In December 2019, the following indicators were updated in order to correct an error in indicator 13 and to reflect the availability of new data for indicators 2b, 4c and 19:

- 2b. Status of threatened habitats: habitats of European importance
- 4c. Status of threatened species: species of European importance
- 13. Awareness, understanding and support for conservation

These updates have led to a revision of this Compendium document and this version therefore supersedes the earlier version published on 5 September 2019.

All photographs are sourced from Natural England’s flickr account
## Contents

Introduction ................................................................................................................................. 5

Overview of assessment of change for all indicators and their component measures ............... 7

1. Extent and condition of protected areas .................................................................................. 14

2a. Status of threatened habitats ............................................................................................... 20

2b. Status of threatened habitats: habitats of European importance ........................................ 28

3. Habitat connectivity in the wider countryside ...................................................................... 33

4a. Status of priority species: relative abundance ..................................................................... 40

4b. Status of priority species: distribution .................................................................................. 47

4c. Status of threatened species: species of European importance .......................................... 55

5. Species in the wider countryside: farmland .......................................................................... 60

6. Species in the wider countryside: woodland ....................................................................... 71

7. Species in the wider countryside: wetlands .......................................................................... 79

8. Species in the wider marine environment ............................................................................. 86

9. Biodiversity and ecosystem services: terrestrial ................................................................. 90

10. Biodiversity and ecosystem services: pollination .............................................................. 95

11. Biodiversity and ecosystem services: marine ............................................................... 100

12a. Genetic resources for food and agriculture: animal genetic resources ......................... 106

12b. Genetic resources for food and agriculture: plant genetic resources .............................. 114

13. Awareness, understanding and support for conservation ............................................... 124

14. Taking action for the natural environment ......................................................................... 127

15. Funding for biodiversity ..................................................................................................... 134

16. Integrating biodiversity considerations into local decision making ................................ 138

17. Global biodiversity impacts of UK consumption .............................................................. 141

18. Climate change impacts ..................................................................................................... 143
19. Trends in pressures on biodiversity: pollution................................................................. 146
20. Trends in pressures on biodiversity: invasive species ..................................................... 151
21. Trends in pressures on biodiversity: surface water status ............................................. 156
22. Agricultural and forest area in environmental management schemes.............................. 161
23. Sustainable fisheries: fish stocks harvested within safe limits ........................................ 168
24. Biodiversity data for decision making ............................................................................ 174
Annex: National Statistics .................................................................................................... 180
Introduction

Biodiversity is the variety of all life on Earth. It includes all species of animals and plants, and the natural systems that support them. Biodiversity matters because it supports the vital benefits we get from the natural environment. It contributes to our economy, our health and wellbeing, and it enriches our lives.

In 2011, the government published *Biodiversity 2020: A strategy for England’s wildlife and ecosystem services*. This new, ambitious biodiversity strategy for England built on the Natural Environment White Paper and provided a comprehensive picture of how we are implementing our international and EU commitments. It set out the strategic direction for biodiversity policy for the next decade on land (including rivers and lakes) and at sea. It built on the successful work that has gone before, but also sought to deliver a real step change.

*Biodiversity 2020* also included plans to develop and publish a compact set of indicators to assess progress with delivery of the strategy. They were to be outcome-focused with an emphasis on indicators showing the status of components of biodiversity and with additional response and pressure indicators to show progress with the priority actions set out in the strategy. The indicators are grouped by the 4 themes of the EU Biodiversity Strategy; a more integrated large-scale approach to conservation on land and at sea; putting people at the heart of biodiversity policy; reducing environmental pressures; and improving our knowledge.

The government’s previous biodiversity indicator set was reviewed in 2011 to ensure that it continued to be based on the most robust and reliable available data. Some refinements to existing indicators were identified to improve their relevance, make them easier to understand, or address concerns over data quality or availability. Where the review identified gaps where there were no indicators for particular outcomes or actions in the Strategy, or where the existing indicators were only indirectly linked to outcomes, development work has been identified to fill these gaps. The set remains relevant to the new Strategy and to the new international framework of ‘Aichi’ targets agreed under the Convention on Biological Diversity.

In 2012, a new set of 24 *Biodiversity 2020* indicators was published. In this 2019 publication, where possible, each of the indicators has been revised or updated with the most recent data. In some cases, work to fill gaps or improve indicators is ongoing and the work planned to further refine or deliver indicators is described briefly.

The *Biodiversity 2020* indicators are dependent on a wide variety of data, provided by government, research bodies, and the voluntary sector. As Official Statistics, the presentation and assessment of the indicators has been verified by the data providers, and the production and editing of the indicators has been overseen by government statisticians in Defra. The England Biodiversity Indicators are a Defra National Statistics compendium. See the Annex for further details.

---

1 The UK Government is a signatory to the Convention on Biological Diversity (CBD) and is committed to the new biodiversity goals and targets ‘the Aichi targets’ agreed in 2010 and set out in the Strategic Plan for Biodiversity 2011–2020 (PDF 1.03 MB).
Assessing indicators

Each indicator is composed of one or more measures which will show trends over time. Many indicators have a single measure, but where data cannot be combined logically the indicator will have more than one measure. Each measure is summarised or assessed separately using a set of ‘traffic lights’. The traffic lights show ‘change over time’. They do not show whether the measure has reached any published or implied targets, or indeed whether the status is ‘good’ or ‘bad’, although where targets have been set, these are identified in the indicator text.

The traffic lights are determined by identifying the period over which the change is to be assessed and comparing the value of the measure in the base or start year with the value in the end year.

- ✅ Improving
- 🔙 Little or no overall change
- ❌ Deteriorating
- 🌡 Insufficient or no comparable data

Where possible, the assessment has been made by evaluating trends using statistical analysis techniques. The assessment may be made by Defra statisticians in collaboration with the data providers, or undertaken by the data providers themselves. A green or red traffic light is only applied when there is sufficient confidence that the change is statistically significant and not simply a product of random fluctuations.

For some indicators, it is not possible to formally determine statistical significance and in such cases the assessment has been made by comparing the difference between the value of the measure in the base or start year and the value in the end year against a ‘rule of thumb’ threshold. The standard threshold used is 3%, unless noted otherwise. Where the data allow it, a 3-year average is used to calculate the base year; this reduces the likelihood of any unusual year(s) unduly influencing the assessment. Where an indicator value has changed by less than the threshold of 3%, the traffic light has been set at amber. The choice of 3% as the threshold is arbitrary but is commonly used across other government indicators; the use of this approach is kept under review.

The traffic lights only reflect the overall change in the measure from the base to latest year and do not reflect fluctuations during the intervening years.

Where data are available, 2 assessment periods have been used:

1. Long term – an assessment of change since the earliest date for which data are available, although if the time series is for less than 10 years a long-term assessment is not made.
2. Short term – an assessment of change over the latest 5 years.

In a minority of cases the short-term assessment has been carried out over a shorter time period, where the earliest data point is within the past 5 years but where statistical analysis allows a robust assessment of change over time.

The individual indicators also have a third marker showing the direction of change in the latest year. This period is too short to make any meaningful assessment; however, when the change exceeds a 1% threshold, the direction is given simply as an acknowledgement of very recent trends and as a possible early indication of emerging trends.
## Overview of assessment of change for all indicators and their component measures

<table>
<thead>
<tr>
<th>Strategy theme and relevant indicators</th>
<th>Long-term change</th>
<th>Short-term change</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1: A more integrated, large-scale approach to conservation on land and at sea</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Extent and condition of protected areas</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SSSIs in favourable or unfavourable recovering condition</td>
<td>2003–2019</td>
<td>≃ 2014–2019</td>
</tr>
<tr>
<td>2a. Status of threatened habitats</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extent of priority habitats</td>
<td></td>
<td>≃</td>
</tr>
<tr>
<td>Condition of priority habitats</td>
<td>≃</td>
<td>2014–2019</td>
</tr>
<tr>
<td>2b. Status of threatened habitats: habitats of European importance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Percentage of habitats of European importance in favourable or improving conservation status</td>
<td>2007–2019</td>
<td>2013–2019</td>
</tr>
<tr>
<td>3. Habitat connectivity in the wider countryside</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Experimental statistic on functional connectivity in the UK</td>
<td>Not assessed</td>
<td>Not assessed</td>
</tr>
<tr>
<td>4a. Status of priority species: relative abundance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4b. Status of priority species: distribution</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4c. Status of threatened species: species of European importance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Percentage of species of European importance in favourable or improving conservation status</td>
<td>2007–2019</td>
<td>2013–2019</td>
</tr>
<tr>
<td>5. Species in the wider countryside: farmland</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Butterflies of the wider countryside on farmland</td>
<td>1990–2018</td>
<td>≃ 2013–2018</td>
</tr>
<tr>
<td>Bat populations</td>
<td>1999–2017</td>
<td>2012–2017</td>
</tr>
<tr>
<td>Plant diversity, enclosed farmland – to be developed</td>
<td>Not assessed</td>
<td>Not assessed</td>
</tr>
<tr>
<td>6. Species in the wider countryside: woodland</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Butterflies of the wider countryside in woodland</td>
<td>1990–2018</td>
<td>≃ 2013–2018</td>
</tr>
</tbody>
</table>

---

2 The earliest available year is used as the baseline for assessment of long-term change. The base year used for each measure is shown in the table. Where data are unavailable or if the data run is fewer than 10 years, a long-term assessment is not given.

3 An assessment of change for the latest 5 years; or as shown if the data do not allow for an assessment over a 5-year period.
<table>
<thead>
<tr>
<th>Strategy theme and relevant indicators</th>
<th>Long-term change ²</th>
<th>Short-term change ³</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plant diversity, woodland plants – to be developed</td>
<td>Not assessed</td>
<td>Not assessed</td>
</tr>
<tr>
<td>Wintering waterbirds</td>
<td>1975/76–2015/16</td>
<td>2010/11–2015/16</td>
</tr>
<tr>
<td>Breeding seabirds</td>
<td>Not assessed</td>
<td>Not assessed</td>
</tr>
<tr>
<td>Goat breeds</td>
<td>2004–2018</td>
<td>2013–2018</td>
</tr>
<tr>
<td>Pig breeds</td>
<td>2000–2018</td>
<td>2013–2018</td>
</tr>
<tr>
<td>Horse breeds</td>
<td>2000–2018</td>
<td>2013–2018</td>
</tr>
<tr>
<td>Sheep breeds</td>
<td>2000–2018</td>
<td>2013–2018</td>
</tr>
<tr>
<td>Cattle breeds</td>
<td>2000–2018</td>
<td>2013–2018</td>
</tr>
<tr>
<td>UK Cumulative Enrichment Index</td>
<td>1960–2018</td>
<td>2013–2018</td>
</tr>
</tbody>
</table>

2: Putting people at the heart of biodiversity policy

<p>| Public awareness, understanding and support for conservation |  |  |
| Proportion of people highly engaged with the issue of biodiversity loss |  |  |
| Wildlife gardening |  |  |
| Public sector expenditure on biodiversity in England |  |  |
| Non-governmental organisation expenditure on biodiversity in the UK | 2012/13–2017/18 | 2012/13–2017/18 |
| Local sites under positive management | 2008/09–2017/18 | 2012/13–2017/18 |</p>
<table>
<thead>
<tr>
<th>Strategy theme and relevant indicators</th>
<th>Long-term change</th>
<th>Short-term change</th>
</tr>
</thead>
<tbody>
<tr>
<td>17. Global impacts of UK consumption</td>
<td>To be developed</td>
<td>Not assessed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Not assessed</td>
</tr>
<tr>
<td><strong>3: Reducing environmental pressures</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18. Climate change impacts</td>
<td>Timing of biological events: Spring Index</td>
<td>Not assessed</td>
</tr>
<tr>
<td></td>
<td>Area affected by Sulphur (acidity)</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Area affected by nitrogen deposition</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Marine pollution: combined input of hazardous substances</td>
<td>✓</td>
</tr>
<tr>
<td>20. Trends in pressures on biodiversity: invasive species in Great Britain</td>
<td>Terrestrial species</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Freshwater species</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Marine (coastal) species</td>
<td>✓</td>
</tr>
<tr>
<td>21. Trends in pressures on biodiversity: surface water body status</td>
<td>Percentage surface water bodies in 'High' or 'Good' ecological status</td>
<td>2013–2018</td>
</tr>
<tr>
<td>22. Agricultural and forest area in environmental management schemes</td>
<td>Higher-level or targeted agri-environment schemes</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Percentage of woodland certified as sustainably managed</td>
<td>✓</td>
</tr>
<tr>
<td>23. Sustainable fisheries: fish stocks harvested within safe limits</td>
<td>Percentage of UK fish stocks harvested sustainably</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Percentage of UK fish stocks with biomass at full reproductive capacity</td>
<td>✓</td>
</tr>
<tr>
<td><strong>4: Improving knowledge</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24. Biodiversity data for decision making</td>
<td>Cumulative number of records in the National Biodiversity Network</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Number of publicly accessible records at 1km² resolution or better</td>
<td>✓</td>
</tr>
</tbody>
</table>

⚠️ = improving
⚠️⚠️ = little or no overall change
⚠️⚠️⚠️ = deteriorating
⚠️⚠️⚠️⚠️ = insufficient or no comparable data
**Assessment of change: all measures**

There are 50 individual measures that make up 24 indicators.

In the short term:
- 18 measures (36%) show an improvement;
- 8 measures (16%) show little or no overall change; and
- 12 (24%) show a deterioration.

There are insufficient data to make assessments for 3 measures (6%), and 9 measures (18%) are not assessed.

In the long term:
- 23 measures (46%) show an improvement;
- 1 (2%) show little or no overall change; and
- 14 (28%) show a deterioration.

There are insufficient data to make assessments for 6 measures (12%) and 6 measures (12%) are not assessed.

The charts below show the accumulative traffic lights for the 50 measures and for the different themes.

**Figure 1: Number of long-term and short-term indicator assessments by direction of change, all measures and strategy themes**

![Traffic light chart](chart.png)

**Note:** Based on 50 measures, which make up 24 indicators (6 measures are not assessed in the long term and 9 measures are not assessed in the short term).
Seventeen measures either show an improvement in both the long term and short term, or they show an improvement in the short term and no long-term assessment could be made:

- Extent of protected areas at sea;
- Bat populations;
- Removal of greenhouse gases by forests in England;
- Effective population size of UK native goat breeds;
- Effective population size of UK native sheep breeds;
- Effective population size of UK native cattle breeds;
- UK Plant genetic resources – Enrichment Index;
- Time spent on environmental volunteering;
- Non-governmental organisation expenditure on biodiversity in England;
- Local sites under positive management;
- Air pollution impacts on sensitive habitats: sulphur (acidity);
- Marine pollution: combined input of hazardous substances;
- Area of farmland under targeted agri-environment schemes;
- UK fish stocks harvested within safe limits;
- Biomass of UK fish stocks at full reproductive capacity;
- Cumulative number of records in the National Biodiversity Network; and
- Number of publicly accessible records at 1 km² resolution or better.

Four measures have deteriorated in the long term but improved or remained stable in the short term:

- Change in distribution of priority species in the UK;
- Butterflies of the wider countryside on farmland;
- Butterflies of the wider countryside in woodland; and
- Marine ecosystem integrity (fish size in the North-western North Sea).

Conversely, 4 measures show improvement in the long term but are deteriorating in the short term:

- Wintering waterbirds;
- Effective population size of UK native pig breeds;
- Public sector expenditure on biodiversity in England; and
- Percentage of woodland certified as sustainably managed.

The following 11 measures have deteriorated in all time periods over which assessments can be made:

- Percentage of habitats of European importance in favourable or improving conservation status;
- Percentage of species of European importance in favourable or improving conservation status;
- Change in relative abundance of priority species in the UK;
- Breeding farmland birds;
- Breeding woodland birds;
- Distribution of pollinating insects in the UK;
- Effective population size of UK native horse breeds at risk;
- Extent of invasive species in Great Britain: Terrestrial;
- Extent of invasive species in Great Britain: Freshwater;
- Extent of invasive species in Great Britain: Marine; and
- Proportion of surface water bodies classified as ‘high’ or ‘good’ ecological status.
Strategy theme 1 – A more integrated, large scale approach to conservation on land and at sea

- Over the long term, 11 measures have improved, of these, 7 continue to improve in the short term, whilst wintering water birds and the effective population size of native pig breeds are declining in the short term.
- Of the 11 measures deteriorating in the long term, 7 deteriorated and 3 showed no change over the short term.
- The one measure for which it is currently only possible to make a short-term assessment (the condition of priority habitats), has shown little or no overall change, over this time period.

Figure 2: Number of long-term and short-term indicator assessments by direction of change, strategy theme 1

![Diagram showing the number of long-term and short-term indicator assessments by direction of change.]

Note: Based on 29 measures, which make up 12 indicators. Two indicators/measures are not assessed in the long term or short term and a further 2 measures (from 2 separate indicators) are not assessed in the long or short term either.

Strategy theme 2 – Putting people at the heart of biodiversity policy

- For this theme, of the 3 measures that show long-term improvement, 2 have also improved in the short term (time spent environmental volunteering and local sites under positive management), the other one has deteriorated (public sector expenditure on biodiversity in England).
- Non-governmental organisation expenditure on biodiversity in the UK has increased in the short term; it is not yet possible to make a long-term assessment of this measure.
Conservation on land and at sea

Figure 3: Number of long-term and short-term indicator assessments by direction of change, strategy theme 2

<table>
<thead>
<tr>
<th>Number of indicator assessments</th>
<th>Long term</th>
<th>Short term</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improving</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Deteriorating</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Insufficient data</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

Note: Based on 7 measures which make up 5 indicators. One indicator/measure is not assessed in either the long term or the short term.

Strategy theme 3 – Reducing environmental pressures

- 5 measures have improved in both the long and short term: area affected by sulphur (acidity); marine pollution; agricultural area under environmental management schemes; percentage of fish stocks harvested sustainably; and biomass of fish stocks at full reproductive capacity.
- The percentage of woodland certified as sustainably managed has increased in the long term but decreased over the short term.
- 3 measures, all relating to pressure from invasive species, have deteriorated in the long term; it is not possible to assess these measures in the short term.
- The proportion of surface water bodies classified as ‘good’ or ‘high’ ecological status cannot yet be assessed over the long term and has decreased in the short term.

Figure 4: Number of long-term and short-term indicator assessments by direction of change, strategy theme 3

<table>
<thead>
<tr>
<th>Number of indicator assessments</th>
<th>Long term</th>
<th>Short term</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improving</td>
<td>7</td>
<td>5</td>
</tr>
<tr>
<td>Deteriorating</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Insufficient data</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Little or no overall change</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

Note: Based on 12 measures which make up 6 indicators. One indicator/measure is not assessed in the long term or the short term and a further indicator comprising of 3 measures is not assessed in the short term.

Strategy theme 4 – Improving knowledge

This theme only has one indicator (2 measures), so no chart is provided. The cumulative number of records in the National Biodiversity Network and the number of publicly accessible records at 1km² resolution or better have both increased over the long term and the short term.
1. Extent and condition of protected areas

Type: Extent – Response indicator; Condition – State indicator

1a. Extent of protected areas

The total extent of land and sea protected in England through national and international protected areas increased from 1.2 million to 2.7 million hectares (ha) between 1999 and 2019; an increase of 124% (Figure 1.1).

This total consists of over 1 million ha of terrestrial and freshwater areas, representing about 8% of the land area of England and 1.7 million ha of marine sites (out to the 12 nautical mile limit), representing 33% of England inshore waters. The area of marine sites increased substantially; by almost 52% in the 5 years to 2019, although there was no change in the latest year; further detail on the increase can be found in the background section.

