fish pass at Diglis.
Duke of Burgundy – Vulnerable  Duke of Burgundy, David Kjaer (rspb-images.com)	**35%↓** abundance decline 1979-2021[12] 10-year trend little change	**Habitat management**	Duke of Burgundy have recently been down-listed from Endangered to Vulnerable in Great Britain[13] and conservation is likely to have played an important role in this status improvement. Habitat management in the North York Moors helped stabilise populations by providing open grassland to support the larval foodplants Primrose and Cowslip, and the scrubby grassland patches utilised by the species[14].

Nature-friendly farming, and sustainable forestry and fisheries

The current and future state of nature depends on the adoption of nature friendly and sustainable practices in fisheries, farming and forestry. The Government has committed to Target 10 of the Global Biodiversity Framework, which focuses on managing agriculture, aquaculture, fisheries and forestry sustainably via the use of biodiversity-friendly practices. The Environment Improvement Plan 2023 for England (EIP) pledges to increase nature-friendly farming on land by 2030, expand tree canopy and woodland cover by 2050, restore Marine Protected Areas with stronger protections by 2024, and implement Fisheries Management Plans to enhance sustainability on a stock-by stock basis These efforts aim to conserve biodiversity, ensure productivity and maintain nature's contributions to people.

Farming

Farmland wildlife has declined due to agricultural intensification, facilitated by agrochemical use and mechanisation since the 1950s[15]. Agriculture produces 11% of UK greenhouse gas emissions, impacting public health and wildlife[16,17]. In addition, some widespread, generalist species, such as Hedgehogs, are now absent from large tracts of farmland across England[18]. To address these issues, the UK Government and devolved administrations have implemented agri-environment schemes (AES) to promote sustainable and nature-friendly farming. As of 2020, AES-covered farms in England accounted for 20.7% of the agricultural area, with 1.4 million ha in legacy Higher Level Stewardship agreements and 1.6 million ha in Countryside Stewardship agreements.

Agri-environment schemes are the primary policy tool in England for addressing farmland biodiversity decline. The Agriculture Act 2020 reformed agricultural policy in England, introducing new Environmental Land Management schemes and modifying the Countryside Stewardship scheme. Well-targeted AES accompanied by appropriate advice can benefit both overall biodiversity[19-23] and specific taxonomic groups[24-29], although this is sometimes over long time-scales[30].

Since 2018, Defra has been designing new agricultural policies for England. This involves amending the Countryside Stewardship scheme and introducing two additional schemes: the Sustainable Farming Incentive and Landscape Recovery[31]. These projects have multiple objectives, including supporting biodiversity, addressing climate change, improving water quality and promoting public access. Currently, Landscape Recovery is in the pilot phase, with 21 projects funded in 2022 and plans for an additional 25 projects in 2023. The funding covers the project development phase, with the expectation that successful projects will leverage private finance for the project delivery phase.

The EIP includes a 2030 target of achieving 65-80% adoption by landowners of nature-friendly farming practices on 10-15% of their land[32]. Meeting this target could potentially halt species declines. A study found that higher-tier AES agreements covering 47% of arable and 26% of pastoral farmed landscapes would be necessary to increase regional farmland bird populations by 10% over a decade[33]. Priority and specialist bird species, as well as upland farming systems, would require even higher provision levels and over larger areas. Similarly, woodland bird populations would likely require Woodland Improvement Grant management covering a significant proportion of woodlands (36-50%) to positively impact their population trends[34].

Targets set under the Environment Act 2021 also aim to reduce nitrogen, phosphorus and sediment pollution from farming by 40% by 2038. However, the specifics of local targeting, incentives and whether these reductions will be sufficient for freshwater wildlife recovery remain unclear.

Forestry

In 2022, woodland cover in England was 10.2% (1.32 million ha), up from 9.5% in 1998. Approximately 24% of woodland cover in England is certified as sustainably managed[35]. The UK's woodland composition is evenly split between native and non-native tree species, although conifer plantations only account for 26% of woodland cover in England. Forest Research conducted the first comprehensive Woodland Ecological Condition assessment in 2020, evaluating indicators such as deadwood, veteran trees, open space, tree species diversity, ages and structure. In England, 9% of native woodland stands are in favourable condition, 90% are intermediate, and 1% are unfavourable[36].

Changes in woodland structure following the decline of traditional management techniques has been identified as one of the drivers of the population decline of specialist woodland birds[37]. Although new woodlands are being established around the UK, it may take centuries before they can support those specialist species found in ancient sites. Actively managing existing woodlands to vary the age structure, or species-targeted AES woodland management can help to increase bird diversity in the short term[34]. Currently, little is known about the impact of broader AES woodland management schemes, and work is underway to assess the impact of the Woodland Improvement (WD2) option of the Countryside Stewardship scheme[38].