Figure 1.1: Extent of national and European protected areas on land and at sea, 1999 to 2019

Notes:
1. The extent of protected sites is the cumulative area assessed in March of each year shown.
2. Extent is based on the following designations: Sites of Special Scientific Interest (SSSI), Special Areas of Conservation (SAC), Special Protection Areas (SPA), National Nature Reserves (NNR), Ramsar sites and Marine Conservation Zones (MCZ).
3. For sites that span English borders, only the area within England is included.
4. Sites between mean low water and the 12 nautical mile limit are included in the ‘marine’ measure; sites beyond 12 nautical miles, in UK waters, are excluded. These are covered by the UK protected sites indicator.

Source: Natural England.
The figures include sites on land (terrestrial, freshwater and coastal areas to mean low water (MLW)) and at sea protected by 6 designations: Sites of Special Scientific Interest (SSSI), Special Areas of Conservation (SAC), Special Protection Areas (SPA), National Nature Reserves (NNR), Ramsar sites and Marine Conservation Zones (MCZ). Any one protected area can have more than one designation, but each site contributes only once to the indicator total.

1b. Condition of Sites of Special Scientific Interest (SSSI)

Biodiversity 2020: A strategy for England’s wildlife and ecosystem services has a higher level outcome to achieve “… at least 50% of SSSIs in favourable condition, while maintaining at least 95% in favourable or recovering condition”.

There has been a net decrease in the area of SSSIs in favourable condition; down from 44% in 2003 to 38.9% in March 2019 (Figure 1.2). The sudden drop in the SSSI area in favourable condition from 43.2% in 2010 to 36.6% in 2011 was largely due to a more rigorous application of the ‘Common Standard for Monitoring’ protocols in assessing feature condition.

However, over the past 5 years, there has been a small increase in the area of SSSIs in favourable condition, from 37.5% in 2014 to 38.9% in 2019. The area in unfavourable recovering condition has increased substantially from 13% in 2003 to 54.7% in 2019. The overall proportion of SSSIs in favourable or unfavourable recovering condition remained above the 95% target from 2011 to 2017 but fell slightly to 93.6% in 2019.

Figure 1.2: Cumulative proportion of Sites of Special Scientific Interest in favourable or unfavourable recovering condition, 2003 to 2019

Notes:
1. Site condition is the cumulative area assessed in March of each year shown. As new assessments are completed they replace the previous ones, so the graph is a snapshot of the condition of the site network at a given point in time.
Conservation on land and at sea

2. The black dotted line shows the ‘Biodiversity 2020’ target.
3. The drop in the SSSI area in favourable condition between 2010 and 2011 was largely due to a more rigorous application of the ‘Common Standard for Monitoring’ protocols in assessing feature condition.

Source: Natural England.

Indicator assessment

<table>
<thead>
<tr>
<th>Assessment of change in extent and condition of protected areas</th>
<th>Long term</th>
<th>Short term</th>
<th>Latest year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extent of protected areas on land</td>
<td>✔️</td>
<td>☹️</td>
<td>No change (2019)</td>
</tr>
<tr>
<td>Extent of protected areas at sea</td>
<td>✔️</td>
<td>✔️</td>
<td>No change (2019)</td>
</tr>
<tr>
<td>SSSIs in favourable or unfavourable recovering condition</td>
<td>✔️</td>
<td>☹️</td>
<td>Decrease (2019)</td>
</tr>
</tbody>
</table>

Note: Long-term and short-term assessment of the individual measures are based on a 3% rule of thumb. The base year for these assessments uses a 3-year average. See Assessing Indicators.

Relevance

The indicator shows progress with commitments to improve the status of our wildlife and habitats. It is relevant to outcomes 1, 1A, 1C and 2A in Biodiversity 2020: A strategy for England’s wildlife and ecosystem services (see Annex A). It is also relevant to a number of international targets (see Annex B of the aforementioned publication for further details).

Background

Extent

The total extent of protected areas in Figure 1.1 is the combined area of:

- nationally designated sites (Sites of Special Scientific Interest (SSSI), National Nature Reserves (NNR), and Marine Conservation Zones (MCZ)), and
- internationally designated sites (Special Protection Areas (SPA) and Special Areas of Conservation (SAC)) under the European Union’s Birds and Habitats Directives respectively and Ramsar sites under the Convention on Wetlands of International Importance.

There is considerable geographic overlap in these designations, with many sites being designated as 2 or more of SSSI, NNR, MCZ, SAC, SPA and Ramsar, although such sites contribute only once to the calculated areas presented here. The indicator is based on a spatial analysis of protected area polygons which removes overlaps between designation types. As a result of the calculation method there may be small differences from previously published results. Coastal sites are split at mean low water and contribute to both the terrestrial and marine lines in Figure 1.1.

During 2014, Natural England commissioned a new mean low water (MLW) line to more accurately delineate the terrestrial and marine sites. So despite there being an increase in the number of SSSI in that year, the reported terrestrial area in England decreased by almost 20,000 ha. There was a concomitant increase in the SSSI marine area over the same year.
SSSIs can be designated to protect biological (species and/or habitats) and/or geological (landforms and/or geology) features. Sites may be designated as just biological, just geological, or as mixed biological/geological sites.

The SSSI designation underpins almost all of the international sites to the MLW mark, but the European sites go beyond this with the inclusion of marine areas – an additional 1.2 million ha has been designated as marine SACs and/or SPAs (as of March 2014). Figure 1.1 shows the cumulative effect of adding European sites to the protected areas network over time, as they were submitted in a number of tranches to the European Commission over several years. In the last few years the majority of terrestrial sites required to be designated under the Birds and Habitats Directives have been submitted to the European Commission, however marine sites are still being designated. There are currently 254 SACs covering over 1.4 million ha and 87 SPAs covering over 1.8 million ha. Figure 1.3 shows the change in the extent of different designation types on land (above the MLW mark) and Figure 1.4 shows the equivalent changes at sea (below the MLW mark to 12 nautical miles) since 2000.

**Marine Conservation zones**

The area of marine sites (out to the 12 nautical mile limit) has increased substantially, by almost 52% to 1.7 million ha in the 5 years to 2019. A large contributor to this has been the designation of inshore marine sites under the European Birds and Habitats Directives. The first jump was an increase of 700,000 ha in marine SACs/SPAs designated from 2011 to 2012.

Marine Conservation Zones are designated by government under the Marine and Coastal Access Act 2009 to conserve the diversity of nationally rare, threatened and representative habitats and species. There were 50 MCZs in waters around England at 31 March 2019; the first 27 zones were designated in November 2013 resulting in the increase of 109,000 ha visible in the 2014 data. The second phase designated a further 23 sites in January 2016, resulting in the increase of 240,000 ha seen in the 2016 data. The third phase (an additional 41 sites) will be designated in May 2019. This final phase of MCZ designations will essentially complete the UK Blue Belt and the UKs contribution to the ecologically coherent network in the North East Atlantic in terms of the representation of species and habitats.

**Figure 1.3: Extent of national and European protected sites on land in England, by designation, 2000 to 2019**
Notes:
1. The extent of protected sites is the cumulative area assessed in March of each year shown.
2. Terrestrial sites include land (terrestrial, freshwater and coastal areas) to mean low water.

Source: Natural England.

Figure 1.4: Extent of national and European protected sites at sea in England, by designation, 2000 to 2019

Notes:
1. The extent of protected sites is the cumulative area assessed in March of each year shown.
2. Marine sites between mean low water and the 12 nautical mile limit are included; sites beyond 12 nautical miles, in UK waters, are excluded. These are included in the UK indicator on protected sites.

Source: Natural England.

SSSI Condition

Biodiversity 2020: A strategy for England’s wildlife and ecosystem services includes a high-level outcome to achieve:

"... 90% of priority habitats in favourable or recovering condition and at least 50% of SSSIs in favourable condition, while maintaining at least 95% in favourable or recovering condition by 2020."

This indicator focuses on the condition of SSSIs. The first part of the outcome on priority habitats is presented separately as part of indicator 2a ‘Status of threatened habitats’.

Nationally important SSSIs are designated with the aim of conserving specific biological or geological features. The condition of these features is assessed on a rolling programme against agreed standards. ‘Favourable’ condition status indicates that the SSSI meets the agreed standards for the features of interest. ‘Unfavourable recovering’ condition status indicates that the SSSI fails to meet the standards, but has appropriate management in place that will achieve those standards (sites with inappropriate or no suitable management are ‘unfavourable’).
The UK-wide Common Standards Monitoring programme is undertaken by the statutory conservation agencies to assess the effectiveness of management of the features for which protected areas have been designated. Favourable Condition Target(s) have been set for each site. The monitoring tests whether these targets have been met. Figure 1.5 below shows the detailed condition of SSSIs at the 31 March 2019. In total, 93.5% of sites were in favourable or unfavourable recovering condition, 3.8% were ‘unfavourable no change’ and 2.6% were in an unfavourable declining condition.

**Figure 1.5: Condition of Sites of Special Scientific Interest (SSSI), March 2019**

<table>
<thead>
<tr>
<th>Condition</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Favourable condition</td>
<td>38.9%</td>
</tr>
<tr>
<td>Unfavourable recovering condition</td>
<td>54.7%</td>
</tr>
<tr>
<td>Unfavourable no change condition</td>
<td>3.8%</td>
</tr>
<tr>
<td>Unfavourable declining condition</td>
<td>2.6%</td>
</tr>
</tbody>
</table>

**Source:** Natural England.

**Web links for further information**

<table>
<thead>
<tr>
<th>Reference</th>
<th>Website</th>
</tr>
</thead>
<tbody>
<tr>
<td>GOV.UK</td>
<td>Marine conservation zone designations in England</td>
</tr>
<tr>
<td>Joint Nature Conservation Committee</td>
<td>Common Standards Monitoring Programme</td>
</tr>
<tr>
<td>Joint Nature Conservation Committee</td>
<td>Common Standards Monitoring Guidance</td>
</tr>
<tr>
<td>Joint Nature Conservation Committee</td>
<td>Marine protected areas – interactive map</td>
</tr>
<tr>
<td>Natural England</td>
<td>SSSI condition statistics</td>
</tr>
<tr>
<td>Natural England</td>
<td>Site designations</td>
</tr>
</tbody>
</table>

**Last updated:** September 2019

**Latest data available:** March 2019
2a. Status of threatened habitats

Type: State indicator

2a.1. Extent of priority habitats

There are 1.87 million hectares (ha) of terrestrial and coastal priority habitats recorded in the 2013 priority habitats’ inventory for England. These habitats represent around 14% of the total land area of the country (Figure 2a.1) but it is not currently possible to assess the extent to which this area changes from year to year (see background section for further details). Freshwater and marine habitats are not included in this indicator.

Deciduous woodland accounts for 39% of total priority habitats resource in England, the largest proportion of any habitat group. Wetland habitats account for a further 29%; heathlands for 16% and grasslands and coastal habitats for 7% each. Rarer habitats such as traditional orchards and limestone pavements together make up 1% of the total resource.

Figure 2a.1: Distribution of terrestrial and coastal priority habitats in England, 2013

Source: Natural England.
Priority habitats can be designated as protected areas called Sites of Special Scientific Interest (SSSIs). They can also be outside of these SSSI protected areas but be under Higher Level Stewardship (HLS) or Countryside Stewardship (CS) agreements, or fall within Forestry Commission (FC) ‘Managed woodland’. Some priority habitats however, fall outside of the protection of all these schemes. The designated site network of SSSIs makes up 40% of the total priority habitat area in England (see indicator number 1 on ‘Extent and condition of protected areas’ for further details).

The majority of the land resource for 18 of the 24 terrestrial and coastal priority habitats designated in England falls within protected areas (see Table 2a.1 for a full list of priority habitats in England). Coastal saltmarsh, mudflats and coastal vegetated shingle have the highest proportion of their resource covered by protected areas (96%, 92% and 90% respectively); other habitats such as lowland raised bog, limestone pavements, mountain heaths and willow scrub, and saline lagoons also have more than 80% of their land resource falling within protected areas. Examples of priority habitats where the majority of the land resource falls outside of the protected areas network include traditional orchards (almost 100%) and deciduous woodlands (88%).

2a.2. Condition of priority habitats

*Biodiversity 2020: A strategy for England’s wildlife and ecosystem services* has a higher level outcome to achieve “… 90% of priority habitats in favourable or recovering condition”.

As of 31 March 2019, a little over 1.25 million hectares (ha) of priority habitats were in target condition. This equates to 66.9% of all priority habitats in a favourable or unfavourable recovering condition (Figure 2a.2). Two of the 24 habitat types achieved or exceeded 90% of their area in favourable or unfavourable recovering condition, with a further 10 achieving or exceeding 80%, the target value for each individual habitat (see Figure 2a.4 in the background section).
Notes:

1. The ‘favourable SSSI’, ‘unfavourable recovering SSSI’ and ‘non SSSI under HLS, CS or FC’ categories have been aggregated to more clearly display the percentage of the total area of priority habitat in target condition.
2. The black dotted line shows the ‘Biodiversity 2020’ target.
3. The underlying dataset for this chart was revised in 2019 to include new data on priority habitats within FC managed woodland. The chart and dataset are therefore not directly comparable to those appearing in publications up to and including 2018.

Source: Natural England.

Broken down to within and outside of protected sites, 37.1% of all priority habitats are in a favourable or unfavourable recovering condition and are included within SSSIs; a further 29.8% are in favourable management but fall outside of SSSIs (i.e. they are under HLS or CS agreements or fall within FC managed woodland). Since 2011, there has been a 14.9% increase in the area of priority habitat in target condition (from 1.09 million ha in 2011 to 1.25 million ha in 2019). This has been largely due to the uptake of HLS management agreements outside of SSSIs in 2012 and 2013 and the uptake of CS management agreements outside of SSSIs from 2016 onwards. In the short term, the indicator has been relatively static with the area of priority habitats in target condition increasing by 1.4% from a figure of 1.23 million ha in 2014.

Figure 2a.3: Condition of priority habitat as a percentage of area assessed, 2011 to 2019

Notes:

1. The blue sections of the bars correspond to the blue section of the bars in Figure 2a.2.
2. The underlying dataset for this chart was revised in 2019 to include new data on priority habitats within FC managed woodland. The chart and dataset are therefore not directly comparable to those appearing in publications up to and including 2018.

Source: Natural England.

It is not possible to report of the condition of some 30% of priority habitats that occur outside of SSSIs and that are not under HLS or CS agreements or within FC managed woodland. Some habitats also require further work to agree a monitoring methodology, notably woodlands and freshwater habitats.
Indicator assessment

<table>
<thead>
<tr>
<th>Assessment of change in extent and condition of priority habitats</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Long term</strong></td>
</tr>
<tr>
<td>Extent of priority habitats</td>
</tr>
</tbody>
</table>

Notes:

1. The 2013 priority habitats’ inventory does not allow for assessing changes to the extent of habitats, therefore, no assessments have been made for the extent measure (see background section for further details).

2. The short-term assessment of the condition measure is based on a 3% rule of thumb. The base year for this assessment uses a 3-year average. See Assessing Indicators.

Relevance

There are 56 habitats recognised as of ‘principal importance’ for the conservation of biological diversity in England under section 41 of the Natural Environment and Rural Communities Act 2006. The indicator shows progress towards commitments to improve the status of our wildlife and habitats. It is relevant to outcomes 1, 1A and 2 in Biodiversity 2020: A strategy for England’s wildlife and ecosystem services (see Annex A). It is also relevant to a number of international targets (see Annex B of the aforementioned publication for further details).

Background

Extent of priority habitats

In 2013, Natural England published a new priority habitats’ inventory for England covering 24 priority habitats (Table 2.a.1). This 2013 inventory addressed problems with the original Biodiversity Action Plan (BAP) priority habitat inventories which were produced from 1999 onwards and derived from habitat datasets collated across the country. The 2013 inventory moves from multiple habitat layers to a single layer based on Rural Land Registry polygons (derived from OS MasterMap).

In bringing the existing inventories into a single layer with no overlaps, a set of criteria were used to assign one main habitat (or no main habitat) to each polygon. Where other habitats may be present in the polygon, e.g. as part of a mosaic, these are attributed as ‘attribution habitats’. This also provides an audit trail showing which habitats were candidates for main and additional habitats and how the main habitat was identified, as well as details of any manual changes to the main or additional habitats. Overall, this does however lead to an overestimate of Priority Habitat cover in England, particularly for MG5 communities (unimproved neutral grassland, including hay meadows) that are a subset of the Lowland Meadows Priority Habitat.

The 2013 priority habitats’ inventory does not allow for assessing changes to the extent of habitats, as changes to the inventory itself would represent improvements in current knowledge of the extent of priority habitats, rather than actual changes in the extent of those habitats. As a result, no assessment of change has been made for the extent measure. Furthermore, although there have been subsequent revisions to the priority habitats’ inventory, this indicator consistently assesses changes in the condition of habitats reported in the 2013 inventory.

It is also worth noting that there are alternative data published for the extent (but not condition) of priority habitats in England, including (i) those based on the (now archived) Biodiversity Action Reporting System (BARS) and (ii) those used for the selection of biological SSSIs. However, the
2013 priority habitats inventory map is considered to be the best available national source of extent data for indicator 2a as it allows for an assessment of how the condition (based on management and designations) of these priority habitats has changed over time.

Defra, Natural England and the Joint Nature Conservation Committee (JNCC) are working to improve the quantity and quality of data on threatened habitats, for example, by improving standards for habitat mapping, and by investing in research to develop new methods that combine satellite, remote sensing and field data in order to provide better information on the stock and change in threatened habitats.

Table 2a.1: Priority habitats that are mapped into the 2013 single habitats' inventory for England

<table>
<thead>
<tr>
<th>Priority habitats (24)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blanket bog</td>
</tr>
<tr>
<td>Coastal and floodplain grazing marsh</td>
</tr>
<tr>
<td>Coastal saltmarsh</td>
</tr>
<tr>
<td>Coastal sand dunes</td>
</tr>
<tr>
<td>Coastal vegetated shingle</td>
</tr>
<tr>
<td>Deciduous woodland</td>
</tr>
<tr>
<td>Limestone pavements</td>
</tr>
<tr>
<td>Lowland calcareous grassland</td>
</tr>
<tr>
<td>Lowland dry acid grassland</td>
</tr>
<tr>
<td>Lowland fens</td>
</tr>
<tr>
<td>Lowland heathland</td>
</tr>
<tr>
<td>Lowland meadows</td>
</tr>
<tr>
<td>Lowland raised bog</td>
</tr>
<tr>
<td>Maritime cliffs and slope</td>
</tr>
<tr>
<td>Mountain heath and willow scrub</td>
</tr>
<tr>
<td>Mudflats</td>
</tr>
<tr>
<td>Purple moor-grass and rush pastures</td>
</tr>
<tr>
<td>Reedbeds</td>
</tr>
<tr>
<td>Saline lagoons</td>
</tr>
<tr>
<td>Traditional orchards</td>
</tr>
<tr>
<td>Upland calcareous grassland</td>
</tr>
<tr>
<td>Upland hay meadows</td>
</tr>
<tr>
<td>Upland heathland</td>
</tr>
<tr>
<td>Upland flushes, fens and swamps</td>
</tr>
</tbody>
</table>

The deciduous woodland inventory which was derived from Forest Research’s National Inventory of Woodland and Trees has been replaced by one derived from the newer National Forest Inventory. The following categories were used to define deciduous woodland:

- Broadleaved (B)
- Mixed (Mb) – predominantly broadleaved
- Coppice (O)
- Coppice-with-Standards (P)

There are a number of terrestrial priority habitats for which no inventories exist, in particular for (i) inland rock outcrops and scree habitats and (ii) open mosaic habitats on previously developed land. Calaminarian grasslands are included in more recent versions of the priority habitats’ inventory but the 2013 inventory is used for this indicator in order to ensure continuity of trend reporting. For certain habitat types; ponds, hedgerows and arable field margins, it may be impractical to map the entire resource, but changes in extent and condition can still be derived from a sample survey.