Under the EIP, there is a target to increase tree canopy and woodland cover from 14.5% to 16.5% of total land area in England by 2050. Alongside this, under the Net Zero Strategy, the UK Government has committed to increasing tree-planting across the UK to 30,000 ha per year by March 2025. After 2024-25, England will primarily deliver tree-planting through the Environmental Land Management scheme, part of Defra's wider Future Farming and Countryside Programme.

"The EIP includes a 2030 target of achieving 65-80% adoption by landowners of nature-friendly farming practices on 10-15% of their land[32]"


RSPB Arne Nature Reserve, Rosie Dutton (rspb-images.com)

Marine fisheries

UK fishing vessels land around 400,000 tonnes of fish each year in the UK and an additional 200-300,000 tonnes abroad. Around 70% of UK landings by weight are in Scotland. The percentage of UK quota-fish stocks fished at or below their maximum sustainable yield, and/or within acceptable mortality range levels, has improved from 9% in 1990 to 50.9% in 2019. However, 26.3% of UK quota-fish were overfished in 2019.

Bottom-trawling has detrimental effects on target species, benthic substrates and associated species[39]. Unsustainable fishing practices also result in the unintended capture of non-target wildlife species, including marine mammals, seabirds, some species of sharks and rays, and non-target fish[40-45]. Efforts are underway to address these issues, including collaborations among fishers, scientists, NGOs and governments. Initiatives include the use of innovative methods like 'looming eyes' buoys and predator-shaped kites to prevent seabird bycatch, as well as projects developing electronic monitoring solutions and conducting risk assessments for seabird bycatch in gillnet fisheries[41].

Efforts are underway to implement ecosystem-based fisheries management, particularly regarding industrial fisheries for Sandeels in the North Sea. Sandeels are crucial for the marine ecosystem, serving as a vital food source for seabirds, marine mammals and larger fish. All UK administrations have recognised that urgent measures are needed to protect Sandeels and are considering closure of these fisheries.

The Joint Fisheries Statement, agreed upon by all four UK fisheries administrations, outlines policies to achieve the objectives of the UK Fisheries Act 2020. Key elements, including Fisheries Management Plans, are currently being developed. A forthcoming Future Catching Policy aims to prevent and monitor unwanted catch, while proposals for England will soon open for consultation, including the use of Remote Electronic Monitoring to support sustainable fisheries.


Troup Head RSPB reserve, Andy Hay (rspb-images.com)

Protected areas

Protected areas are essential for conserving species and habitats and providing benefits to people. Target 3 of the Global Biodiversity Framework is the '30 by 30' target, which commits to protecting 30% of land and sea for nature by 2030, prioritising areas of biodiversity significance. Achieving the international 30x30 target requires effective management, equitable governance, and providing local communities with access to benefits.

Action – extent and condition

English protected areas on land include various designations, including Sites of Special Scientific Interest (SSSIs), Special Areas of Conservation (SACs), Special Protection Areas (SPAs), Ramsar sites and National Nature Reserves (NNRs); taken together these sites cover 7% of England's land[46]. These areas prioritise nature conservation but also allow compatible activities. National Parks and Areas of Outstanding Natural Beauty serve multiple purposes, including conserving natural beauty, wildlife and cultural heritage, while facilitating public enjoyment and recreation. The Sandford Principle gives priority to the conservation purpose of National Parks, and encompasses nature conservation, natural beauty, wildlife and cultural heritage.

Only 34% of terrestrial biological features of Sites of Special Scientific Interest (SSSIs) are in favourable condition[47]. The UK government has committed to restoring 75% of terrestrial protected sites to a favourable condition by 2042[32].

At sea, progress has been made in designating Marine Protected Areas (MPAs) in English waters, including Marine Conservation Zones and three pilot Highly Protected Marine Areas (HPMAs) identified in 2023[48]. Along with marine-focused SPAs and SACs, designated sites now cover 40% of English waters[46]. The UK government has also pledged to have 70% of designated features in MPAs in good condition by 2042.

However, significant gaps exist in monitoring, management and enforcement. Damaging fishing practices, like bottom-trawling, persists in 98% of offshore UK MPAs designated for benthic features.

The condition of terrestrial SSSIs, SPAs and SACs is assessed using Common Standards Monitoring. However, many sites have not been assessed recently; for example, 78% of English SSSIs had no site visit between 2015 and 2021. The recently published Environmental Improvement Plan has set a new target for all SSSIs in England to have an updated condition assessment by 2028.

Impact

Landscapes in the UK containing protected areas exhibit a greater representation of priority species compared to unprotected landscapes[50]. Across more than 1,200 invertebrate species, protected areas demonstrate higher species richness, with an average of 30 more species found in 1 km^2 squares with high levels of protection compared to unprotected areas[51]. However, the patterns of higher species richness or abundance in protected areas may be explained by historically greater losses in unprotected areas, or protected areas generally being initially sited in nature-rich areas[52,53].

While protected areas generally support richer biodiversity, evidence on species trends is mixed. Bird species of conservation concern have positive population trends in protected areas when there is also a high coverage of protected areas in the surrounding region[54]. Also, sites designated for specific target species groups, such as SPAs and Ramsar sites for wetland birds, are more likely to benefit populations, and larger areas are more beneficial than smaller ones[55].

The impacts of MPAs on species and habitats are not fully understood as there is incomplete monitoring and management, coupled with enforcement challenges. Limited budgets allow for monitoring of only four to six English MPAs annually[49]. The Marine Management Organisation is implementing a programme to manage fishing activities in MPAs by 2024 but currently only four sites have implemented bylaws for fishing management[56], including the extensive Dogger Bank, known for its ecological importance and as a habitat for Sandeels[57]. Trawl fishing is now prohibited in the entire site, resulting in a significant reduction in fishing effort[58].

Carbon and protected areas

Healthy ecosystems provide various benefits, including food sources, income generation and recreational opportunities for people. They also play a crucial role in climate change mitigation and adaptation by capturing and storing carbon, reducing the impact of extreme weather events, and protecting coastal areas. Around 47% of carbon stocks in nature-rich terrestrial habitats in the UK are found within existing protected areas[59]. MPAs not only restore habitats and species but also contribute significantly to climate change mitigation by safeguarding 'blue carbon' stores, with the UK's MPA network holding substantial carbon stocks[60].

Future

While there are no legally binding targets for site condition in England, the 25 Year Environment Plan sets a target for 75% of protected areas to be in favourable condition by 2042. The Environmental Improvement Plan[32] includes interim targets for all SSSIs to have an up-to-date condition assessment, and for 50% of SSSIs to have actions on track to achieve favourable condition by 2028[61].

The Global Biodiversity Framework 30x30 target represents a significant opportunity to drive improvements in the extent and condition of protected areas for nature in England. Alongside protected areas, Other Effective Area-based Conservation Measures (OECMs) can also contribute to this target. These areas outside designated sites are a novel concept in England, and will require new frameworks for their identification, monitoring and reporting.

The first three Highly Protected Marine Areas (HPMAs) in England cover nearly 1000 km^2. These areas are designed to achieve full ecosystem recovery, so may offer an opportunity to restore populations of declining species such as Balearic Shearwater.

Ecosystem Restoration

Anthropogenic pressures have resulted in significant habitat loss, change and degradation in the UK[62]. Ecosystem restoration plays a vital role in reversing these trends by enhancing biodiversity, ecological function and ecosystem services. These efforts at both global and national levels aim to restore and protect natural and semi-natural habitats. Target 2 of the Global Biodiversity Framework commits to restoring 30% of degraded habitats effectively by 2050 and enhancing nature's contribution to people through ecosystem-based approaches and nature-based solutions for climate change. In England, the UK Government has pledged to restore or create over 500,000 ha of wildlife-rich habitats by 2042.

Restoration can aim to reduce degradation, or focus on improving conditions to facilitate partial or full ecosystem recovery. Recovery can be the result of active management or occur naturally when pressures on an ecosystem are reduced, and approaches include rewilding, rehabilitation, repair and regeneration. Rather than preserving ecosystems as static entities, there is a shift towards enabling adaptation to changing climatic conditions and external pressures. This section focuses on selected habitat types offering significant benefits for biodiversity and, where sufficient data is available, reports on restoration efforts[63,64,83].

Action – extent and condition of ecosystems

Twenty-four percent of English woodland is certified as sustainably managed[65], and 9% of native woodland in England was in good ecological condition at the last assessment in 2010-2015[36]. Half of English saltmarsh, and 27% of peatland are in good ecological condition[67,69]. None of the marine regions assessed in 2018 met the Good Environmental Status target of less than 15% of the seafloor subject to high levels of fishing-related disturbance[68], nor were the targets met for intertidal and soft sediment habitats[113].

Brown Hare, David Tipling (rspb-images.com)

Article 17 of the Habitats Directive relates to habitats considered to be rare, endangered or vulnerable in Europe[71]. There are 70 of these habitats in England; by area these are 39.3% woodland, 29.3% wetland, 16% heathland, 7.5% grassland, 6.9% coastal and 1% inland rock and orchard. At the most recent assessment, four habitats were in favourable condition, 60 in unfavourable condition, and six in unknown condition[72].

There are significant proportions of the English seafloor habitats which are subject to high levels of disturbance; 75% of the English Channel, 50% of the northern North Sea and 48% of the southern North sea[68].