Priority habitat maps have been published for rivers and lakes. The rationale for these maps is to identify the most natural remaining freshwater habitats in order to protect them against deterioration and provide a focus for undertaking improvement works to maximise their natural function for characteristic biological assemblages.
Conservation on land and at sea

Condition of priority habitats

Biodiversity 2020: A strategy for England’s wildlife and ecosystem services includes a high-level outcome to achieve:

“... 90% of priority habitats in favourable or recovering condition and at least 50% of SSSIs in favourable condition, while maintaining at least 95% in favourable or recovering condition by 2020.”

This indicator focuses on the condition of priority habitats and the individual contributions to the 90% outcome. The second part of the outcome on SSSIs is presented separately as part of indicator 1, 'Extent and condition of protected areas'.

Overall progress towards the 90% outcome is assessed as the proportion of the total area of priority habitat that is in ‘favourable or unfavourable recovering’ condition, with the value for each individual habitat being more than 80% favourable or unfavourable recovering (see Figure 2a.4 for details on individual priority habitats).

‘Favourable’ condition status indicates that a particular site meets agreed standards for the priority habitat of interest. ‘Recovering’ condition status indicates that the site fails to meet the standards, but has appropriate management in place that will achieve those standards, sites with inappropriate or no suitable management are ‘unfavourable’.

Given the overlap with the SSSI outcome, and the different levers available to achieve favourable condition inside and outside SSSIs, it is important to report separately on the condition of SSSI and non-SSSI priority habitat. Some habitats require further work to agree a monitoring methodology, notably in woodlands and freshwater habitats. It is also necessary to ensure that priority habitat assessed as ‘favourable’ is also meeting the needs of associated species. A proposed methodology for assessing and reporting favourable and unfavourable recovering condition for priority habitats is set out in Table 2a.2 below.

Table 2a.2: Assessment and definition of ‘favourable’ and ‘recovering’ condition for priority habitats

<table>
<thead>
<tr>
<th>Habitats</th>
<th>Methodology for ‘favourable’ condition assessment</th>
<th>Definition of ‘recovering’ condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Terrestrial and coastal habitats</td>
<td>SSSI resource condition assessed through CSM; non-SSSI resource condition through stratified random sampling.</td>
<td>Under appropriate management (i.e. the area under appropriate AES options).</td>
</tr>
<tr>
<td>Freshwater habitats</td>
<td>SSSI resource condition assessed through CSM; non-SSSI resource assessed using WFD monitoring methodology with water bodies assessed as at ‘High Ecological Status' treated as synonymous with ‘favourable’.</td>
<td>WFD monitoring methodology with water bodies progressing towards ‘Good Ecological Status' treated as synonymous with ‘recovering’.</td>
</tr>
<tr>
<td>Woodland habitats</td>
<td>SSSI resource condition assessed through CSM; non-SSSI resource condition through stratified random sampling.</td>
<td>Woodlands meeting UK Forestry Standard for biodiversity – no monitoring yet in place.</td>
</tr>
</tbody>
</table>

Note: AES – agri-environment scheme; CSM – Common Standards Monitoring for SSSIs; EWGS – England Woodland Grant Scheme.
Common Standards Monitoring (CSM) guidelines provide the basis for assessing the extent of priority habitat that is in favourable or unfavourable recovering condition within designated sites (SSSIs). Figure 2a.4 shows the percentage of individual priority habitats in target condition. A detailed breakdown of the condition data for each of these habitats, together with their extent, is available in the associated dataset for this indicator.

‘In favourable management’ has been used as a proxy outside of SSSI and counts towards the target of being in ‘unfavourable recovering condition’. For non-SSSI priority habitat, only HLS, CS, or FC management has been included as ‘unfavourable recovering’ for the purpose of this provisional analysis. In the future, other mechanisms of achieving ‘appropriate management’ will also be included. For details on the Environmental Stewardship Scheme (i.e. HLS) and the CS scheme, refer to indicator22, ‘Agricultural and forest area in environmental management schemes’.

Figure 2a.4: Percentage of individual priority habitat types in target condition, March 2019

Note: The ‘favourable SSSI’, ‘unfavourable recovering SSSI’ and ‘non SSSI but under HLS, CS or FC’ categories have been combined to more clearly display the percentage of that habitat in target condition.

Source: Natural England.
**Web links for further information**

<table>
<thead>
<tr>
<th>Reference</th>
<th>Website</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forestry Commission</td>
<td>National Forestry Inventory</td>
</tr>
<tr>
<td>Joint Nature Conservation Committee</td>
<td>UK Priority Habitats</td>
</tr>
</tbody>
</table>
| Joint Nature Conservation Committee | Common Standards Monitoring Programme  
| | Common Standards Monitoring Guidance |
| Natural England | Habitats of ‘principal importance’ for the conservation of biological diversity in England |
| Natural England | River and lake information and maps |

**Last updated:** September 2019  
**Latest data available:** March 2019
2b. Status of threatened habitats: habitats of European importance

Type: State indicator

Status of habitats of European importance

This indicator has been updated with new data from the 2019 UK Habitats Directive Article 17 report to the European Union.

In 2007, 6% of the habitats occurring in England that are listed in Annex I of the Habitats Directive were in favourable conservation status, this figure decreased to 3% in 2013 before increasing again to 6% in 2019 (Figure 2b.1).

The conservation status of 49% of habitats was unfavourable-improving in 2007, it decreased to 33% in 2013 and 21% in 2019.

The conservation status of 30% of the habitats was unfavourable-declining in 2007, this decreased to 24% in 2013 and 23% in 2019.

Figure 2b.1: Conservation status of habitats of European importance occurring in England, 2007, 2013 and 2019

Note: The graph is based on the 70 habitats listed in Annex I of the Habitats Directive that occur in England.

Indicator assessment

### Assessment of change in conservation status of habitats of European importance occurring in England

<table>
<thead>
<tr>
<th>Percentage of habitats of European importance occurring in England in favourable or improving conservation status</th>
<th>Long term</th>
<th>Short term</th>
<th>Latest year</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007–2019</td>
<td>×</td>
<td>×</td>
<td>Not assessed</td>
</tr>
</tbody>
</table>

**Note:** The long and short-term assessments are based on a 3% rule of thumb. See [Assessing Indicators](#). No latest-year change is provided because Article 17 reports are only submitted once every 6 years and therefore, any latest-year change would simply mirror the short-term assessment.

### Relevance

This indicator is relevant to outcomes 1, 1A and 2 in *Biodiversity 2020: A strategy for England’s wildlife and ecosystem services* (see Annex A). It is also relevant to a number of international targets (see Annex B of the aforementioned publication for further details).

### Background

The indicator shows progress towards maintaining and/or restoring favourable conservation status for habitat types listed under Annex I of the EU Habitats Directive. These are habitats for which the UK has European level conservation responsibilities. An assessment of status and trends for each habitat is undertaken every 6 years. Trends in unfavourable conservation status allow identification of whether progress is being made, as it will take many years for some habitats to reach favourable conservation status. The status assessments presented in this indicator are based on the 70 UK habitats listed in Annex I of the Habitats Directive that are found in England.

The first UK assessment of conservation status of habitats and species listed in the annexes of the Directive was produced in 2007; a second assessment was produced in 2013; and a third assessment was made in 2019. Each individual habitat assessment requires information on 4 parameters, which are brought together to form an overall assessment. These parameters are: range; area; structure; and functions and future prospects.

The trend in the overall assessment is based upon an integration of the trend information for the individual parameters (see links for UK approach). Each assessment concludes whether the habitat is in one of the following states:

- ‘favourable’;
- unfavourable-inadequate’;
- ‘unfavourable-bad’; or
- ‘unknown’.

The UK reported on 77 habitats listed in Annex I of the Habitats Directive in 2013. The conservation status assessments quoted in this indicator are for a subset consisting of 70 UK habitats that are found in England. Grouping the habitats by broad habitat types leads to the following breakdown for England:

- Marine 7
- Coastal 15
- Heaths and scrub 8
- Woodlands 9
- Grasslands 9
- Freshwater 7
A full list of these habitats, together with their individual assessment results for 2007, 2013 and 2019 is presented in the dataset supporting this indicator.

**Assessment of change in conservation status**

The indicator is based on an evaluation of whether the results obtained in 2019 are better or worse than those obtained in 2013 (short term) and 2007 (long term). It is likely to take time before habitats move from unfavourable conservation status to favourable conservation status, so for the unfavourable assessments, an assessment of trend is made to determine if the habitat is improving, declining, or showing no change. At its simplest (Figure 2b.1), this can be the proportion of habitats which are favourable, or show an improving trend (i.e. favourable, or unfavourable-inadequate but improving, or unfavourable-bad but improving). This applies to 27% of habitats assessed in 2019, 36% of habitats assessed in 2013 and 54% of habitats assessed in 2007⁴; the measure is therefore assessed as declining in both the long and short term.

Figure 2b.1 combines the unfavourable inadequate and unfavourable-bad assessments which show a similar direction of trend. In all 3 assessments, improving and declining trends were assigned where the evidence allowed a conclusion that improvements or declines in the conservation status of habitats were occurring. Thus:

- Unfavourable-inadequate improving and unfavourable-bad improving were summed to form the category ‘unfavourable improving’, and
- Unfavourable-inadequate declining and unfavourable-bad declining were summed to form the category ‘unfavourable declining’.

In 2007, no trend was assigned to those habitats which were neither improving nor declining. This included both habitats for which the trend was unknown, and those for which there was no evidence of change. For ease of comparison in the figures, unfavourable-inadequate and unfavourable-bad assessments with no trend conclusion in 2007 were summed to form the category ‘unfavourable stable’; the same term was used for 2013 and 2019 data, but with more confidence that the trend was neither improving nor declining.

Figure 2b.2 provides a breakdown of Figure 2b.1 by showing the number of habitats in the unfavourable categories which arise from the unfavourable-inadequate or unfavourable-bad assessment categories in 2019. The picture for habitats is somewhat worse than for species (see indicator number 4c), in that relatively more habitats are in unfavourable conservation status, and relatively more habitats which are unfavourable are in unfavourable-bad status.

---

⁴ Note that the combined figures for favourable and unfavourable-improving may differ from the sum of the figures provided individually for these categories due to rounding.
Figure 2b.2: Status of habitats of European importance occurring in England, 2019

Notes:
1. The graph is based on the 70 habitats listed in Annex I of the Habitats Directive that occur in England.
2. Darker red bars show the number of habitats within a trend which were unfavourable-bad; lighter red bars show the number of habitats within a trend which were unfavourable-inadequate.


The Joint Nature Conservation Committee and Natural England have carefully collated and considered a wide range of data, using a robust quality assurance protocol, to come to the conclusion for each habitat, and to ensure changes, including within category changes, have been consistently and accurately discriminated. These changes are ecologically important, as stabilising a decline in a habitat, for example, is an important conservation achievement. The information sources on which the assessments are based are quite varied – their quality is documented in the database which underpins the assessments. The changes are largely based on evidence, though expert opinion was used in cases where evidence was not available.

Web links for further information

<table>
<thead>
<tr>
<th>Organisation</th>
<th>Subject</th>
</tr>
</thead>
<tbody>
<tr>
<td>European Topic Centre on Biological Diversity (EIONET)</td>
<td><a href="#">European guidance on making conservation status assessments</a></td>
</tr>
<tr>
<td>European Topic Centre on Biological Diversity (EIONET)</td>
<td><a href="#">Online report on Article 17 of the Habitats Directive: conservation status of habitats and species of Community interest (2001-2006)</a></td>
</tr>
<tr>
<td>European Topic Centre on Biological Diversity (EIONET)</td>
<td><a href="#">EEA Technical report No 2/2015: Results from reporting under the nature directives 2007-2012</a></td>
</tr>
<tr>
<td>Joint Nature Conservation Committee</td>
<td>EU Habitats Directive</td>
</tr>
<tr>
<td>Organisation</td>
<td>Subject</td>
</tr>
<tr>
<td>--------------------------------------------------</td>
<td>----------------------------------------------</td>
</tr>
<tr>
<td>Joint Nature Conservation Committee</td>
<td>UK Habitats Directive Report, 2019</td>
</tr>
</tbody>
</table>

**Last updated:** December 2019

**Latest data available:** 2019
3. Habitat connectivity in the wider countryside

Experimental statistic: The UK biodiversity indicators project team would welcome feedback on the novel methods used in the development of this indicator.

Type: State indicator

Functional connectivity in the UK

No new data point but this indicator has been updated to include woodland birds.

For UK butterflies, the average functional connectivity between 1985 and 1995 was relatively stable, the unsmoothed index fell to a low of 48% in 2004, and then rose. The level of functional connectivity in 2012 (110%) is 10% greater than in the start year of 1985, with 72% of species increasing in connectivity in the late short term (2000 to 2012), see Figure 3.1. The long-term trend from 1985 to 2012 masks mixed, individual species trends, with 33% of species increasing in functional connectivity, 19% decreasing, and 48% showing no significant change.

For UK woodland birds, the average functional connectivity between 1985 and 1996 was relatively stable. However, between 1999 and 2012 the unsmoothed index declined to a low of 44% of its 1999 base-line value in 2005 and although it has since shown some signs of recovery, most species (57%) have declined in connectivity in the late short term (1999 to 2012), see Figure 3.2.

Figure 3.1: Functional connectivity of butterflies in the UK, 1985 to 2012, using a 10-year moving window

5 There is no assessment of the long-term trend or the numbers of species that have increased, deceased or shown no change over the long term because of the break in the time series between 1996 and 1999.

Indicator Description

Connectivity is a measure of the relative ease with which typical species can move through the landscape between patches of habitat. Habitat loss and fragmentation can reduce the size of populations and hinder the movement of individuals between increasingly isolated populations, threatening their long-term viability.

This indicator illustrates changes in functional connectivity – the ability of species to move between resource patches – of 33 butterfly and 29 woodland bird species in the UK. The indicator is based on a measure of population synchrony, which is the level of correlation in time-series of population growth rates from different monitoring sites. Quantifying functional connectivity will allow more targeted landscape conservation management to help reduce the risk of species extinction.
Notes:

1. The connectivity index was calculated as the mean value of population synchrony using a 10-year moving window. The index values were extracted from a statistical (mixed effects) model which accounts for other factors known to influence population synchrony, therefore focusing the measure on functional connectivity.

2. The line graph shows the unsmoothed average trend (dashed line), and the smoothed average trend (using a LOESS regression function; solid line) of functional connectivity over time across all 33 species. The shaded area represents the 95% confidence interval around the smoothed average trend.

3. The figure in brackets shows the number of species in the index.

4. The number of individual species included in each time period varies due to the availability of data: there were 21 species in the long-term period, 24 in the early short-term period and 31 in the late short-term period. In all, 33 species from 3 habitat types (woodland, grassland, and garden and hedgerows) are included in the indicator.

5. The bar chart shows the percentage of species within the indicator that have shown a statistically significant increase, a statistically significant decrease, or no significant change in functional connectivity over 3 time periods (long term, 1985 to 2012; early short term, 1985 to 2000; and late short term, 2000 to 2012). 

Source: UK Butterfly Monitoring Scheme, University of Reading.

**Figure 3.2: Functional connectivity of woodland birds in the UK, 1985 to 2012, using a 10-year moving window**

Notes:

1. The connectivity index was calculated as the mean value of population synchrony using a 10-year moving window. The index values were extracted from a statistical (mixed effects) model which accounts for other factors known to influence population synchrony, therefore focusing the measure on functional connectivity.

2. The line graph shows the unsmoothed average trend (dashed line), and the smoothed average trend (using a LOESS regression function, solid line) of functional connectivity over 2 time periods (1985 to 1996 and 1999 to 2012) across all 25 or 23 species. The shaded area represents the 95% confidence interval around the smoothed average trend.

3. The gap in the time series is due to the non-availability of data for 1997 and 1998.

4. The figures in brackets show the number of species in the index.

5. The number of individual species included in each time period varies due to the availability of data: there were 25 species in the early short-term period and 23 in the late short-term period.

6. The bar chart shows the percentage of species within the indicator that have shown a statistically significant increase, a statistically significant decrease, or no significant change in functional connectivity over 2 time periods (early short term, 1985 to 1996; and late short term, 1999 to 2012).

Source: British Trust for Ornithology, University of Reading.
As this is an experimental statistic it has not been assessed. The UK biodiversity indicators project team would welcome views on whether Figure 3.1 and/or Figure 3.2 should be the headline measure, together with comments on the value of this new indicator (i.e. is this measuring something readers feel should be measured?) and the quality of the new indicator (i.e. how well does it measure connectivity?).

Relevance

Habitat loss and fragmentation was identified by the Millennium Ecosystem Assessment as one of 5 direct drivers of biodiversity loss. Habitat loss is a significant driver of biodiversity loss in the UK (Lawton et al., 2010). It results in fragmentation whereby habitats are separated into small, isolated patches (Fahrig, 2003). This inhibits individuals from dispersing across the landscape which is essential for metapopulation persistence, range shifts under climate change, and maintaining genetic diversity (Hanski, 1997; Watts & Handley, 2010). Quantifying functional connectivity as the ability of a focal species to move between resource patches (Oliver et al., 2017; Powney et al., 2011), is therefore important in order to manage landscapes appropriately and reduce species extinction risk (Powney et al., 2012).

Habitat fragmentation and loss can be cumulative over time, but may be reversed through habitat management, restoration and recreation. Many of the habitats in the UK landscape are already highly fragmented. The effects of habitat fragmentation can be compounded by changes in land use between patches. The importance of these changes depends on which habitats are next to each other (edge effects) and the ease with which species can move through the intervening landscape (permeability).

The indicator is relevant to outcomes 1 and 3 in Biodiversity 2020: A strategy for England’s wildlife and ecosystem services (see Annex A). The indicator is also relevant to international goals and targets (see Annex B of the aforementioned publication for further details).

Background

Functional connectivity is determined by the number of individuals leaving patches (e.g. emigration often when local abundance is high), the intrinsic dispersal capability of individuals, and the structure of the landscape facilitating or hindering movement (Figure 3.3). Certain methods to measure functional connectivity, such as mark-release recapture studies or landscape genetics are expensive, time consuming and can only be conducted over small spatial scales. Larger-scale (national) indicators therefore have tended to focus on structural metrics based on land cover combined with expert opinion on species’ habitat associations and movement capacity (Watts & Handley, 2010). While useful, these approaches are limited by the frequency by which land cover data are updated and by substantial uncertainty in using expert opinion to estimate species’ movement capabilities across land cover types. This indicator uses a data-derived method based on widely available, annually updated species monitoring data – which gives a ‘species-eye-view’ (empirically derived) measure of functional connectivity.

The functional connectivity indicator is based on a measure of population synchrony, the level of correlation in time-series of annual population growth rates between different monitoring sites. Population synchrony is known to be influenced by distance between sites, habitat similarity, shared climate and position in geographic range (Powney et al., 2011, 2012). After accounting for these factors, research has shown population synchrony to be an effective measure of functional connectivity, responsive to the structure of land cover between sites (Powney et al., 2011, 2012), and reflecting actual movements of individuals from independent mark-release-recapture data (Oliver et al., 2017). Additional evidence which analysed over 60 UK birds and butterflies found that mobile and more abundant species have higher levels of population synchrony (Morrison et al., in prep). In this indicator, data from the UK Butterfly Monitoring Scheme (UKBMS) and British Trust for Ornithology (BTO) are used, which comprise spatial and temporally replicated standardised population monitoring data (see Figure 3.4 for an overview of the locations of these sites). Two BTO datasets are used: the Common Birds Census (CBC) which ceased in 2000 and the Breeding Bird...
Conservation on land and at sea Survey (BBS) which began in 1994 and continues today. Because the number and identity of monitoring sites varies through time, an approach based on mixed effects models is used to account for this variation while estimating a temporal trend in functional connectivity.