Impact

Woodland restoration can involve planting or fostering natural regeneration of native tree species, reducing excessive grazing and browsing pressure from livestock and deer, eradicating or controlling invasive non-native species such as *Rhododendron ponticum*, and thinning or coppicing to open the woodland canopy. Examples of restoration projects include: the Heart of England Forest, which aims to create a continuous 12,000 ha woodland across Worcestershire and Warwickshire; the Celtic Rainforest along Britain's Atlantic coastline; and the Woodland Trust seeking to treble the area of native woodland in favourable ecological condition by 2030 .

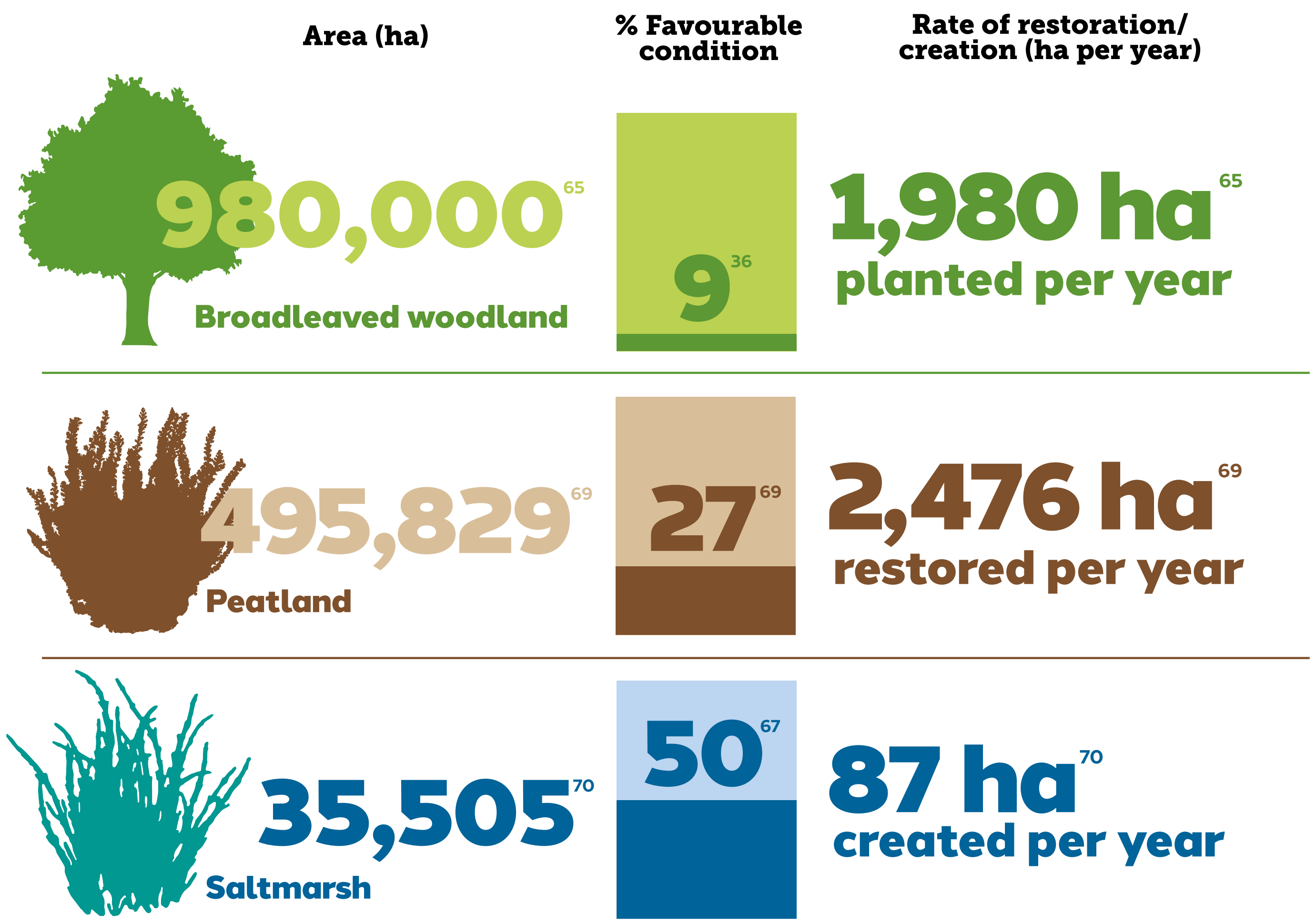


Figure 11: Extent, condition and rate of restoration or creation of select carbon-rich habitats in England.

Peatland restoration as a nature-based solution to climate change

Ecosystem restoration can help mitigate and adapt to climate change, offering numerous benefits for people, wildlife and the environment. A prime UK habitat for climate-motivated restoration are peatlands, which include blanket bog, raised bog and fenland. Around three-quarters of English peatlands are damaged or degraded due to factors such as nitrogen deposition, overgrazing, burning, drainage and afforestation with commercial timber plantations[69]. Initiatives like the Nature for Climate Fund support large-scale restoration projects such as the Peak District's 'Moors for the Future', to reverse some of this damage. The 'Nature, climate and people' section of this report explores nature-based solutions in more detail.

Future

Ecosystem restoration can be lengthy, and outcomes influenced by external factors beyond land managers' control. While some projects may yield noticeable results in a few years, restoration often requires decades or even centuries to fully realise its benefits. Monitoring progress over such extended timescales can be challenging, necessitating long-term planning, investment and adaptive management strategies. There is still much to learn about the most effective restoration approaches. In the UK and England, the current monitoring and reporting of habitat condition is insufficient to assess progress towards statutory targets. Current restoration rates are insufficient to meet the goal of restoring 30% of degraded habitat by 2050. To meet the interim target of 30% under restoration by 2030, it is crucial to engage closely with local communities, involving them in shared restoration plans for improved outcomes for both people and the environment[73].

Case study

RSPB Wallasea Island Nature Reserve, David Wootton (rspb-images.com)

Coastal habitats at Wallasea Island

Over the last 400 years, the Essex coast in south-east England has lost 91% of its intertidal salt marsh to land claims for agriculture, increasing coastal erosion and sea-level rise. Wallasea Island, on the Thames Estuary,was enclosed in sea walls and used for grazing marsh until it was drained and converted to arable land in the 1930s. Between 2009 and 2016, the Environment Agency and the RSPB undertook managed realignment to restore intertidal habitat, creating more space for sea water in the estuary. More than three million tonnes of earth were brought by boat from the tunnels of a large rail infrastructure project in London to help create a 115 ha intertidal area of saltmarsh, islands and mudflats. The reserve covers more than 740 ha, two-thirds of which have now been transformed from arable farmland to saltmarsh, mudflats, lagoons and grazing marsh. Wallasea Island is now a wildlife-rich habitat and a popular site for people to visit, with 30,000 visitors in 2020[74].

Nature, climate and people

As outlined elsewhere in this report, there are a number of nature targets in the UK and England, including to halt and reverse biodiversity declines and restore degraded habitats. However, restoration must be integrated with efforts to mitigate and adapt to climate change, in order to meet the statutory net zero emissions target for 2050. Moreover, we must also meet societal needs for food, housing, transportation, employment, energy and access to nature, including a target that people should be able to access green or blue spaces within a 15-minute walk from their homes.

Simulations indicate that maximising nature-based solutions such as native woodland creation and peatland restoration are crucial for achieving net-zero emissions in the land sector. However, trade-offs with food production may arise that could be offset through a combination of dietry change, food waste reduction and yield growth[75]. Careful evaluation of costs and benefits are necessary, particularly the potential for domestic actions to have unintended impacts on overseas biodiversity (offshoring)[76]. Integrating nature conservation, climate action and land use is essential, as highlighted by the Global Biodiversity Framework's targets on biodiversity-inclusive spatial planning, climate resilience and access to green and blue spaces. Following Recommendation 9 of the National Food Strategy (2021), the UK Government has committed to publish a Land Use Framework in 2023, to guide local decision making and ensure an optimum balance between food, climate and nature recovery goals.

Action – Extent of anticipated land and sea-use change

Achieving the UK's legally binding net zero emissions target[77-80] requires both sequestration (the removal of greenhouse gasses from the atmosphere) and mitigation (reducing greenhouse gas emissions). Adaptation (preparing for the impacts of climate change) is also needed to minimise impacts on society and environment. All will require significant changes in land and sea use, and nature-based solutions (NbS) can play a crucial role.

Adaptation efforts can include restoring natural processes, such as river basin management to reduce flooding and storm damage. For wildlife, adaptation involves providing a resilient network of natural habitats, with more, larger and better-connected sites to accommodate the inevitable range-shifts driven by climate change.

Land-based mitigation focuses on restoring carbon-rich habitats like peatlands and promoting habitat creation, particularly through afforestation, with a target to plant 180,000 ha of new woodland in England by 2042[61]. The impacts of afforestation on climate and nature will vary over decades and centuries, influenced by factors such as tree species, soil types, ground disturbance levels and the habitats being replaced by trees[81-84].

Efforts to tackle climate change will involve a vast increase in renewable energy capacity. The British Energy Security Strategy includes an ambition for 50GW of energy from offshore wind by 2030, representing a near fivefold increase during the current decade. Further expansion is likely beyond 2030, and the UK's Climate Change Committee recommends a further doubling of capacity by 2050[85].