Figure 3.3: Schematic of factors that influence functional connectivity, which in turn can affect species extinction risk

- **Mean abundance**: High butterfly abundance leads to increased propagule pressure which can facilitate the spread of populations.
- **Landscape permeability**: Less hostile landscapes (e.g. with more resources and fewer barriers to dispersal) lead to improved functional connectivity.
- **Individual movement capacity**: The capacity of individuals to move across landscapes may be affected by weather and may also evolve through biological selection, thus affecting the functional connectivity of populations.
- **Autocorrelation in climate**: Synchronised fluctuations in butterfly abundances could be driven by correlated fluctuations in environmental conditions.

Figure 3.4: Locations of the monitoring sites for each dataset, (a) UKBMS (n = 701), (b) CBC (n = 109), and (c) BBS (n = 2499)

Source: UK Butterfly Monitoring Scheme.
Population synchrony in growth rates (i.e. interannual population changes; following Powney et al., 2010) was calculated for all pair-wise monitoring site combinations, using a moving 10-year window from 1980 to 2016. A mixed effects model was fitted, with population synchrony as the response variable, and the mid-year of the moving window included as a fixed categorical effect. To account for other known drivers of population synchrony, distance between sites, habitat similarity index, and mean northing were included as predictors in the model (Powney et al., 2011). Site pair ID and species were included as random intercepts. Coefficients for each year were extracted and used as a measure of functional connectivity along with standard errors reflecting uncertainty of the estimate.

To determine how many butterfly species were changing in functional connectivity over time, 3 periods of change were investigated: 2 short-term trends; early (1985 and 2000) and late (2000 and 2012), and one long-term trend (1985 and 2012). For birds, 2 time periods were chosen: early short term using the CBC dataset (1985 to 1996) and late short term using the BBS dataset (1999 to 2012). These time-periods were chosen to ensure there was no overlap in the 10-year moving window (i.e. they represent independent input data). For each time period comparison, and for each species, coefficients and their uncertainty were extracted from the mixed effects model to determine whether connectivity had significantly increased or decreased, or there had been no significant change between the 2 comparison years (Figure 3.1 and 3.2).

It is important that the measure of functional connectivity reflects the three main components determining movement between sites (Figure 3.3) and not confounding effects. Two possible confounding effects could be a) a temporal trend in spatial autocorrelation in climate over time, or b) increasing variance in climate over time. To test for a), Moran’s I was calculated for four climatic variables: mean temperature and rainfall for each season (spring, summer, autumn, winter). Linear and quadratic regression models were fitted for each variable against year. These models showed no significant trends suggesting no evidence for changes in spatial autocorrelation in climate over time. To test for b), the variation in seasonal mean temperature and total precipitation were compared between 1985 to 2000 and 2000 to 2012. Analysis using an F-test revealed no significant changes in variance between the 2 time periods.

Evidence supporting a strong signal of species movement on population synchrony

1. Estimated quality of intervening landscape between sites is positively related to population synchrony (Speckled wood butterfly at scales of up to 100km, Powney et al., 2011).
2. Distance along woodland edges is a better predictor of movement than Euclidean distance – a similar result found for both population synchrony and mark-release-capture (Ringlet butterfly; Powney et al., 2012).
3. Patches with higher frequency of movements between them from mark-release-capture experiments also have higher population synchrony (bog fritillary butterfly; Oliver et al., 2015).
4. Species that are mobile and more abundant have higher levels of population synchrony and these results are robust to an additional effect of species position in their geographic range (61 butterflies and birds; Morrison et al., in prep).

Evidence finding little signal of climatic changes on trends in population synchrony

1. No significant temporal trend in spatial autocorrelation of seasonal temperature and precipitation variables (Morrison et al., in prep).
2. No significant temporal trend in variability of seasonal temperature and precipitation variables (Morrison et al., in prep).
Archived measure on habitat connectivity

Until 2013, this indicator was based on an analysis of the change in habitat connectivity for selected broad habitats in the wider countryside. The indicator methodology was developed by Forest Research in collaboration with the Centre for Ecology & Hydrology, using Countryside Survey data collected consistently from 591 Countryside Survey 1km² sample squares in Great Britain in 1990, 1998 and 2007. The results of this work provided a significant step forward in understanding and describing habitat fragmentation and connectivity, but unfortunately it has not been possible to update this indicator since the last Countryside Survey was carried out in 2007.

Given the age of the most recent data and the lack of any future opportunities to source updates in a consistent way, the UK Biodiversity Indicators Steering Group decided to reclassify this indicator as 'under development' and look at new options for a headline measure.

The indicator presented the change in the degree of habitat connectivity in Great Britain between 1990 and 2007, for 2 broad habitats (see Figure 3.5):

1. Broad-leaved, mixed and yew woodland. This includes all woodland with a canopy cover of at least 25%, where more than 80% of the canopy trees are broad-leaved species or yew trees.
2. Neutral grassland, which includes all grassland on neutral soils including both unimproved and semi-improved grassland.

Figure 3.5: Change in habitat connectivity for selected broad habitats in the wider countryside of England, 1990 to 2007

Notes:

1. The mean connectivity value is a measure of the relative connectivity of habitats on a scale of 0 (not connected) to 100 (contiguous habitat). Typical values are between zero and one.
2. Changes shown by an asterisk (*) indicate a significant change between 1990 and 2007.

Source: Centre for Ecology & Hydrology, Forest Research.

The indicator provided a measure of functional connectivity of these 2 habitats in the wider landscape (i.e. the relative likelihood of species typical of the habitat being able to move within and between habitat patches). The calculations took into account the area of habitat patches, how isolated they are, which habitats are next to each other, and the ease with which species are able to move through the surrounding landscape. The influence of habitat quality on species was only partially covered by this indicator.
The measure required further analysis to better explain the causes of the changes in connectivity and, as a result, the information available was insufficient to make an assessment of change. The indicator did however show no significant change in the connectivity of broad-leaved, mixed and yew woodland in England, and an increasing trend in the connectivity of neutral grassland. The trend for neutral grassland was significant between 1990 and 2007 but not in the short term between 1998 and 2007 (Figure 3.5).

Web links for further information

<table>
<thead>
<tr>
<th>Organisation</th>
<th>Subject</th>
</tr>
</thead>
<tbody>
<tr>
<td>Butterfly Conservation</td>
<td>UK Butterfly Monitoring Scheme</td>
</tr>
<tr>
<td>Centre for Ecology &amp; Hydrology</td>
<td>Countryside Survey 2007</td>
</tr>
<tr>
<td>Centre for Ecology &amp; Hydrology</td>
<td>Land Cover Map</td>
</tr>
<tr>
<td>Forestry Commission</td>
<td>Evaluating Biodiversity in Fragmented Landscapes</td>
</tr>
<tr>
<td></td>
<td>(PDF 4.88 KB)</td>
</tr>
<tr>
<td>Millennium Ecosystem Assessment</td>
<td>Home Page</td>
</tr>
</tbody>
</table>

References


Last updated: September 2019

Latest data available:

Experimental statistic on Functional Connectivity: 2012 (mid-year of most recent 10-year moving window of data)

Archived measure of Habitat Connectivity: no update (2007)
4a. Status of priority species: relative abundance

Type: State Indicator

Relative abundance of priority species in the UK

Official lists of priority species have been published for each UK country. There are 2,890 species on the combined list; actions to conserve them are included within the respective countries’ biodiversity or environment strategies. This indicator shows the average change in the 214 species for which abundance trends are available.

By 2016, the index of relative abundance of priority species in the UK had declined to 40% of its value in 1970, a statistically significant decrease (Figure 4a.1). Over this long-term period, 22% of species showed a strong or weak increase and 63% showed a strong or weak decline.

Between 2011 and 2016, the index was 22% lower than its value in 2011, again showing a statistically significant decrease. Over this short-term period, 35% of species showed a strong or weak increase and 46% showed a strong or weak decline.

Figure 4a.1: Change in the relative abundance of priority species in the UK, 1970 to 2016

Notes:
1. The line graph shows the unsmoothed trend (dashed line) with its 95% confidence interval (shaded area).
2. The figure in brackets shows the number of species included in the composite index.
3. The bar chart shows the percentage of species within the indicator that have increased (weekly or strongly), decreased (weakly or strongly) or shown no change in abundance based on set thresholds of change.
4. All species in the indicator are present on one or more of the country priority species lists (Natural Environmental and Rural Communities Act 2006 – Section 41 (England), Environment (Wales) Act 2016 section 7, Northern Ireland Priority Species List, Scottish Biodiversity List).
5. This indicator is not directly comparable with the previous publication. There have been a number of minor changes in the composition and a revision to the statistical methods used (see the indicator description section for more detail).

**Source:** Bat Conservation Trust, British Trust for Ornithology, Butterfly Conservation, Centre for Ecology & Hydrology, Defra, Joint Nature Conservation Committee, People’s Trust for Endangered Species, Rothamsted Research, Royal Society for the Protection of Birds.

**Indicator assessment**

<table>
<thead>
<tr>
<th>Priority species – Relative abundance</th>
<th>Long term</th>
<th>Short term</th>
<th>Latest year</th>
</tr>
</thead>
</table>

**Note:** Analysis of the underlying trends is undertaken by the data providers.

**Indicator description**

Priority species are defined as those appearing on one or more of the biodiversity lists of each UK country (Natural Environmental and Rural Communities Act 2006 - Section 41 (England), Environment (Wales) Act 2016 section 7, Northern Ireland Priority Species List, Scottish Biodiversity List). The combined list contains 2,890 species in total. The priority species were highlighted as being of conservation concern for a variety of reasons, including rapid decline in some of their populations. Actions to conserve these priority species are included within the respective countries’ biodiversity or environment strategies.

Of the 2,890 species in the combined priority species list, the 214 for which robust quantitative time series of relative species abundance are available are included in the indicator. These 214 species include birds (104), butterflies (23), mammals (11) and moths (76). This selection is taxonomically limited at present; it includes no vascular or non-vascular plants, fungi, amphibians, reptiles, or fish. The only invertebrates included are butterflies and moths. The species have not been selected as a representative sample of priority species and they cover only a limited range of taxonomic groups. The measure is therefore not fully representative of species in the wider countryside. The time series that have been combined cover different time periods, were collected using different methods and were analysed using different statistical techniques. In some cases, data have come from non-random survey samples. See the technical background document for more detail.

The relative abundance of each of these species is the estimated population (abundance) of the species in the latest year of the time series taken as a percentage of its estimated population in the earliest year of the time series (i.e. the relevant base year). The relative abundance of a species will increase when the population of the species grows; it will decrease when the population of the species declines.

Between 1970 and 2016, the index of relative abundance of priority species in the UK fell from 100 to 40. This change was assessed as a statistically significant decline. The long-term assessment is made on the unsmoothed time series of relative species abundance generated by the data providers. It is based on a test of statistical significance that compares the change and the 95% confidence intervals between 1970 and 2016. To calculate the short-term trend, a change statistic between 2010 and 2016 is calculated for each species, these short-term trend estimates are then re-sampled to provide confidence intervals on that change statistic (Eaton et al., 2015). In 2016, the index of relative abundance of the 214 species included in the indicator fell by 22% relative to the 2011 level; a statistically significant decline.

Whilst showing a similar general pattern to previously published iterations, the indicator given here shows a less substantial decline; the previous indicator ended on a value (relative to the 1970
Conservation on land and at sea

baseline) of 32% in 2015, whereas the value for 2015 in this update is 47%. There have been a number of minor changes to the indicator in terms of species composition (215 species included in 2019 versus 215 species in 2018) and the treatment of data for both birds and bats, but the principal cause of the changed indicator is a revision in the statistical methods used to generate moth trends. See the technical background document for more detail.

Relevance

Priorities for species and habitat conservation are set at a country level through country biodiversity or environment strategies. Each country has an identified list of priority species, which are of high conservation concern due, for example, to restricted range or population declines. The indicator therefore includes a substantial number of species that, by definition, are becoming less abundant.

Measures of abundance are more sensitive to change than measures of distribution (see indicator 4b). Nonetheless, if a threatened species that has been declining starts to recover, its distribution should stabilise, and may start to increase. If the proportion of species in the indicator that are stable or increasing grows, the indicator will start to decline less steeply. If the proportion declines, it will fall more steeply. Success can therefore be judged by reference to trends in both indicators 4a and 4b, as well as other information on other priority species for which there are insufficient data for inclusion in the indicator.

The indicator shows progress with commitments to improve the status of our wildlife and habitats. It is relevant to outcomes 1 and 3 in Biodiversity 2020: A strategy for England’s wildlife and ecosystem services (see Annex A). It is also relevant to a number of international targets (see Annex B of the aforementioned publication for further details).

Background

The measure is a composite indicator of 214 species from 4 broad taxonomic groups, see the technical background document for a detailed breakdown of the species and groups included. The priority species identified in each of the 4 UK countries were highlighted as being of conservation concern for a variety of reasons, including their scarcity, their iconic nature or a rapid decline in their population. They are not representative of wider species in general. They do however include a range of taxonomic groups, and will respond to the range of environmental pressures that biodiversity policy aims to address, including land use change, climate change, invasive species and pollution. The short-term assessment of change can be used to assess the impact of recent conservation efforts and policy aimed at halting and reversing species declines. However, natural fluctuations (particularly in invertebrate populations) and short-term response to weather may have a strong influence on the short-term assessment.

Regardless of advances in statistical techniques, there are likely to be species on the priority lists for which little monitoring or occurrence data are available. Reasons for this include rarity, difficulty of detection, or those for which monitoring methods are unreliable or unavailable. In order for the indicator to be representative of priority species, a method of assessing the changing status of these remaining data poor species would need to be considered.

The time series for each species in the indicator is converted into an index. Each time series is scaled as a percentage of its value in its first year (i.e. the first year has an index value of 100 regardless of when a species was first included in the indicator). This enables all species to be brought together on an equal basis – common species and rarer species are thereby given equal weighting, and the annual index value is the geometric mean of the scaled species values for that year. For species trends entering the indicator after the first year, their value in the first year is set to the geometric mean of those species trends already in the indicator. Any missing values are estimated using linear interpolation (Collen et al., 2008) and 1% of the trend average is added to any trends containing zero values (Loh et al., 2005). Species trends ending prior to the end year of the indicator are held at their final values to the end of the data series (currently 2016).
The overall trend shows the balance across all the species included in the indicator. Individual species within each measure may be increasing or decreasing in abundance (Figure 4a.1). Estimates will be revised when new data or improved methodologies are developed and will, if necessary, be applied retrospectively to earlier years. Further details about the species that are included in the indicator, and the methods used to create the priority species indicator can be found in the technical background document.

Confidence intervals for each year are created using bootstrapping (Buckland 2005; Freeman et al., 2001). In each iteration, a random sample of species is selected, and the geometric mean calculated. The headline indicator (Figure 4a.1) masks variation between the taxonomic groups. Figure 4a.2 shows the index for each taxonomic group separately, generated using the same methods as the headline indicator. The moths have undergone the most dramatic decline with an index value in the final year (2016) that was only 14% of its value in 1970. Similar strong declines in moths were noted in 4b. Butterflies have also experienced a strong decline, with an index value in 2016 that was 17% of its value in 1976. These are counterbalanced by relative stability in the birds index (99% in 2016 relative to the base year of 1970) and an increase in the mammals index, which had a value of 114% in 2016 (relative to a base year of 1993).

Figure 4a.2: Change in relative species abundance by taxonomic group, 1970 to 2016

Notes:
1. The graphs show the unsmoothed trend (dashed line) together with the 95% confidence interval (shaded area) for each of the 4 taxonomic groups included in the composite indicator.
2. The figures in brackets show the number of species included in each measure.

Conservation on land and at sea

Combined long-term change in the relative abundance and distribution of priority species

The assessment given here is based on the indicators published in 2018; it has not been updated in 2019 and does not reflect new data published in the fiches for 4a or 4b.

The priority species indicator currently comprises of 2 measures; this indicator (4a) based on abundance data and 4b based on distribution data. The assessments are made separately for these 2 indicators which can result in potentially different messages. Ideally, these would be combined into a single assessment for priority species, however such a combined indicator needs to address challenges about differences in the data types that contribute to 4a and 4b. Simply combining the species trends would assume equivalence across the 2 datatypes, i.e. that a 10% change in abundance is equivalent to a 10% change in distribution. This has, to date, been deemed an unreasonable assumption to make. Furthermore, combining change from different datatypes leads to a lack of clarity around what the indicator is actually measuring when using magnitude of change.

The Centre for Ecology & Hydrology have proposed a technique to produce a combined evaluation of priority species, using both abundance and distribution data. The key development is that rather than assessing the indicator based on magnitude of change, the assessment is based on the balance of increasing versus decreasing species. This is consistent with existing indicators, in that the assessment is a statement of confidence in whether the overall trend line has increased, decreased or showed no overall change. It also sidesteps the challenges of combining different data types by only assuming that the confidence with which a species is assigned an increasing or decreasing trend can be compared across data types (see the technical background document for further details). As this technique is currently being refined, it has only been used to produce a measure of the combined long-term change in the 2 priority species indicators (Figure 4a.3).

Of the 929 priority species included in the 2018 update of indicators 4a and 4b, 225 (24%) have increased, 317 (34%) have decreased and 387 (42%) have shown no significant change in either abundance or distribution between 1970 and 2015. Overall, the long-term trend for the combined measure of priority species abundance and distribution in the UK is declining.

Figure 4a.3: Combined long-term change in the relative abundance and distribution of priority species in the UK, 1970 to 2015

Notes:

1. Based on 929 species included in the 2018 update of indicators 4a and 4b. Each species contributes once only – so either to 4a or to 4b.
2. The graph provides information on the percentage of species which have increased, decreased or remained unchanged; it does not assess the amount of change in those species.

Source: Distribution data from: Biological records data collated by a range of national schemes and local data centres. Abundance data from: Bat Conservation Trust, British Trust for Ornithology, Butterfly
Web links for further information

<table>
<thead>
<tr>
<th>Reference</th>
<th>Title</th>
<th>Website</th>
</tr>
</thead>
<tbody>
<tr>
<td>British Trust for Ornithology</td>
<td>Indicators of wild bird populations</td>
<td><a href="http://www.bto.org/science/monitoring/developing-bird-indicators">http://www.bto.org/science/monitoring/developing-bird-indicators</a></td>
</tr>
<tr>
<td>Butterfly Conservation</td>
<td>Butterflies and Moths</td>
<td><a href="https://butterfly-conservation.org/">https://butterfly-conservation.org/</a></td>
</tr>
<tr>
<td>Joint Nature Conservation Committee</td>
<td>Seabird Monitoring Programme</td>
<td><a href="http://jncc.defra.gov.uk/page-1550">http://jncc.defra.gov.uk/page-1550</a></td>
</tr>
<tr>
<td>Wales Biodiversity Partnership</td>
<td>Section 7 priority species in Wales</td>
<td><a href="https://www.biodiversitywales.org.uk/Environment-Wales-Bill">https://www.biodiversitywales.org.uk/Environment-Wales-Bill</a></td>
</tr>
<tr>
<td>Wildfowl and Wetlands Trust</td>
<td>National water bird estimates</td>
<td><a href="http://www.wwt.org.uk/research/monitoring/">http://www.wwt.org.uk/research/monitoring/</a></td>
</tr>
<tr>
<td>UK Biodiversity Partnership</td>
<td>UK Biodiversity Action Plans</td>
<td><a href="http://jncc.defra.gov.uk/page-5155">http://jncc.defra.gov.uk/page-5155</a></td>
</tr>
<tr>
<td>UK Butterfly Monitoring Scheme</td>
<td>Butterflies as indicators</td>
<td><a href="http://www.ukbms.org/indicators.aspx">http://www.ukbms.org/indicators.aspx</a></td>
</tr>
</tbody>
</table>
References


**Last updated**: September 2019

**Latest data**: 2016
4b. Status of priority species: distribution

Type: State Indicator

Distribution of priority species in the UK

No additional data point since the previous publication but methodological changes have resulted in revisions to the full data series (see method changes section for further details).

Official lists of priority species have been published for each UK country. There are 2,890 species on the combined list; actions to conserve them are included within the respective countries' biodiversity or environment strategies.

Between 1970 and 2016, the index of distribution of priority species in the UK decreased; with a higher proportion of species decreasing in distribution than increasing. The long-term trend is assessed as a decline of 27%.

The index was 3% lower in 2016 than in 2011, with 33% of species showing an increase and 50% showing a decline. However, this short-term decrease was not significant, and therefore the short-term assessment is stable.

Figure 4b.1: Change in distribution of UK priority species, 1970 to 2016

Notes:

1. The line graph shows the unsmoothed trend (dashed line) with variation around the line (shaded area) within which users can be 90% confident that the true value lies (credible interval).
2. The figure in brackets shows the number of species included in the composite index
3. The bar chart shows the percentage of species within the indicator that have increased, decreased or shown no change in distribution (measured as the proportion of occupied sites), based on set thresholds of change.
4. All species in the indicator are present on one or more of the country priority species lists (Natural Environmental and Rural Communities Act 2006 – Section 41 (England), Environment (Wales) Act 2016 section 7, Northern Ireland Priority Species list, Scottish Biodiversity List).
5. These charts are not directly comparable to previous versions of the indicator. As a result of methodological improvements and more stringent criteria in the occupancy model analysis, fewer species
Conservation on land and at sea

have been included in the 2019 iteration of this indicator compared with the 2018 iteration (714 versus 395). Also since 2018, data updates to the Biological Records Centre database for 3 groups (craneflies, hoverflies and leaf and seed beetles) have been received for this indicator (see method changes section for further details).

Source: Biological records data collated by a range of national schemes and local data centres.

Indicator assessment

<table>
<thead>
<tr>
<th>Assessment of change in distribution of priority species in the UK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Priority species – Distribution</td>
</tr>
<tr>
<td>Long term</td>
</tr>
</tbody>
</table>

Note: Analysis of the underlying trends is undertaken by the data providers.

Indicator description

Priority species are defined as those appearing on one or more of the biodiversity lists of each UK country (Natural Environmental and Rural Communities Act 2006 - Section 41 (England); Environment (Wales) Act 2016 section 7, Northern Ireland Priority Species List, Scottish Biodiversity List). The combined list contains 2,890 species in total. The priority species were highlighted as being of conservation concern for a variety of reasons, including rapid decline in some of their populations. Actions to conserve these priority species are included within the respective countries’ biodiversity or environment strategies.

Of the 2,890 species on the combined priority species list, the 395 for which robust quantitative time-series of the proportion of occupied sites are available are included in the indicator. These 395 species include bees, wasps and ants (80); bryophytes and lichens (120); moths (117); and other insects (39). The species have not been selected as a representative sample of priority species and they cover only a limited range of taxonomic groups. The measure is therefore not fully representative of species in the wider countryside. See the technical background document for more detail.

The relative change in distribution of each of these species is measured by the number of 1km grid squares across the UK in which they were recorded – this is referred to as the ‘occupancy index’. The occupancy index will increase when a species becomes more widespread; it will decrease when a species becomes less widespread.

The index of distribution of priority species in the UK fell by more than 20% between 1970 and 1981; this was then followed by a relatively stable period until 2010 when the composite trend steadily declined until 2016. Occupancy of priority species was assessed as declining between 1970 and 2016. The index was 27% lower in 2016 than in 1970, this is considered a significant change. Although the indicator decreased by 3% between 2011 and 2016, it was assessed as stable when taking into account the 90% credibility interval. Uncertainty in the species-specific annual occupancy estimates are incorporated into the overall indicator; details of how this was done are included in the technical background document.

Relevance

Priorities for species and habitat conservation are set at a country level through country biodiversity or environment strategies. Each country has an identified list of priority species, which are of high conservation concern due, for example, to restricted range or population declines. The indicator therefore includes a substantial number of species that, by definition, are becoming less widespread.
Measures of distribution are less sensitive to change than measures of abundance (see indicator 4a). Nonetheless, if a threatened species that has been declining starts to recover, its distribution should stabilise, and may start to increase. If the proportion of species in the indicator that are stable or increasing grows, the indicator will start to decline less steeply. If the proportion declines, it will fall more steeply. Success can therefore be judged by reference to trends in both indicators 4a and 4b, as well as other information on other priority species for which there are insufficient data for inclusion in the indicator.

The indicator shows progress with commitments to improve the status of our wildlife and habitats. It is relevant to outcomes 1 and 3 in Biodiversity 2020: A strategy for England’s wildlife and ecosystem services (see Annex A). It is also relevant to a number of international targets (see Annex B of the aforementioned publication for further details).

**Background**

The measure is a composite indicator of 395 species from 20 taxonomic groups (8 of the 28 groups originally modelled did not contain any species with sufficient data to be included in the final analysis), see the technical background document for a detailed breakdown of the species and groups in the indicator. The priority species identified in each of the 4 UK countries were highlighted as being of conservation concern for a variety of reasons, including their scarcity, their iconic nature or a rapid decline in their population. They are not representative of wider species in general. They do however include a range of taxonomic groups, and will respond to the range of environmental pressures that biodiversity policy aims to address, including land use change, climate change, invasive species and pollution. The short-term assessment of change can be used to assess the impact of recent conservation efforts and policy aimed at halting and reversing species declines. However, natural fluctuations (particularly in invertebrate populations) and short-term response to weather may have a strong influence on the short-term assessment.

Regardless of advances in statistical techniques and the increase in the number of biological records collected, there are likely to be species on the priority lists for which little monitoring or occurrence data is available. Reasons for this include rarity, difficulty of detection, or those for which monitoring methods are unreliable or unavailable. In order for the indicator to be representative of priority species, a method of assessing the changing status of these remaining data poor species would need to be considered.

The Bayesian occupancy approach enables an estimation of species occurrence even though the data used in this indicator were collected without a standardised survey design (van Strien et al., 2013; Isaac et al., 2014a and b). For each species, records were extracted at the 1km grid square scale with records on different days being treated separately, and an annual time-series of the proportion of sites occupied was calculated. Each species-specific time-series was scaled so the first value in 1970 was set to 100. The annual index was estimated as the arithmetic mean of the scaled species-specific occupancy estimates. Each species was given equal weighting within the indicator. Uncertainty in the species-specific annual occupancy estimates is represented by the 90% credible intervals. See the technical background document for further detail on production of the indicator.

Species were grouped into one of 5 categories based on both their short-term (over the most recent 5 years of data) and long-term (all years) mean annual change in occupancy. The threshold values for each category were based on those of the wild bird indicator. See the technical document on the Bayesian indicator development for further detail on the calculation of the species-specific trends.

The trends of the taxonomic groups included within a multi-species indicator are often obscured by its composite nature. Indicator lines have been generated for a number of sub groups using the same method so that the trends for these groups can be seen more clearly (see Figure 4b.2). The bees, wasps and ants group experienced an overall decline, with an index in 2016, 78% of the value in 1980. These are counterbalanced by increases in bryophytes and lichens, which had an index value of 120 in 2016. The moths have undergone the most dramatic decline with an index value in
the final year 57% of the value in 1970. Similar strong declines in moths were noted in 4a. The underpinning causes of this decrease are not completely understood.

Since 2018, data updates to the Biological Records Centre database for 3 groups (craneflies, hoverflies, and leaf and seed beetles) have been received for this indicator. In addition a methodological revision has been conducted to improve reliability in the index.

**Figure 4b.2: Change in distribution of priority species, by taxonomic group, 1970 to 2016**

**Notes:**
1. The graphs show the unsmoothed trend (dashed line) and variation around the line (shaded area) within which users can be 90% confident that the true value lies for each of the taxonomic groups included in the composite indicator.
2. The figures in brackets show the number of species included in each measure.
3. All species in the indicator are present on one or more of the country priority species lists (Natural Environmental and Rural Communities Act 2006 – Section 41 (England), Environment (Wales) Act 2016 section 7, Northern Ireland Priority Species list, Scottish Biodiversity List).
4. The indicator for bees, wasps and ants starts in 1980.
5. These charts are not directly comparable to previous versions of the indicator. As a result of methodological improvements and more stringent criteria in the occupancy model analysis, fewer species have been included in the 2019 iteration of this indicator compared with the 2018 iteration (714 versus 395). Also since 2018, data updates to the Biological Records Centre database for 3 groups (craneflies, hoverflies and leaf and seed beetles) have been received for this indicator (see method changes section for further details).

**Source:** Biological records data collated by a range of national schemes and local data centres.

**Method changes from 4b 2018**
For the 2019 update of indicator 4b, a more stringent record threshold for species inclusion has been applied than in 2018, increasing the minimum number of records from 10 to 50. Species were also excluded if they had either a 10-year gap in records or less than 10 years of occupancy...
estimates. The time series for individual species has also been restricted to after their first record and to not extend beyond the last records available for their taxonomic group. This has reduced the number of species included within the indicator (from 714 in 2018 to 395 in 2019) but has focussed it upon the species which are most likely to have robust trends.

**Combined long-term change in the relative abundance and distribution of priority species**

The assessment given here is based on the indicators published in 2018; it has not been updated in 2019 and does not reflect new data published in the fiches for 4a or 4b.

The priority species indicator currently comprises of 2 measures; 4a based on abundance data and this indicator (4b) based on distribution data. The assessments are made separately for these 2 indicators, which can result in potentially different messages. Ideally, these would be combined into a single assessment for priority species, however such a combined indicator needs to address challenges about differences in the data types that contribute to 4a and 4b. Simply combining the species trends would assume equivalence across the 2 datatypes, i.e. that a 10% change in abundance is equivalent to a 10% change in distribution. This has, to date, been deemed an unreasonable assumption to make. Furthermore, combining change from different datatypes leads to a lack of clarity around what the indicator is actually measuring when using magnitude of change.

The Centre for Ecology & Hydrology have proposed a technique to produce a combined evaluation of priority species, using both abundance and distribution data. The key development is that rather than assessing the indicator based on magnitude of change, the assessment is based on the balance of increasing verses decreasing species. This is consistent with existing indicators, in that the assessment is a statement of confidence in whether the overall trend line has increased, decreased or showed no overall change. It also sidesteps the challenges of combining different data types by only assuming that the confidence with which a species is assigned an increasing or decreasing trend can be compared across data types (see the technical background document for further details). As this technique is currently being refined, it has only been used to produce a measure of the combined long-term change in the 2 priority species indicators (Figure 4b.3).

**Figure 4b.3: Combined long-term change in the relative abundance and distribution of priority species in the UK, 1970 to 2015**

- **Confident increase**
- **Likely increase**
- **No change**
- **Likely decrease**
- **Confident decrease**

**Notes:**

1. Based on 929 species included in the 2018 update of indicators 4a and 4b. Each species contributes once only – so either to 4a or to 4b.

2. The graph provides information on the percentage of species which have increased, decreased or remained unchanged; it does not assess the amount of change in those species.
Conservation on land and at sea

Source: Distribution data from: Biological records data collated by a range of national schemes and local data centres. Abundance data from: Bat Conservation Trust, British Trust for Ornithology, Butterfly Conservation, Centre for Ecology & Hydrology, Defra, Joint Nature Conservation Committee, People’s Trust for Endangered Species, Rothamsted Research, Royal Society for the Protection of Birds.

Of the 929 priority species included in the 2018 update of indicators 4a and 4b, 225 (24%) have increased, 317 (34%) have decreased and 387 (42%) have shown no significant change in either abundance or distribution between 1970 and 2015. Overall, the long-term trend for the combined measure of priority species abundance and distribution in the UK is declining.

Web links for further information

<table>
<thead>
<tr>
<th>Reference</th>
<th>Title</th>
<th>Website</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aquatic Heteroptera Recording Scheme</td>
<td>Home page</td>
<td><a href="https://www.britishbugs.org.uk/recording.html">https://www.britishbugs.org.uk/recording.html</a></td>
</tr>
<tr>
<td>British Dragonfly Society</td>
<td>Recording Dragonflies and Damselflies in the British Isles</td>
<td><a href="http://www.british-dragonflies.org.uk/content/recording-dragonflies-and-damselflies-britain">http://www.british-dragonflies.org.uk/content/recording-dragonflies-and-damselflies-britain</a></td>
</tr>
<tr>
<td>British Isles Neuropterida Recording Scheme</td>
<td>Home page</td>
<td><a href="http://lacewings.myspecies.info/">http://lacewings.myspecies.info/</a></td>
</tr>
<tr>
<td>British Myriapod and Isopod Group</td>
<td>Centipede and Millipede recording schemes</td>
<td><a href="http://www.bmig.org.uk/">http://www.bmig.org.uk/</a></td>
</tr>
<tr>
<td>Brachidae &amp; Chrysomelidae Recording Scheme</td>
<td>Relevant BRC webpage</td>
<td><a href="https://www.brc.ac.uk/term/scheme/brachidae-chrysomelidae-recording-scheme">https://www.brc.ac.uk/term/scheme/brachidae-chrysomelidae-recording-scheme</a></td>
</tr>
<tr>
<td>Butterfly Conservation</td>
<td>Butterflies and Moths</td>
<td><a href="https://butterfly-conservation.org/">https://butterfly-conservation.org/</a></td>
</tr>
<tr>
<td>Centre for Ecology &amp; Hydrology – Biological Records Centre</td>
<td>Recording Schemes</td>
<td><a href="http://www.brc.ac.uk/">http://www.brc.ac.uk/</a> <a href="http://www.brc.ac.uk/recording-schemes">http://www.brc.ac.uk/recording-schemes</a></td>
</tr>
<tr>
<td>Reference</td>
<td>Title</td>
<td>Website</td>
</tr>
<tr>
<td>--------------------------------------------------------</td>
<td>----------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Centre for Ecology &amp; Hydrology – Biological Records</td>
<td>Home page</td>
<td><a href="http://www.conchsoc.org/">http://www.conchsoc.org/</a></td>
</tr>
<tr>
<td>Diperists Forum</td>
<td>Cranefly, Empididae &amp; Dolichopodidae, Fungus gnat Recording Schemes</td>
<td><a href="http://www.dipteristsforum.org.uk/">http://www.dipteristsforum.org.uk/</a></td>
</tr>
<tr>
<td>Gelechiid Recording Scheme</td>
<td>Home page</td>
<td><a href="http://www.gelechiid.co.uk/">http://www.gelechiid.co.uk/</a></td>
</tr>
<tr>
<td>Ground Beetle Recording Scheme</td>
<td>Homepage</td>
<td><a href="http://www.coleoptera.org.uk/carabidae/recording">http://www.coleoptera.org.uk/carabidae/recording</a></td>
</tr>
<tr>
<td>Hoverfly Recording Scheme</td>
<td>Home page</td>
<td><a href="http://www.hoverfly.org.uk/portal.php">http://www.hoverfly.org.uk/portal.php</a></td>
</tr>
<tr>
<td>Hypogean Crustacea Recording Scheme</td>
<td>Home page</td>
<td><a href="http://hcrs.freshwaterlife.org/">http://hcrs.freshwaterlife.org/</a></td>
</tr>
<tr>
<td>National Moth Recording Scheme</td>
<td>Homepage</td>
<td><a href="http://www.mothscount.org/text/27/national_moth_recording_scheme.html">http://www.mothscount.org/text/27/national_moth_recording_scheme.html</a></td>
</tr>
<tr>
<td>Orthoptera Recording Scheme</td>
<td>Homepage</td>
<td><a href="http://www.orthoptera.org.uk/">http://www.orthoptera.org.uk/</a></td>
</tr>
<tr>
<td>Riverfly Recording Schemes: Ephemeroptera, Plecoptera and Trichoptera</td>
<td>Home page</td>
<td><a href="http://www.riverflies.org/riverfly-recording-schemes">http://www.riverflies.org/riverfly-recording-schemes</a></td>
</tr>
<tr>
<td>Soldierflies and Allies Recording Scheme</td>
<td>Home page</td>
<td><a href="http://www.brc.ac.uk/soldierflies-and-allies/home">http://www.brc.ac.uk/soldierflies-and-allies/home</a></td>
</tr>
<tr>
<td>Staphylinidae Recording Scheme</td>
<td>Relevant BRC webpage</td>
<td><a href="https://www.brc.ac.uk/scheme/staphylinidae-recording-scheme">https://www.brc.ac.uk/scheme/staphylinidae-recording-scheme</a></td>
</tr>
<tr>
<td>Terrestrial Heteroptera Recording Scheme</td>
<td>Homepage</td>
<td><a href="http://www.britishbugs.org.uk/recording.html">http://www.britishbugs.org.uk/recording.html</a></td>
</tr>
<tr>
<td>Reference</td>
<td>Title</td>
<td>Website</td>
</tr>
<tr>
<td>-----------</td>
<td>-------</td>
<td>---------</td>
</tr>
<tr>
<td>- Shield bugs and allied species</td>
<td></td>
<td></td>
</tr>
<tr>
<td>UK Biodiversity Partnership</td>
<td>UK Biodiversity Action Plans</td>
<td><a href="http://jncc.defra.gov.uk/page-5155">http://jncc.defra.gov.uk/page-5155</a></td>
</tr>
<tr>
<td>Weevil and Bark Beetle Recording Scheme + Scolytidae</td>
<td>Relevant BRC webpage</td>
<td><a href="https://www.brc.ac.uk/scheme/weevil-and-bark-beetle-recording-scheme">https://www.brc.ac.uk/scheme/weevil-and-bark-beetle-recording-scheme</a></td>
</tr>
<tr>
<td>Wales Biodiversity Partnership</td>
<td>Section 7 priority species in Wales</td>
<td><a href="https://www.biodiversitywales.org.uk/Environment-Wales-Bill">https://www.biodiversitywales.org.uk/Environment-Wales-Bill</a></td>
</tr>
</tbody>
</table>

**References**


**Last updated:** September 2019

**Latest data:** 2016
4c. Status of threatened species: species of European importance

Type: State indicator

**Status of species of European importance**

This indicator has been updated with new data from the 2019 UK Habitats Directive Article 17 report to the European Union.

In 2007, 28% of species occurring in England that are listed in Annexes II, IV or V of the Habitats Directive were in favourable conservation status; this figure increased to 41% in 2013 and 37% in 2019 (Figure 4c.1).

The conservation status of 19% of the species was unfavourable-improving in 2007, it decreased to 11% in 2013 and 5% in 2019.

The conservation status of 14% of the species was unfavourable-declining in 2007, this increased to 16% in 2013 and 19% in 2019.

**Figure 4c.1: Conservation status of species of European importance occurring in England, 2007, 2013 and 2019**

---

**Notes:**
1. The number of species assessed was 80 in 2007 and 83 in 2013 and 2019.
2. The graph is based on the species listed in Annexes II, IV and V of the Habitats Directive, excluding vagrants, which occur in England.
3. The ‘unfavourable-unknown’ category was first introduced in 2019.

**Source:** UK Habitats Directive (Article 17) reports to the EU, 2007, 2013 and 2019.
Indicator assessment

| Assessment of change in conservation status of species of European importance occurring in England |
|---------------------------------|-----------------|-----------------|-----------------|

Note: The long and short-term assessments are based on a 3% rule of thumb. See Assessing Indicators. No latest-year change is provided because Article 17 reports are only submitted once every 6 years and therefore, any latest-year change would simply mirror the short-term assessment.

Relevance

This indicator is relevant to outcomes 1, 2 and 3 in Biodiversity 2020: A strategy for England’s wildlife and ecosystem services (see Annex A). It is also relevant to a number of international targets (see Annex B of the aforementioned publication for further details).

Background

The indicator shows progress with maintaining and/or restoring favourable conservation status for species listed under Annexes II, IV or V of the EU Habitats Directive in 2007, 2013 and 2019. These are species for which the UK has European level conservation responsibilities. An assessment of status and trends for each species is undertaken every 6 years. Trends in unfavourable conservation status allow identification of whether progress is being made, as it will take many years for some species to reach favourable conservation status. The status assessments presented in this indicator are based on 83 UK species listed in Annexes II, IV or V of the Habitats Directive that are found in England.