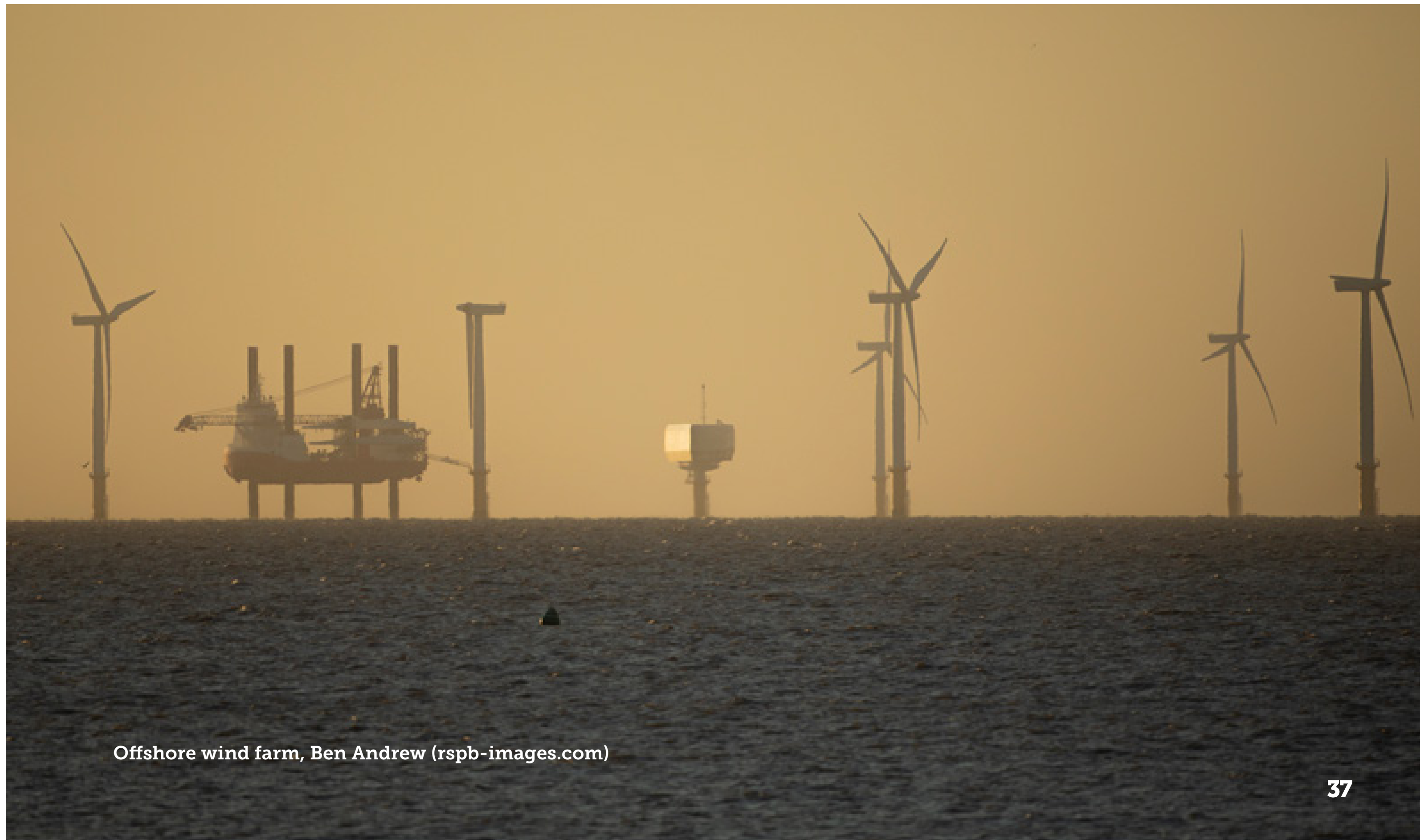
By 2050, the UK's population is projected to increase by four million, with a higher proportion residing in urban areas. This will lead to shifts in land use in order to meet housing targets and improve access to urban green spaces. Well-designed natural areas in urban settings are crucial for both people and wildlife, allowing the free movement of species and preventing inbreeding in isolated wildlife populations. The UK Government's Levelling up and Regeneration Bill proposes significant changes to the land-use planning system in England, including replacing existing systems of environmental assessment with a novel, and as yet undesigned, Environmental Outcomes Report.

Impact

Offshore wind and marine spatial planning

The UK and devolved governments have ambitious targets for renewable energy generation, including a significant contribution from offshore wind. However, poorly planned projects can harm the marine environment, potentially affecting a wide range of species. Seabirds are at risk from direct collision, displacement from foraging areas and disruption of important flight paths[87-90]. Impacts on migrating bats is also a significant concern but less information is available than for birds[91,92]. Noise from construction activities, such as pile driving, can have short-term negative effects on cetaceans and fish[93,94] while artificial light may represent ongoing disturbance. The impacts on benthic and fish communities are not well understood[95]. Electrical fields around subsea cables and operational noise can affect species that rely on magnetic or electrical cues[96,97]; construction materials may create artificial reefs, altering species communities[98,99]; while reduced fishing effort within windfarms may cause local concentrations of fish, but will in turn attract seabirds, increasing collision risk[100,101].