The information sources on which the assessments are based vary between species – their quality is documented in the database which underpins the assessments. The changes are largely based on evidence, though expert opinion was used in a few cases where evidence was not available.

The first assessment of conservation status of habitats and species listed in the annexes of the Directive was produced in 2007; a second assessment was produced in 2013; and a third assessment was made in 2019. Each individual species assessment requires information on 4 parameters, which are brought together using an evaluation matrix to form an overall assessment. The parameters are: range, population, habitat for the species; and future prospects.

The trend in the overall assessment is based upon an integration of the trend information for the individual parameters (see links for UK approach). Each assessment concludes whether the species is in one of the following states:

- ‘favourable’;
- ‘unfavourable-inadequate’;
- ‘unfavourable-bad’; or
- ‘unknown’.

In 2007, the UK reported on 89 species, 80 of which were found to occur in England. In addition, 28 species classed as vagrants or occasional visitors (4 bats, 16 cetaceans, 4 turtles, and 4 seals) to the UK were not fully assessed. Instead a paragraph of information was provided on the occurrence of each of these vagrant species. In 2013 and 2019, the UK reported on 93 species, and collated information on a further 32 vagrants (6 bats, 1 fish, 17 cetaceans, 4 turtles and 4 seals).
The conservation status assessments quoted in this indicator are for 83 species that are found in England, excluding the 32 vagrant species. The taxonomic breakdown of the 83 species reported in 2019 is:

- Mammals: 29
- Fish: 12
- Amphibians: 4
- Reptiles: 2
- Invertebrates: 16
- Plants: 20

It should be noted that the list of species on the Habitats Directive Annexes was selected with a European emphasis, and therefore only represents a subset of those considered to be of importance for conservation effort within the UK. A full list of these species, together with their individual assessment results for 2007, 2013 and 2019 is presented in the dataset supporting this indicator.

Within the Habitats Directive, species can be listed on one or more of 3 annexes:

- **Annex II**: Animal and plant species of Community interest whose conservation requires the designation of Special Areas of Conservation (46 species in the UK, including one vagrant);
- **Annex IV**: Animal and plant species of Community interest in need of strict protection (81 species in the UK, including 32 vagrants);
- **Annex V**: Animal and plant species of Community interest whose taking in the wild and exploitation may be the subject of management measures (26 species in the UK; no vagrants).

**Assessment of change in conservation status**

The indicator is based on an evaluation of whether the results obtained in 2019 are better or worse than those obtained in 2013 (short term) and 2007 (long term). It is likely to take time before species move from unfavourable conservation status to favourable conservation status, so for the unfavourable assessments, an assessment of trend is made to determine if the species is improving, declining, or showing no change. At its simplest (Figure 4c.1), this can be the proportion of species which are favourable, or show an improving trend (i.e. favourable, or unfavourable-inadequate but improving, or unfavourable-bad but improving. This applies to 42% of species assessed in 2019, 52% of species assessed in 2013 and 46% of species assessed in 2007; the measure is therefore assessed as declining in both the long and short term.

Figure 4c.1 combines the unfavourable inadequate and unfavourable-bad assessments which show a similar direction of trend. In all 3 assessments, improving and declining trends were assigned where the evidence allowed a conclusion that improvements or declines in the conservation status of habitats were occurring. Thus:

- Unfavourable-inadequate improving, and unfavourable-bad improving were summed to form the category ‘unfavourable improving’;
- Unfavourable-inadequate declining and unfavourable-bad declining were summed to form the category ‘unfavourable declining’.

In 2007, no trend was assigned to those species which were neither improving nor declining. This included both species for which the trend was unknown, and those for which there was no evidence of change. For ease of comparison in the figures, unfavourable-inadequate and unfavourable-bad assessments with no trend conclusion in 2007 were summed to form the category ‘unfavourable stable’; the same term was used for 2013 and 2019 data, but with more confidence that the trend was neither improving nor declining.

Figures 4c.2 provides a breakdown of Figure 4c.1 by showing the number of species in the unfavourable categories which arise from the unfavourable-inadequate or unfavourable-bad assessment categories in 2019. The picture for species is somewhat better than for habitats (see
Conservation on land and at sea

indicator number 2b), in that relatively more species are in favourable conservation status, and relatively more species which are unfavourable are in unfavourable-inadequate status than unfavourable-bad status.

**Figure 4c.2: Status of species of European importance occurring in England, 2019**

![Bar chart showing status of species](image)

**Notes:**
1. The graph is based on 76 species listed in Annexes II, IV and V of the Habitats Directive, excluding vagrants, which occur in England.
2. Darker red bars show the number of species within a trend which were unfavourable-bad; lighter red bars show the number of habitats within a trend which were unfavourable-inadequate.

**Source:** UK Habitats Directive (Article 17) report to the EU, 2019.

The Joint Nature Conservation Committee and Natural England have carefully collated and considered a wide range of data, using a robust quality assurance protocol, to come to the conclusion for each species, and to ensure changes, including within category changes, have been consistently and accurately discriminated. These changes are ecologically important, as stabilising a decline in a species, for example, is an important conservation achievement. The information sources on which the assessments are based are quite varied – their quality is documented in the database which underpins the assessments. The changes are largely based on evidence, though expert opinion was used in cases where evidence was not available.

**Web links for further information**

<table>
<thead>
<tr>
<th>Organisation</th>
<th>Subject</th>
</tr>
</thead>
<tbody>
<tr>
<td>European Topic Centre on Biological Diversity (EIONET)</td>
<td>European guidance on making conservation status assessments</td>
</tr>
<tr>
<td>Organisation</td>
<td>Subject</td>
</tr>
<tr>
<td>--------------------------------------------------</td>
<td>--------------------------------------------------------------</td>
</tr>
<tr>
<td>European Topic Centre on Biological Diversity (EIONET)</td>
<td>EEA Technical report No 2/2015: Results from reporting under the nature directives 2007-2012</td>
</tr>
<tr>
<td>Joint Nature Conservation Committee</td>
<td>EC Habitats Directive</td>
</tr>
<tr>
<td>Joint Nature Conservation Committee</td>
<td>UK Habitats Directive Report, 2019</td>
</tr>
</tbody>
</table>

**Last updated**: November 2019

**Latest data available**: 2019
5. Species in the wider countryside: farmland

**Type:** State indicator

### 5a. Populations of farmland species

#### Birds

In 2017, the England farmland bird index was less than half (45%) of its 1970 value (Figure 5.1). The majority of this decline occurred between the late 1970s and early 1980s and was largely due to the negative impact of rapid changes in many farmland management practices during this period. More recently, the smoothed index decreased by 7% between 2011 and 2016.

Since 1990, the England farmland butterfly index has fallen by 10% (Figure 5.2) and the long-term smoothed trend shows a statistically significant decline. Although the index has shown some recovery since it reached an all-time low in 2012, the short-term assessment of the smoothed trend shows no significant change. Last summer’s heatwave meant that 2018 was a better year for butterflies across England; ranked 18th in the 43-year series.

#### Bats

Since 1999, the England farmland bat index has increased by 34% (Figure 5.3). This is likely due at least in part to the introduction of strict legal protection and a milder climate over this period. In the short term, between 2012 and 2017, assessment of the smoothed trend indicates that the farmland bat index has increased by 9.3%. The bat species vary in their habitat requirements, but all occur in farmland and woodland landscapes. For convenience, they are only presented here in the farmland indicator.

**Figure 5.1: Breeding birds on farmland in England, 1970 to 2017**

**Notes:**
1. This indicator is taken from the Defra National Statistics publication ‘Wild bird populations in England’.
2. The line graph shows the unsmoothed trend (dashed line) and the smoothed trend (solid line) together with its 95% confidence interval (shaded).
3. The figure in brackets shows the number of species in the index.
4. The bar chart shows the percentage of species within the indicator that have increased, decreased or shown no change, based on set thresholds of annual change.
Source: British Trust for Ornithology, Defra, Joint Nature Conservation Committee, Royal Society for the Protections of Birds.

Figure 5.2: Butterflies of the wider countryside on farmland in England, 1990 to 2018

Notes:

1. The line graph shows the unsmoothed trend (dashed line) and the smoothed trend (solid line) together with its 95% confidence interval (shaded).
2. The figure in brackets shows the number of species in the index.
3. This indicator includes individual measures for 22 species of butterflies, the farmland index, however, only includes 21 trends. This is because an aggregate trend is used for small skipper (Thymelicus lineola) and Essex skipper (Thymelicus sylvestris); these 2 species have been combined due to historical difficulties with distinguishing them in the field.
4. The bar chart shows the percentage of species within the indicator that have shown a statistically significant increase, a statistically significant decrease or no statistically significant change.
5. Since 2017, an improved analysis method has been used to derive the species indices (see ‘Background’ section for further information).
6. The line graph is not directly comparable to previous versions of this publication. Improvements in the modelling technique have allowed the inclusion of more data; this has resulted in slight alternations to the trends for individual species and the composite trend.

Source: Butterfly Conservation, Centre for Ecology & Hydrology, Defra, Joint Nature Conservation Committee.

Figure 5.3: Widespread bats on farmland in England, 1999 to 2018
Conservation on land and at sea

Notes:
1. The line graph shows the unsmoothed trend (dashed line) and the smoothed trend (solid line) together with its 95% confidence interval (shaded).
2. The figure in brackets shows the number of species in the index.
3. This indicator includes individual measures for 11 species of bats, the index, however, only includes 10 trends. This is because an aggregate trend is used for the whiskered bat (Myotis mystacinus) and Brandt’s bat (Myotis brandti); these 2 species have been combined due to difficulties with distinguishing them in the field.
4. The bar chart shows the percentage of species within the indicator that have increased, decreased or shown no change.
5. Since 2018, this indicator has been extended to include 11 species instead of 8. The complete time series in the accompanying dataset has also been updated to reflect these changes.

Source: Bat Conservation Trust.

The long-term decline of the farmland bird indicator for England has been driven mainly by the decline of those species that are restricted to, or highly dependent on, farmland habitats (the ‘specialists’). Between 1970 and 2017, the farmland specialists index declined by 71% and the farmland generalists index (covering those species which are found in a wider range of habitats) by only 4%. The smoothed trend shows a decline of 73% for specialist species and 7% for generalist species (Figure 5.4).

Changes in farming practices, such as the loss of mixed farming systems, the move from spring to autumn sowing of arable crops, and increased pesticide use, have been demonstrated to have had adverse impacts on a number of farmland birds such as skylark and grey partridge. Three farmland specialists (grey partridge, turtle dove and tree sparrow) have declined by 90% or more relative to 1970 levels. By contrast, 2 other farmland specialists (stock dove and goldfinch) have more than doubled over the same period, illustrating how pressures and responses to pressures vary between species.

Figure 5.4: Populations of specialist and generalist farmland birds in England, 1970 to 2017

Notes:
1. The line graph shows the unsmoothed trends (dashed lines) and the smoothed trends (solid lines).
2. The figures in brackets show the number of species in each index.

Source: British Trust for Ornithology, Defra, Joint Nature Conservation Committee, Royal Society for the Protection of Birds.
Since 1990, the farmland butterflies index has fallen by 10%. The figures demonstrate how numbers fluctuate from year to year, but overall, based on the underlying smoothed trend, the indicator has continued to show a significant long-term decline. Individual butterfly species fare differently within this overall trend. Species of the wider countryside in significant long-term decline on farmland include: white-letter hairstreak, wall, small tortoiseshell, gatekeeper, small copper, small/Essex Skipper and peacock. Of these, the small tortoiseshell and peacock have also decreased over the short term since 2013. Three species, the ringlet, speckled wood and brimstone, increased over the long term but showed no short-term change. Holly blue has increased since 2013 but showed no long-term change.

The long-term increase in the England farmland bat index is primarily driven by strong increases in 3 species; greater horseshoe bat, lesser horseshoe bat and common pipistrelle and between 1999 and 2017, the combined survey trend for these species increased by 157%, 130% and 91% respectively. One other species showed a weaker increase over the same period, and the remaining 6 species showed no significant change. In the short term, between 2012 and 2017, 3 species have increased significantly, and 7 species show no significant change. No species show a decline in either the long or short-term, however it is not possible to produce separate trends for whiskered bat and Brandt’s bat as they cannot be reliably distinguished in the field. It is therefore possible that an increase in one species could mask a decline in the other. It is also important to note that England’s rarer and more specialised bat species are not included in the index due to difficulties monitoring these species. The farmland bat index and long-term assessment reflect changes in bat populations since 1999. It is generally considered that prior to this there were major declines in bat populations throughout Western Europe during the 20th century.

## Indicator assessment

<table>
<thead>
<tr>
<th>Assessment of change in abundance and diversity of species in the wider countryside (farmland)</th>
<th>Long term</th>
<th>Short term</th>
<th>Latest year</th>
</tr>
</thead>
</table>

**Note:** To better capture patterns in the data, where possible, long-term and short-term assessments are made on the basis of smoothed data, with analysis of the underlying trends being undertaken by the data providers. Due to differences in the methods used to produce smooth trends for birds, butterflies and bats, the long-term and short-term assessments are made to 2016 for the bird index, 2017 for the bat index and 2018 for the butterfly index. All latest year assessments are based on unsmoothed data to the latest year available.
5b. Farmland plant species richness

An indicator of plant species richness has been published previously within the biodiversity indicators set, based on analysis of changes in land cover recorded in the Countryside Survey – a detailed periodic audit of a statistically representative sample of land across Great Britain. As the latest Countryside Survey data are from 2007, the data previously presented for this indicator are considered too out of date to be fit-for-purpose and retained within the indicator set as a headline measure: the UK Biodiversity Indicators Steering Group therefore took the decision to move these data and the accompanying analysis to the background section of this fiche.

During 2015 and 2016, the Centre for Ecology & Hydrology (CEH), Joint Nature Conservation Committee (JNCC) and Defra, investigated the possibility of using Bayesian occupancy models – see indicators 4 and 10 for details – to identify trends in plant species. Trials have focussed on species that will be monitored with the National Plant Monitoring Scheme (NPMS; see below). CEH have since developed a novel combined abundance/occupancy model for NPMS data in a Bayesian framework. Simulation tests and applications to real data indicate potential to contribute to a new indicator of UK habitat quality. Further development is needed to extend the model to create annual indices and to give consideration to the method of individual species trend aggregation.

In the slightly longer term it is anticipated that the NPMS designed by the Botanical Society of Britain and Ireland, CEH, Plantlife and JNCC will provide relative abundance data for around 400 indicator species – which will be more equivalent to the data underpinning the birds, bats and butterfly indicators – allowing a more comparable indicator of plants and habitat trends to be developed. It will not be possible to produce a trend before 2020, as the NPMS was only launched in 2015 and further time is needed to collect enough data to be able to calculate the size and direction of the trend. Initial consideration of possible options for an indicator focussed on plant diversity in the survey plots; a more detailed evaluation of the data is being undertaken to see if trends for individual species within habitats can be derived from the data.

Relevance

Species groups such as bats, birds and butterflies are considered to provide a good indication of the broad state of the environment because they occupy a wide range of habitats and there are long-term data on changes in populations which help in the interpretation of shorter-term fluctuations. Butterflies also play a complementary role to birds and bats as an indicator, because they use the landscape at a far finer scale.

These indicators show progress towards commitments to improve the status of our wildlife and habitats. They are relevant to outcomes 1 and 3 in Biodiversity 2020, A strategy for England’s wildlife and ecosystem services (see Annex A). The indicators are also relevant to international goals and targets (see Annex B of the aforementioned publication).

Background

Farmland birds

The farmland bird measure has been supplied by the British Trust for Ornithology (BTO), the Royal Society for the Protection of Birds (RSPB) and JNCC, and is compiled using data from the Common Bird Census (CBC) and Breeding Bird Survey (BBS). Within the farmland bird measure there are trends for 19 species (Table 5.1). Each species is given equal weighting and the index is the geometric mean of the individual species indices. The assessment of change is based on a statistical test of the underlying trend, using smoothed species trends derived from general additive models, with bootstrapping to generate confidence limits. Further details about species and methods can be found on the BTO website (see web-links).
Table 5.1: Species included in the farmland bird indicator

<table>
<thead>
<tr>
<th>Generalist birds (7)</th>
<th>Specialist birds (12)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greenfinch (<em>Chloris chloris</em>)</td>
<td>Corn bunting (<em>Emberiza calandra</em>)</td>
</tr>
<tr>
<td>Jackdaw (<em>Corvus monedula</em>)</td>
<td>Goldfinch (<em>Carduelis carduelis</em>)</td>
</tr>
<tr>
<td>Kestrel (<em>Falco tinnunculus</em>)</td>
<td>Grey partridge (<em>Perdix perdix</em>)</td>
</tr>
<tr>
<td>Reed bunting (<em>Emberiza schoeniclus</em>)</td>
<td>Lapwing (<em>Vanellus vanellus</em>)</td>
</tr>
<tr>
<td>Rook (<em>Corvus frugilegus</em>)</td>
<td>Linnet (<em>Carduelis cannabina</em>)</td>
</tr>
<tr>
<td>Woodpigeon (<em>Columba palumbus</em>)</td>
<td>Starling (<em>Sturnus vulgaris</em>)</td>
</tr>
<tr>
<td>Yellow wagtail (<em>Motacilla flava</em>)</td>
<td>Stock dove (<em>Columba oenas</em>)</td>
</tr>
<tr>
<td></td>
<td>Skylark (<em>Alauda arvensis</em>)</td>
</tr>
<tr>
<td></td>
<td>Tree sparrow (<em>Passer montanus</em>)</td>
</tr>
<tr>
<td></td>
<td>Turtle dove (<em>Streptopelia turtur</em>)</td>
</tr>
<tr>
<td></td>
<td>Whitethroat (<em>Sylvia communis</em>)</td>
</tr>
<tr>
<td></td>
<td>Yellowhammer (<em>Emberiza citrinella</em>)</td>
</tr>
</tbody>
</table>

Composite indicators can mask a lot of variation among the species within them. The bar chart provided alongside the headline chart (Figure 5.1), shows the percentage of species within the indicator that have increased, decreased or shown no change. Whether an individual bird species is defined as increasing or decreasing has been decided by its rate of annual change over the time period (long or short) of interest. If the rate of annual change would lead to a population decrease of 50% (halving), or a population increase of 100% (doubling) or more over 25 years, the species is said to have shown a 'strong decline' or a 'strong increase' respectively. Rates of change less than these but above +33% (increase) or below -25% (decrease) are labelled 'weak'. Asymmetric thresholds are used for declines and increases to represent an equivalent symmetrical proportional change in an index. These thresholds for decline are based on the rates used in the *Birds of Conservation Concern* status assessment for birds in the UK. Note that for most species, particularly over the longer period, the change is statistically significant.

Butterflies on farmland

The farmland butterflies indicator is a multi-species index compiled by Butterfly Conservation and CEH from data collated through the UK Butterfly Monitoring Scheme (UKBMS) including the Wider Countryside Butterfly Survey (WCBS). The indicator includes 22 species of butterflies associated with farmland, however the farmland measure only includes trends for 21 species because an aggregate trend is used for small skipper (*Thymelicus lineola*) and Essex skipper (*Thymelicus sylvestris*). These 2 species have been combined due to historical difficulties with distinguishing them in the field (Table 5.2).

The year-to-year fluctuations in butterfly numbers are often linked to natural environmental variation, especially weather conditions. Therefore, in order to identify underlying patterns in population trends, the assessment of change is based on smoothed indices. The smoothed trend in the multi-species indicator is assessed by structural time-series analysis. A statistical test is performed using the software ‘TrendSpotter’ to compare the difference in the smoothed index in the latest year versus other years in the series. Within the measures, each species is given equal weight, and the annual figure is the geometric mean of the component species indices for that year.