It is essential to consider the environmental implications of offshore wind projects and implement effective mitigation measures to minimise negative impacts on marine ecosystems. There is now a Marine Spatial Prioritisation Programme (MSPri) in England which seeks to address this need. Proper planning and monitoring are crucial for achieving renewable energy goals while safeguarding biodiversity and the health of marine ecosystems. Cumulative impacts of offshore installations rather than each individual development must also be considered. This is now recognised in the development process, but many outstanding uncertainties require further research.


Offshore wind farm, Ben Andrew (rspb-images.com)

Robin, Ben Andrew (rspb-images.com)

Impact – people and planet

Health and wellbeing benefits of natural spaces

Access to nature and greenspace has significant benefits for mental and physical health, helping reduce health inequalities[102-104]. However, access to nature is not equitable across the UK, with variation in proximity to and quality of green and blue spaces[105]. While 88% of households in Great Britain have access to a garden, this varies based on socio-economic status and ethnicity; London has the lowest garden access (79%)[106]. Approximately 72% of households in Great Britain live within a 15-minute walk of a public park[106] and in England, around 62% live within a maximum of 1 km of greenspace[107]. The EIP sets a target for everyone to live within 15 minutes' walk of green or blue space[108].

The role of biodiversity in nature-health relationships is not fully understood. Some studies find positive associations between natural environment richness or diversity and mental health and wellbeing[109]. For example, parks in Bradford with higher biodiversity were linked to restorative benefits, and higher bird abundance correlated with lower rates of depression, anxiety and stress[110]. However, non-significant and negative relationships were also observed[109]. Abundance of certain species groups, such as birds, may have more influence on wellbeing than overall species richness[111].

Future – integrating climate and nature responses on land and at sea

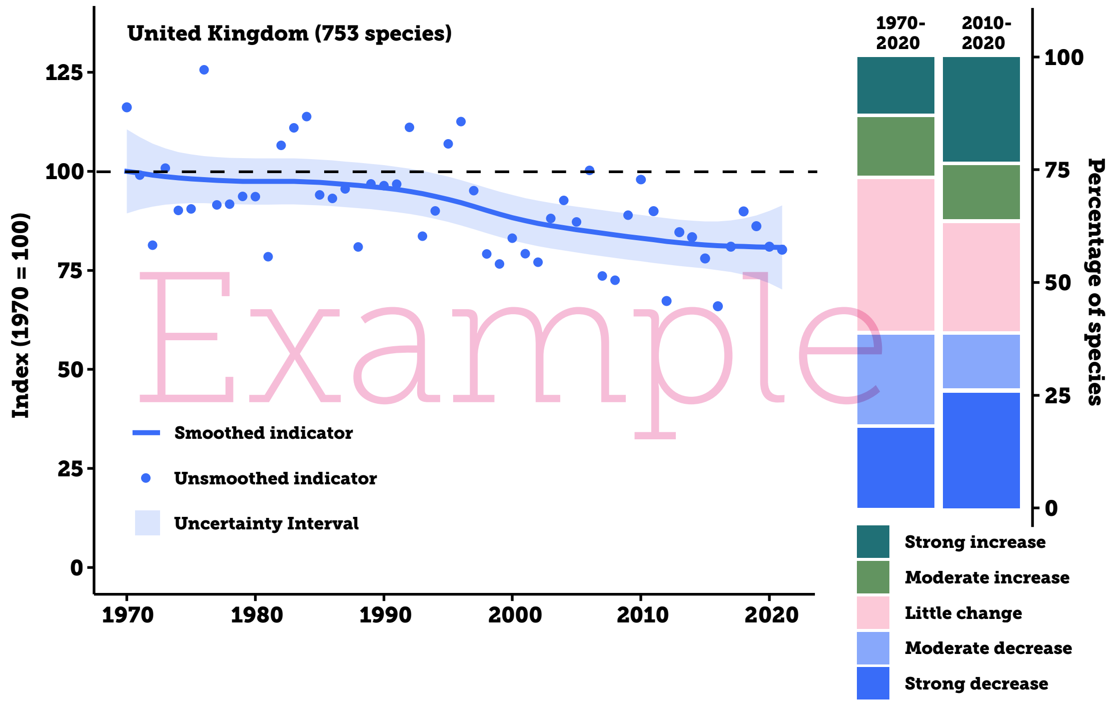
The UK must meet the potentially competing demands of food production, energy generation, construction, climate change adaptation and mitigation, and biodiversity conservation, all within a finite geographical area. While England no longer has a statutory system for strategic land-use planning, the UK Government has committed to developing a Land Use Framework to enable more strategic and spatial planning approaches, offering a policy context for nature-based solutions (NbS) that provides measurable benefits for biodiversity[112].