Populations of individual species within the measure may be increasing or decreasing irrespective of the overall trends. The bar chart provided alongside the headline trend chart (Figure 5.2), shows the percentage of species within the indicator that have shown a statistically significant increase, a statistically significant decrease or shown no statistically significant change. A table summarising the estimated long-term and short-term changes for each species together with an assessment of the individual species trends can be found in the statistical dataset ‘trends in populations of selected butterfly species, 1990 to 2018’.
Table 5.2: Species included in the England farmland butterfly indicator

<table>
<thead>
<tr>
<th>Butterflies (21)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Brimstone (<em>Gonepteryx rhamni</em>)</td>
<td>Peacock (<em>Aglais io</em>)</td>
</tr>
<tr>
<td>Brown argus (<em>Aricia agestis</em>)</td>
<td>Ringlet (<em>Aphantopus hyperantus</em>)</td>
</tr>
<tr>
<td>Common blue (<em>Polyommatus icarus</em>)</td>
<td>Small copper (<em>Lycæna phlaeas</em>)</td>
</tr>
<tr>
<td>Gatekeeper (<em>Pyronia tithonus</em>)</td>
<td>Small heath (<em>Coenonympha pamphilus</em>)</td>
</tr>
<tr>
<td>Green-veined white (<em>Pieris napi</em>)</td>
<td>Small tortoiseshell (<em>Aglais urticeae</em>)</td>
</tr>
<tr>
<td>Holly blue (<em>Celastrina argiolus</em>)</td>
<td>Small/Essex skipper (<em>Thymelicus sylvestris</em>/lineola*)</td>
</tr>
<tr>
<td>Large skipper (<em>Ochlodes venata</em>)</td>
<td>Specckled wood (<em>Pararge aegeria</em>)</td>
</tr>
<tr>
<td>Large white (<em>Pieris brassicae</em>)</td>
<td>Wall (<em>Lasiommatata megera</em>)</td>
</tr>
<tr>
<td>Marbled white (<em>Melannargia galathea</em>)</td>
<td>White-letter hairstreak (<em>Satyrium w-album</em>)</td>
</tr>
<tr>
<td>Meadow brown (<em>Maniola jurtina</em>)</td>
<td></td>
</tr>
<tr>
<td>Orange-tip (<em>Anthocharis cardamines</em>)</td>
<td></td>
</tr>
</tbody>
</table>

The method for compiling species annual indices was improved in 2017 and used again here. Indices are calculated for species using the Generalised Abundance Index (GAI) method developed by Dennis *et al.* (2016) with an additional modification that the data from each site in each year are weighted in the final stage relative to the proportion of the species flight period surveyed that year for that site. This weighting is necessary as the GAI extrapolates from observed data to estimate the total count across the season, accounting for gaps in the recording, and ensures that the observed data have a stronger effect upon the final indices than the extrapolated data.

The new method uses data from butterfly transect sites on farmland and in woodland from UKBMS sites and additionally randomly selected farmland plots from the WCBS. The method uses all butterfly counts in a season to estimate the seasonal pattern of butterfly counts for that year, using a concentrated likelihood method (see Dennis *et al.* (2016)); the resulting indices and species trends are similar to those generated through previous analysis methods.

Since 2015, the site index data have been incorporated into the models; these data are most prevalent in earlier years and thus the graphs are slightly different to those previously presented. As there are delays in data submission, data for previous years are also updated retrospectively; in 2018, for example, extra data were added for 2016 and 2017. This means that the species index for individual years may vary from previous publications. Further details of the methods used can be found on the [UKBMS website](http://ukbms.org.uk) and in the *Technical background document* for this indicator.

**Bats**

The England farmland bat index is compiled by the Bat Conservation Trust using data collected annually from the National Bat Monitoring Programme (NBMP). The NBMP has deployed over 4,600 volunteers (3,514 in England) to record observations of bats at 6,682 sites (4,744 in England). Surveys of bat species include summer roost counts, counts at hibernation sites and visual and/or acoustic observations made along predetermined transects. Most species are surveyed by 2 different methods, both of which are included in the index apart from summer roost count data for common and soprano pipistrelle. Pipistrelle species 'frequent 'roost switching' can cause a negative bias in trends calculated from summer roost counts, so these data are omitted.

Since 2018, 3 additional species have been included in this indicator and the entire time series in the accompanying dataset has been updated to reflect these changes. Although the indicator now includes 11 of the 17 species of breeding bats present in England, the farmland bat index only includes 10 trends. This is because an aggregate trend is used for the whiskered bat (*Myotis mystacinus*) and Brandt's bat (*Myotis brandtii*); these 2 species have been combined due to difficulties with distinguishing them in the field (Table 5.3).
For each bat species included in the index, Generalised Additive Modelling (GAM) is used to calculate the trends in numbers over time (Fewster et al., 2000). The models include terms for factors that can influence the apparent population means (e.g. bat detector model, temperature, etc.), so their effect can be taken into account. The GAM models produce smoothed trends which are more robust against random variation between years. For easier interpretation the means are then converted to an index that is set to 100 for the selected baseline year of data. The species indices are revised when new data become available or when improved modelling methods are developed, and applied retrospectively to data from earlier years. As such, indices published in previous years are not strictly comparable to the current index. To generate the composite bat indicator and confidence intervals, each species has been given equal weighting, and the annual index figure is the geometric mean in that year (Figure 5.3). Confidence intervals are relatively wide due to the high variability inherent in bat monitoring data and the rarity of several species. Long and short-term assessments are run to the penultimate year of the trend as the most recent year’s smoothed data point is likely to change as future years of data are added. The assessment of change in the latest year is therefore based on unsmoothed data. The survey methods and statistical analysis used by the NBMP to produce individual species trends are described in Barlow et al. (2015).

Bat populations are believed to have undergone major declines throughout Western Europe during the 20th century, which have been attributed to persecution, agricultural intensification, habitat and roost loss, remedial timber treatment and declines of their insect prey. Evidence of these declines (synthesised in Haysom et al., 2010) is fragmented as during this period few data were collected in a systematic way. Evidence includes:

- Well documented range contractions of greater horseshoe bat and lesser horseshoe bat across Great Britain and Europe.
- Reports of the loss of large colonies of several species from traditional roosting sites.
- Reductions in the number of known maternity colonies across Great Britain.
- A small number of published population trends (e.g. Ransome, 1989; Guest et al., 2002).

The farmland bat index suggests that more recently some English bat populations are beginning to recover. The greatest weight of evidence suggests that 2 factors have had a positive impact on bat populations: a reduction in human disturbance since the introduction of strict legal protection and a milder climate, in particular over winter and spring which enhances over-winter survival (Burns et al., 2016). Bats have also benefited from direct conservation action and public education (Mitchell-Jones, 1993; Haysom et al., 2010), but remain vulnerable to pressures such as landscape change, climate change, development, and emerging threats that include new building practices, wind turbines, and light pollution (Haysom et al., 2010; Kunz et al., 2007; Rebelo et al., 2010; Stone et al., 2009; 2012).
Plants in the wider countryside

Until 2013, this indicator was based on analysis of the change in plant species richness in the wider countryside. Data were taken from the Countryside Survey. This survey provides a random sample of vegetation plots located in arable and horticultural fields, agricultural grasslands, woodlands and associated boundary habitats in Great Britain. The start point of the data series was 1990, but it has not been possible to update these data since the last Countryside Survey was carried out in 2007. Given the age of the most recent data and the unlikelihood of any future opportunities to source updates in a consistent way, the decision was taken to reclassify the indicator as ‘under development’ and look at new options for a headline measure. Key messages from the previous indicator are presented here.

The indicator shows the number of different plant species per standard unit area (species richness) in enclosed farmland and in neutral grassland and boundary habitats. Within enclosed farmland, there was a significant increase in plant species richness in arable and horticultural land in both the longer term (1990 to 2007) and shorter term (1998 to 2007) but there was little or no overall change in improved grassland between 1990 and 2007. Within neutral grassland and boundary habitats, there was a significant longer-term decrease in plant species richness in all 3 habitats, as well as a significant shorter-term decrease in species richness in stream sides and neutral grassland habitats (see Figure 5.6).

Figure 5.6: Plant species richness in the wider countryside 1990 to 2007: enclosed farmland, neutral grassland and boundary habitats

Notes:

Source: Centre for Ecology & Hydrology, Countryside Survey.

The indicator compares species richness per plot for plots surveyed in 1990, 1998 and 2007. For each broad habitat type, the data are converted to an index (1990 values are set at 100) to compensate for the difference in plot size and species richness between habitats. As a result of agricultural intensification over many years (e.g. the use of herbicides and artificial fertilizers and the
implementation of new cropping and land management practices), arable fields and improved grassland already had low plant diversity in 1990. There is some evidence that arable set-aside schemes in England contributed to a slight increase in diversity by 2007.

Web links for further information

<table>
<thead>
<tr>
<th>Organisation</th>
<th>Subject</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bat Conservation Trust</td>
<td>The National Bat Monitoring Programme</td>
</tr>
<tr>
<td>British Trust for Ornithology</td>
<td>Methods</td>
</tr>
<tr>
<td>British Trust for Ornithology</td>
<td>Volunteer-led surveys</td>
</tr>
<tr>
<td>British Trust for Ornithology, Royal Society for</td>
<td>Technical background document - birds</td>
</tr>
<tr>
<td>the Protection of Birds and Defra</td>
<td></td>
</tr>
<tr>
<td>Butterfly Conservation</td>
<td>The state of Britain's butterflies</td>
</tr>
<tr>
<td>Butterfly Conservation and Centre for Ecology &amp;</td>
<td>Technical background document - butterflies</td>
</tr>
<tr>
<td>Hydrology</td>
<td></td>
</tr>
<tr>
<td>Centre for Ecology &amp; Hydrology</td>
<td>Countryside survey</td>
</tr>
<tr>
<td>Defra</td>
<td>Butterflies in England: species of the wider countryside on farmland and in woodland</td>
</tr>
<tr>
<td>Joint Nature Conservation Committee</td>
<td>Tracking Mammals Partnership</td>
</tr>
<tr>
<td>UK Butterfly Monitoring Scheme</td>
<td>Butterflies as indicators</td>
</tr>
</tbody>
</table>

References


**Last updated:** September 2019

**Latest data available:**

5a Populations of farmland species: birds – 2017, bats and butterflies – 2018

5b Farmland plant species richness – no update (2007)
6. Species in the wider countryside: woodland

Type: State indicator

6a. Populations of woodland species

In 2017, the breeding woodland bird indicator for England was 27% lower than in 1970 (Figure 6.1). The greatest decline occurred between the early 1980s and the early 1990s, since 1996 the index has been more stable. More recently, the smoothed index decreased by 5% between 2011 and 2016.

Since 1990, the woodland butterfly index for England has fallen by 40% (Figure 6.2) and the long-term smoothed trend shows a statistically significant decline. Although the index has shown some recovery since it reached an all-time low in 2012, the short-term assessment of the smoothed trend shows no significant change. Last summer’s heatwave meant that 2018 was a better year for butterflies across England; ranked 18th in the 43-year series.

Figure 6.1: Breeding birds in woodland in England, 1970 to 2017

Notes:
1. This indicator is taken from the Defra National Statistics publication ‘Wild bird populations in England’.
2. The line graph shows the unsmoothed trend (dashed line) and the smoothed trend (solid line) together with its 95% confidence interval (shaded).
3. The figure in brackets shows the number of species in the index.
4. The bar chart shows the percentage of species within the indicator that have increased, decreased or shown no change, based on set thresholds of annual change.

Source: British Trust for Ornithology, Defra, Joint Nature Conservation Committee, Royal Society for the Protection of Birds.
Figure 6.2: Butterflies of the wider countryside in woodland in England, 1990 to 2018

Notes:
1. The line graph shows the unsmoothed trend (dashed line) and the smoothed trend (solid line) together with its 95% confidence interval (shaded).
2. The figure in brackets shows the number of species in the index.
3. This indicator includes individual measures for 24 species of butterflies, the woodland index, however, only includes 23 trends. This is because an aggregate trend is used for small skipper (*Thymelicus lineola*) and Essex skipper (*Thymelicus sylvestris*); these 2 species have been combined due to historical difficulties with distinguishing them in the field.
4. The bar chart shows the percentage of species within the indicator that have shown a statistically significant increase, a statistically significant decrease or shown no significant change.
5. Since 2017, an improved analysis method has been used to derive the species indices (see ‘Background’ section for further information).
6. The line graph is not directly comparable to previous versions of this publication. Improvements in the modelling technique have allowed the inclusion of more data; this has resulted in slight alternations to the trends for individual species and the composite trend.

Source: Butterfly Conservation, Centre for Ecology & Hydrology, Defra, Joint Nature Conservation Committee.

The long-term decline of woodland birds in England has been mostly driven by the decline of specialist woodland birds (those restricted to or highly dependent on particular woodland habitats, such as willow tit, spotted flycatcher and lesser redpoll). Between 1970 and 2017, the index for woodland specialists declined by 42% while the index for woodland generalists increased by 10% (Figure 6.3).

The declines in woodland birds have been attributed to a number of causes including changes in woodland management. A decline in the use of traditional management practices has resulted in a lack of habitat diversity and food sources in the woodland environment. Other causes of the declines in woodland birds include fragmentation of woodland area, loss of habitats and food sources through damage caused by increasing deer populations, and a reduction in some migratory species possibly owing to pressures on migration routes and wintering grounds in southern Europe and Africa. Positive drivers of change include increasing woodland cover and a trend towards milder winters potentially benefitting some species.
Since 1990, the woodland butterflies index has fallen by 40%. This long-term decline is thought to be chiefly due to a lack of woodland management and loss of open spaces in woods. These figures demonstrate how numbers fluctuate from year to year, but overall, based on the underlying smoothed trend, the indicator has continued to show a significant long-term decline. Species of the wider countryside in long-term decline in woodland include: wall, small tortoiseshell, small copper, white-letter hairstreak, small/Essex skipper, gatekeeper, small heath and peacock. Of these, the peacock and small tortoiseshell have again undergone a significant short-term decline, mirroring their performance on farmland. Ringlet also displayed the same trends in woodland as on farmland, increasing significantly over the long term, but showing no significant change since 2013.

### Indicator assessment

<table>
<thead>
<tr>
<th>Assessment of change in abundance and diversity of species in the wider countryside (woodland)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breeding birds in woodland</td>
</tr>
</tbody>
</table>

**Note:** To better capture patterns in the data, long-term and short-term assessments are made on the basis of smoothed data, with analysis of the underlying trends being undertaken by the data providers. Due to differences in the methods used to produce smooth trends for woodland birds and butterflies, the long-term
Conservation on land and at sea

and short-term assessments are made to 2016 for the bird index and 2018 for the butterfly index. All latest year assessments are based on unsmoothed data.

6b. Woodland plant species richness

An indicator of plant species richness has been published previously within the biodiversity indicators set, based on analysis of changes in land cover recorded in the Countryside Survey – a detailed periodic audit of a statistically representative sample of land across Great Britain. As the latest Countryside Survey data are from 2007, the data previously presented for this indicator are considered too out of date to be fit-for-purpose and retained within the indicator set as a headline measure: the UK Biodiversity Indicators Steering Group therefore took the decision to move these data and the accompanying analysis to the background section of this fiche.

During 2015 and 2016, the Centre for Ecology & Hydrology (CEH), Joint Nature Conservation Committee (JNCC) and Defra, investigated the possibility of using Bayesian occupancy models – see indicators 4 and 10 for details – to identify trends in plant species. Trials have focussed on species that will be monitored with the National Plant Monitoring Scheme (NPMS; see below). CEH have since developed a novel combined abundance/occupancy model for NPMS data in a Bayesian framework. Simulation tests and applications to real data indicate potential to contribute to a new indicator of UK habitat quality. Further development is needed to extend the model to create annual indices and to give consideration to the method of individual species trend aggregation.

In the slightly longer term, it is anticipated that the NPMS designed by the Botanical Society of Britain and Ireland, CEH, Plantlife and JNCC will provide relative abundance data for around 400 indicator species – which will be more equivalent to the data underpinning the birds, bats and butterfly indicators – allowing a more comparable indicator of plants and habitat trends to be developed. It will not be possible to produce a trend before 2020, as the NPMS was only launched in 2015 and further time is needed to collect enough data to be able to calculate the size and direction of the trend. Initial consideration of possible options for an indicator focussed on plant diversity in the survey plots; a more detailed evaluation of the data is being undertaken to see if trends for individual species within habitats can be derived from the data.

Relevance

Bird and butterfly populations are considered to provide a good indication of the broad state of the environment because they occupy a wide range of habitats. There are also long-term data on changes in populations which help in the interpretation of shorter-term fluctuations. Butterflies play a complementary role to birds as an indicator, because they use the landscape at a finer spatial scale.

These indicators show progress towards commitments to improve the status of our wildlife and habitats. They are relevant to outcomes 1 and 3 in Biodiversity 2020: A strategy for England’s wildlife and ecosystem services (see Annex A). The indicators are also relevant to international goals and targets (see Annex B of the aforementioned publication).

Background

Woodland birds

The woodland bird measure has been supplied by the British Trust for Ornithology (BTO), the Royal Society for the Protection of Birds (RSPB), and JNCC and is compiled using data from the Common Bird Census (CBC) and the Breeding Bird Survey (BBS). Within the woodland bird measure there are 34 species (Table 6.1). Each species is given equal weighting and the index is the geometric mean of the individual species indices. Bird count data from more than 3,000 sites surveyed annually by volunteers are analysed using log linear models to calculate population trends for each species. The longer-term changes in the indicator are assessed using the version of the indicator generated from the smoothed species trends, with bootstrapping used to generate confidence limits. Further details about species and methods can be found on the BTO website (see web-links).
Table 6.1: Species included in the woodland bird indicator

<table>
<thead>
<tr>
<th>Generalist birds (12)</th>
<th>Specialist birds (22)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blackbird (<em>Turdus merula</em>)</td>
<td>Blackcap (<em>Sylvia atricapilla</em>)</td>
</tr>
<tr>
<td>Blue tit (<em>Cyanistes caeruleus</em>)</td>
<td>Chiffchaff (<em>Phylloscopus collybita</em>)</td>
</tr>
<tr>
<td>Bullfinch (<em>Pyrrhula pyrrhula</em>)</td>
<td>Coal tit (<em>Periparus ater</em>)</td>
</tr>
<tr>
<td>Chaffinch (<em>Fringilla coelebs</em>)</td>
<td>Garden warbler (<em>Sylvia borin</em>)</td>
</tr>
<tr>
<td>Dunnock (<em>Prunella modularis</em>)</td>
<td>Goldcrest (<em>Regulus regulus</em>)</td>
</tr>
<tr>
<td>Great tit (<em>Parus major</em>)</td>
<td>Great spotted woodpecker (<em>Dendrocopos major</em>)</td>
</tr>
<tr>
<td>Lesser whitethroat (<em>Sylvia curruca</em>)</td>
<td>Green woodpecker (<em>Picus viridis</em>)</td>
</tr>
<tr>
<td>Long-tailed tit (<em>Aegithalos caudatus</em>)</td>
<td>Jay (<em>Garrulus glandarius</em>)</td>
</tr>
<tr>
<td>Robin (<em>Erithacus rubecula</em>)</td>
<td>Lesser redpoll (<em>Carduelis cabaret</em>)</td>
</tr>
<tr>
<td>Song thrush (<em>Turdus philomelos</em>)</td>
<td>Lesser spotted woodpecker (<em>Dendrocopos minor</em>)</td>
</tr>
<tr>
<td>Tawny owl (<em>Strix aluco</em>)</td>
<td>Marsh tit (<em>Poecile palustris</em>)</td>
</tr>
<tr>
<td>Wren (<em>Troglodytes troglodytes</em>)</td>
<td>Nightingale (<em>Luscinia megarhynchos</em>)</td>
</tr>
<tr>
<td></td>
<td>Nuthatch (<em>Sitta europaea</em>)</td>
</tr>
<tr>
<td></td>
<td>Redstart (<em>Phoenicurus phoenicurus</em>)</td>
</tr>
<tr>
<td></td>
<td>Siskin (<em>Carduelis spinus</em>)</td>
</tr>
<tr>
<td></td>
<td>Sparrowhawk (<em>Accipiter nisus</em>)</td>
</tr>
<tr>
<td></td>
<td>Spotted flycatcher (<em>Muscicapa striata</em>)</td>
</tr>
<tr>
<td></td>
<td>Treecreeper (<em>Certhia familiaris</em>)</td>
</tr>
<tr>
<td></td>
<td>Tree pipit (<em>Anthus trivialis</em>)</td>
</tr>
<tr>
<td></td>
<td>Willow tit (<em>Poecile montanus</em>)</td>
</tr>
<tr>
<td></td>
<td>Willow warbler (<em>Phylloscopus trochilus</em>)</td>
</tr>
<tr>
<td></td>
<td>Wood warbler (<em>Phylloscopus sibilatrix</em>)</td>
</tr>
</tbody>
</table>

Composite indicators can mask a lot of variation among the species within them. The bar chart provided alongside the headline chart above (Figure 6.1), shows the percentage of species within the indicator that have increased, decreased or shown no change. Whether an individual bird species is defined as increasing or decreasing has been decided by its rate of annual change over the time period (long or short) of interest. If the rate of annual change would lead to a population decrease of 50% (halving), or a population increase of 100% (doubling) or more over 25 years, the species is said to have shown a ‘strong decline’ or a ‘strong increase’ respectively. Rates of change less than these but above +33% (increase) or below -25% (decrease) are labelled ‘weak’. Asymmetric thresholds are used for declines and increases to represent an equivalent symmetrical proportional change in an index. These thresholds for decline are based on the rates used in the *Birds of Conservation Concern* status assessment for birds in the UK. Note that for most species, particularly over the longer period, the change is statistically significant.