Terrestrial NbS include restoring peatlands to prevent greenhouse gas emissions and creating woodlands and other habitats to increase carbon sequestration. Marine and coastal ecosystems in good condition also contribute to carbon sequestration. However, it is important to consider the potential impacts of NbS-driven land use change on food production, to avoid offshoring production impacts overseas. Modelling alternative future scenarios of different approaches to climate change mitigation and land management will facilitate discussions and inform decisions. Spatial plans should align with net zero objectives and support policy frameworks for national infrastructure projects in England. Proper assessment of their impacts on nature is crucial to ensure biodiversity is not compromised in the pursuit of net-zero and other objectives.

APPENDICES

How to interpret this report

We have included this section to help you understand the different measures presented in the *State of Nature 2023* report and how they should be interpreted. For full details of the methods and how these measures were calculated, as well as caveats around interpretation, please refer to pages 188-194 of the main report.



Which data have we used?

- We present trends in abundance and distribution for terrestrial and freshwater species across England, and trends in abundance for marine fish and seabirds.
- Abundance trends are based on changes in the number of individuals at a monitored site, a measure that reflects a species' population size. Distribution trends are based on changes in the number of sites where a species is present. Distribution trends may be calculated at different spatial scales, here we use 1 km^2 for terrestrial and freshwater invertebrates and 10 km^2 for plants and lichens.
- These records came from a wide range of sources, including national monitoring schemes and biological records.
- Abundance trends are for native species only. Distribution trends for invertebrates are primarily for native species but may include a small number of non-native species. Due to the small number of these species, their impact on the average trend lines is likely to be minimal[133]. Distribution trends for vascular plants include species introduced to the UK more than 500 years ago.
- We present assessments of national Red List status for native species.
- Details of our data sources and the species they cover are given at stateofnature.org.uk

How are distribution and abundance metrics related?

The status of species as measured by abundance is considered a key metric for conservation – providing information as to how species are faring and assessing the effectiveness of conservation measures or the impact of particular pressures. However, such data are taxonomically limited, and in contrast the volume of opportunistic species records[134] extends the taxonomic, spatial and temporal coverage of species datasets and analyses. Recent statistical developments have enabled greater use of these datasets for the estimation of species' distribution trends[135-137]. Distribution and abundance trends are often related, and there is evidence that they tend to operate in the same direction[138-139]. However, the relationship between the two measures of change can be complex. In particular, there is evidence that the magnitude of change in distribution trends is smaller than changes in abundance. This is because many species can show substantial variation in abundance without disappearing from sites or occupying new ones. Additionally, for some species or species' groups abundance and distribution trends move in opposite directions, but this is less common[140-141].


Reeds at sunset, Andy Hay (rspb-images.com)

What are the graphs telling me?

The measures we present, at a UK and individual country level, show the following:

- Change over time – Species indicator – The average change in the status of species, based on abundance or distribution data.
- Categories of change – The percentage of species in each trend category eg strong increase or little change.
- Extinction risk – An assessment of Red List status for each species occurring in that country.

Please note that our measures are not directly comparable with those presented in the previous *State of Nature* reports because the current report is based on an increased number of species, updated methods and, in some cases, different data sources.

Change over time – Species indicator

These graphs show indicators based on the abundance data and distribution data separately. Species indicator graphs show the average change in the status of species based on either abundance or distribution data. The shaded areas show a measure of uncertainty around the indicator.

Results reported for each figure include total percentage change in the indicator over the long term and the short term.

Categories of change

Each species was placed into one of three or five trend categories based on annual percentage changes. Results reported for each figure include the percentage of species that showed strong or moderate changes, and those showing little change, in each time period.

Thresholds for assigning species' trends to the categories are given in the Methods section of the main report. A small number of species did not have a short-term assessment, as data were unavailable for recent years.

Extinction risk

We summarised the Great Britain Red Lists to present the proportion of species in each threat category overall, and by different taxonomic groups. In each country we interpret existing Great Britain Red Lists, based on those species known to have occurred in a particular country, with the exception of Northern Ireland, where we used all-Ireland Red List assessments.

Results reported for each figure include the overall percentage of species assessed that are regarded as threatened with extinction from Great Britain or Ireland. This is the percentage of extant species, for which sufficient data are available, classified as Critically Endangered, Endangered or Vulnerable in the latest IUCN Red List assessments.

Official statistics

Where appropriate, trend figures from the official UK or UK country Official statistics[142] are presented alongside the *State of Nature* 2023 analyses.

What time period does this report cover?

In general we show abundance trends in species from 1970 to 2021 and distribution trends from 1970 to 2020. We refer to this as our long-term period. Our short-term period covers the final 10 years of an indicator, often 2010 to 2020. Data availability means that some abundance and distribution indicators start after 1970.

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The State of Nature 2023 report is a collaboration between the conservation and research organisations listed below:

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