Butterflies in woodland

The woodland butterflies indicator is a multi-species index compiled by Butterfly Conservation and CEH from data collated through the UK Butterfly Monitoring Scheme (UKBMS) including the Wider Countryside Butterfly Survey (WCBS). The indicator includes 24 species of butterflies associated with woodland, however the woodland measure only includes trends for 23 species because an aggregate trend is used for small skipper (*Thymelicus lineola*) and Essex skipper (*Thymelicus sylvestris*). These 2 species have been combined due to historical difficulties with distinguishing them in the field (Table 5.2).
Table 6.2: Species included in the England woodland butterfly indicator

<table>
<thead>
<tr>
<th>Butterflies (23)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brimstone (<em>Gonepteryx rhamni</em>)</td>
</tr>
<tr>
<td>Brown argus (<em>Aricia agestis</em>)</td>
</tr>
<tr>
<td>Comma (<em>Polygonia c-album</em>)</td>
</tr>
<tr>
<td>Common blue (<em>Polyommatus icarus</em>)</td>
</tr>
<tr>
<td>Gatekeeper (<em>Pyronia tithonus</em>)</td>
</tr>
<tr>
<td>Green-veined white (<em>Pieris napi</em>)</td>
</tr>
<tr>
<td>Holly blue (<em>Celastrina argiolus</em>)</td>
</tr>
<tr>
<td>Large skipper (<em>Ochlodes venata</em>)</td>
</tr>
<tr>
<td>Large white (<em>Pieris brassicae</em>)</td>
</tr>
<tr>
<td>Marbled white (<em>Melanargia galathea</em>)</td>
</tr>
<tr>
<td>Meadow brown (<em>Maniola jurtina</em>)</td>
</tr>
</tbody>
</table>

The year-to-year fluctuations in butterfly numbers are often linked to natural environmental variation, especially weather conditions. Therefore, in order to identify underlying patterns in population trends, the assessment of change is based on smoothed indices. The smoothed trend in the multi-species indicator is assessed by structural time-series analysis. A statistical test is performed using the software ‘TrendSpotter’ to compare the difference in the smoothed index in the latest year versus other years in the series. Within the measures, each species is given equal weight, and the annual figure is the geometric mean of the component species indices for that year.

Populations of individual species within the measure may be increasing or decreasing irrespective of the overall trends. The bar chart provided alongside the headline trend chart (Figure 6.2), shows the percentage of species within the indicator that have shown a statistically significant increase, a statistically significant decrease or shown no statistically significant change. A table summarising the estimated long-term and short-term changes for each species together with an assessment of the individual species trends can be found in the statistical dataset ‘trends in populations of selected butterfly species, 1990 to 2018’.

The method for compiling species annual indices was improved in 2017 and used again here. Indices are calculated for species using the Generalised Abundance Index (GAI) method developed by Dennis et al. (2016) with an additional modification that the data from each site in each year are weighted in the final stage relative to the proportion of the species flight period surveyed that year for that site. This weighting is necessary as the GAI extrapolates from observed data to estimate the total count across the season, accounting for gaps in the recording, and ensures that the observed data have a stronger effect upon the final indices than the extrapolated data.

The new method uses data from butterfly transect sites on farmland and in woodland from UKBMS sites and additionally randomly selected farmland plots from the WCBS. The method uses all butterfly counts in a season to estimate the seasonal pattern of butterfly counts for that year, using a concentrated likelihood method (see Dennis et al. (2016)); the resulting indices and species trends are similar to those generated through previous analysis methods.

Since 2015, the site index data have been incorporated into the models; these data are most prevalent in earlier years and thus the graphs are slightly different to those previously presented. As there are delays in data submission, data for previous years are also updated retrospectively; in 2018, for example, extra data were added for 2016 and 2017. This means that the species index for individual years may vary from previous publications. Further details of the methods used can be found on the UKBMS website and in the Technical background document for this indicator.
Plants in the wider countryside

Until 2013, this indicator was based on analysis of the change in plant species richness in the wider countryside. Data were taken from the Countryside Survey. This survey provides a random sample of vegetation plots located in arable and horticultural fields, agricultural grasslands, woodlands and associated boundary habitats in Great Britain. The start point of the data series was 1990, but it has not been possible to update these data since the last Countryside Survey was carried out in 2007. Given the age of the most recent data and the unlikelihood of any future opportunities to source updates in a consistent way, the decision was taken to reclassify the indicator as ‘under development’ and look at new options for a headline measure. Key messages from the previous indicator are presented here.

The indicator shows the number of different plant species per standard unit area (species richness) in broadleaf woodland habitats and in hedgerow bases (ground flora only). Within woodlands and hedgerows, there was no significant change in plant species richness over the period 1990 to 2007 (see Figure 6.3).

Figure 6.3: Plant species richness in the wider countryside 1990 to 2007: woodland

![Plant species richness in the wider countryside 1990 to 2007: woodland](image)

Source: Centre for Ecology & Hydrology, Countryside Survey.

The indicator compares species richness per plot for plots surveyed in 1990, 1998 and 2007. For each broad habitat type, the data are converted to an index (1990 values are set at 100) to compensate for the difference in plot size and species richness between habitats.

Web links for further information

<table>
<thead>
<tr>
<th>Organisation</th>
<th>Subject</th>
</tr>
</thead>
<tbody>
<tr>
<td>British Trust for Ornithology</td>
<td>Methods</td>
</tr>
<tr>
<td>British Trust for Ornithology</td>
<td>Volunteer-led surveys</td>
</tr>
<tr>
<td>British Trust for Ornithology, Defra and Royal Society for the Protection of Birds</td>
<td>Technical background - birds</td>
</tr>
<tr>
<td>Butterfly Conservation</td>
<td>The state of Britain's butterflies</td>
</tr>
<tr>
<td>Organisation</td>
<td>Subject</td>
</tr>
<tr>
<td>--------------------------------------------------</td>
<td>-------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Butterfly Conservation and Centre for Ecology &amp; Hydrology</td>
<td>Technical background - butterflies</td>
</tr>
<tr>
<td>Centre for Ecology &amp; Hydrology</td>
<td>Countryside survey</td>
</tr>
<tr>
<td>Defra</td>
<td>Butterflies in England: species of the wider countryside on farmland and in woodland</td>
</tr>
<tr>
<td>Defra</td>
<td>Wild bird populations in England</td>
</tr>
<tr>
<td>Joint Nature Conservation Committee</td>
<td>Plant species of the wider countryside</td>
</tr>
<tr>
<td>UK Butterfly Monitoring Scheme</td>
<td>Butterflies as indicators</td>
</tr>
</tbody>
</table>

**References**


**Last updated:** September 2019

**Latest data available:**

6a Populations of woodland species: birds – 2017 and butterflies – 2018

6b Woodland plant species richness – no update (2007)
7. Species in the wider countryside: wetlands

**Type:** State indicator

**Populations of wetlands species**

Produced largely using the population trends from breeding bird surveys in wetland habitats, the water and wetland bird index has remained fairly stable for most of the period since data collection started in 1975. In 2017, the water and wetland bird index exceeded its 1975 level by 7% (Figure 7.1). Numbers rose slightly in the early 2000s, with the smoothed index showing no significant change between 2011 and 2016.

In the winter of 2016/17, the wintering waterbird index was 98% higher than in 1975/76 (Figure 7.2). The index peaked in the late 1990s, and has declined since, with the smoothed index falling 7% in the short term between 2010/11 and 2015/16.

**Figure 7.1: Breeding wetland birds in England, 1975 to 2017**

![Figure 7.1: Breeding wetland birds in England, 1975 to 2017](image)

**Notes:**

1. The line graph shows the unsmoothed trend (dashed line) and the smoothed trend (solid line) together with its 95% confidence interval (shaded).
2. The figure in brackets shows the number of species in the index.
3. The bar chart shows the percentage of species within the indicator that have increased, decreased or shown no change, based on set thresholds of annual change.

**Source:** British Trust for Ornithology, Defra, Joint Nature Conservation Committee, Royal Society for the Protection of Birds, Wildfowl and Wetlands Trust.
Conservation on land and at sea

For the 25 species for which a long-term trend can be calculated, 36% of species increased, 40% showed no change and 24% declined; the majority of species exhibiting a change show a weak rather than a strong change. For recent colonisers such as little egret, data can only be included from 2004 and therefore a long-term trend could not be calculated.

Figure 7.2: Breeding wintering waterbirds in England, 1975/76 to 2016/17

Notes:

1. The line graph shows the unsmoothed trend (dashed line) and the smoothed trend (solid line) together with its 95% confidence interval (shaded). Data from surveys of wintering waterbirds are based on full counts on wetland and coastal sites of markedly varying size. This means that standard indicator bootstrapping methods cannot be applied and the trend is presented without confidence intervals.
2. The figures in brackets show the number of species in the index.
3. The number of species in each sub indicator do not sum to the number in the all species indicator because 4 species are included in all wintering waterbirds but are neither wildfowl nor wader. These are 2 grebes (little and great-crested), one rail species (coot) and cormorant. These are neither wildfowl nor waders but are in 3 different taxonomic groups none large enough to warrant a separate indicator. They are included in the all wintering waterbird indicator because they behave similarly to wildfowl and are counted in the same way, using the Wetland Bird Survey.
4. The bar chart shows the percentage of species within the indicator that have increased, decreased or shown no change, based on set thresholds of annual change.

Source: British Trust for Ornithology, Defra, Joint Nature Conservation Committee, Royal Society for the Protection of Birds, Wildfowl and Wetlands Trust.

Composite indicators can mask a lot of variation among the species within them. The bar chart provided alongside each habitat chart above shows the percentage of species within that indicator that have increased, decreased or shown no change.

Whether an individual species is defined as increasing or decreasing has been decided by its rate of annual change over the time period (long or short) of interest. If the rate of annual change would lead to a population decrease of 50% (halving), or a population increase of 100% (doubling) or more over 25 years, the species is said to have shown a ‘strong decline’ or a ‘strong increase’ respectively. Rates of change less than these but above +33% (increase) or below -25% (decrease) are labelled ‘weak’. Asymmetric thresholds are used for declines and increases to represent an equivalent symmetrical proportional change in the index. These thresholds for declines are based on the rates used in the Birds of Conservation Concern status assessment for birds in the UK.
Indicator assessment

| Assessment of change in abundance and diversity of species in the wilder countryside (wetlands) |
|-------------------------------------------------------------|-----------------|-----------------|-----------------|
|                                                                                       | Long term       | Short term      | Latest year     |

**Note:** To better capture underlying trends, long and short-term assessments are made on the basis of smoothed data. Due to the smoothing method, the most recent smoothed data point is likely to change when a subsequent year of data is added. Long and short-term assessments using smoothed data are therefore made to 2016 (breeding wetland birds) and 2015/16 (wintering waterbirds) whereas all latest year assessments are based on unsmoothed data. The significance of change in the breeding wetland bird indicator is tested by bootstrapping, a formal statistical approach. This is not appropriate for assessing the wintering waterbird indicator. On the advice of the data providers, changes are assessed using a rule of thumb whereby a change of 5% or more is deemed significant.

**Relevance**

Bird populations have long been considered to provide a good indication of the broad state of wildlife. Birds occupy a wide range of habitats and there are considerable long-term data on changes in bird populations, which help in the interpretation of shorter-term fluctuations in numbers. As they are a well-studied taxonomic group, drivers of change for birds are better understood than for other species groups, which allows for better interpretation of any observed changes. Birds also have huge cultural importance and are highly valued as a part of England’s natural environment by the general public.

The indicator shows progress with commitments to improve the status of our wildlife and habitats. It is relevant to outcomes 1 and 3 in *Biodiversity 2020: A strategy for England’s wildlife and ecosystem services* (see Annex A). The indicator is also relevant to international goals and targets (see Annex B of the aforementioned publication).

**Background**

**Breeding wetland birds**

The breeding wetland bird indicator has been supplied by the British Trust for Ornithology (BTO), the Royal Society for the Protection of Birds (RSPB) and the Joint Nature Conservation Committee (JNCC) with previous support for the Waterways Breeding Bird Survey (WBBS) from the Environment Agency. It is compiled using data from the WBBS and its predecessor the Waterways Bird Survey (WBS), the Breeding Bird Survey (BBS) and its predecessor the Common Bird Census (CBC), the Heronries Survey and the Constant Effort Site scheme (CES). Within the breeding wetland bird measure there are 26 species (Table 7.1). Each species is given equal weighting and the index is the geometric mean of the individual species indices. Bird count data from 300 to over 3,000 sites (depending on the data source for the species) surveyed annually by volunteers are analysed using log linear models to calculate population trends for each species. The longer-term changes in the indicator are assessed using the version of the indicator generated from the smoothed species trends, with bootstrapping used to generate confidence limits.

Although the breeding wetland bird measure shows little change since 1975, this apparent stability masks changes in different types of birds within the indicator. Birds of wet grassland such as yellow wagtail and snipe have declined markedly, whilst birds of slow and standing water, such as tufted duck, have increased (see Figure 7.3).
Table 7.1: Bird species included in the breeding wetland bird indicator

<table>
<thead>
<tr>
<th>Birds of fast flowing water (4)</th>
<th>Birds of slow and standing water (6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Common sandpiper (<em>Actitis hypoleucos</em>)</td>
<td>Coot (<em>Fulica atra</em>)</td>
</tr>
<tr>
<td>Dipper (<em>Cinclus cinclus</em>)</td>
<td>Great-crested grebe (<em>Podiceps cristatus</em>)</td>
</tr>
<tr>
<td>Goosander (<em>Mergus merganser</em>)</td>
<td>Little grebe (<em>Tachybaptus ruficollis</em>)</td>
</tr>
<tr>
<td>Grey wagtail (<em>Motacilla cinerea</em>)</td>
<td>Mallard (<em>Anas platyrhynchos</em>)</td>
</tr>
<tr>
<td>Coot (<em>Fulica atra</em>)</td>
<td>Moorhen (<em>Gallinula chloropus</em>)</td>
</tr>
<tr>
<td>Great-crested grebe (<em>Podiceps cristatus</em>)</td>
<td>Tufted duck (<em>Aythya fuligula</em>)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Birds of wet grassland (8)</th>
<th>Birds of reedbeds (4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Curlew (<em>Numenius arquata</em>)</td>
<td>Cetti’s warbler (<em>Cettia cetti</em>)</td>
</tr>
<tr>
<td>Lapwing (<em>Vanellus vanellus</em>)</td>
<td>Reed bunting (<em>Emberiza schoeniclus</em>)</td>
</tr>
<tr>
<td>Little egret (<em>Egretta garzetta</em>)</td>
<td>Reed warbler (<em>Acrocephalus scirpaceus</em>)</td>
</tr>
<tr>
<td>Mute swan (<em>Cygnus olor</em>)</td>
<td>Sedge warbler (<em>Acrocephalus schoenobaenus</em>)</td>
</tr>
<tr>
<td>Redshank (<em>Tringa totanus</em>)</td>
<td></td>
</tr>
<tr>
<td>Snipe (<em>Gallinago gallinago</em>)</td>
<td></td>
</tr>
<tr>
<td>Teal (<em>Anas crecca</em>)</td>
<td></td>
</tr>
<tr>
<td>Yellow wagtail (<em>Motacilla flava</em>)</td>
<td></td>
</tr>
</tbody>
</table>

Other wetland birds (4)

- Grey heron (*Ardea cinerea*)
- Kingfisher (*Alcedo atthis*)
- Oystercatcher (*Haematopus ostralegus*)
- Sand martin (*Riparia riparia*)
Conservation on land and at sea

Figure 7.3: Breeding wetland birds across 4 wetland habitats in England, 1975 to 2017

Notes:
1. The line graphs show unsmoothed trends (dashed lines) and smoothed trends (solid lines).
2. The figures in brackets show the number of species in each measure.

Source: British Trust for Ornithology, Defra, Joint Nature Conservation Committee, Royal Society for the Protection of Birds.

Wintering waterbirds

The wintering waterbird indicator has been supplied by the British Trust for Ornithology (BTO), the Royal Society for the Protection of Birds (RSPB) and the Joint Nature Conservation Committee (JNCC) with support from the Wildfowl and Wetlands Trust (WWT). It is compiled using data from the Wetland Bird Survey (WeBS) and WWT Goose and Swan Monitoring. There are 41 species, races and populations of bird included in the wintering waterbird indicator. Nearly all species within the indicator can be split into subcategories of wildfowl (ducks, geese and swans) and waders (sandpipers, plovers and their close relatives) which display slightly different trends. Overall, the smoothed wildfowl index has increased by 98% and the wader index has increased 56% between 1975/76 and 2015/16. However, both peaked in the late 1990s and have declined subsequently; between 2010/11 and 2015/16, the smoothed index for waders increased by 2% whereas the index for wildfowl declined by 14%.

Amongst wildfowl, numbers of scaup have shown a strong decline of 80% compared to their baseline levels in 1975/76. The indices for pochard, eider and the European white-fronted goose show weak declines of 49%, 48% and 46% respectively in the long term. Whooper swan and gadwall have both increased, 19- and 14-fold respectively in the long term. And in the short-term between the winters of 2010/11 and 2015/16, the majority of species in the wildfowl indicator declined, with Bewick’s swan and Svalbard light-bellied brent goose declining strongly by 50% and 49% respectively over this short-term period. The indices for both dark-bellied brent goose and shoveler increased by 25% between the winters of 2010/11 and 2015/16.
Amongst waders, the index for avocet has increased over 7-fold since being included in the indicator in 1989/90. The black-tailed godwit increased around 7-fold and numbers of golden plover also show a strong 281% increase in the long term. In contrast, ringed plover and dunlin numbers show the steepest declines, declining by 52% and 48% respectively between the winters of 1975/76 and 2015/16. And in the short term, between the winters of 2010/11 and 2015/16, the indices for golden plover, black-tailed godwit and lapwing increased strongly by 49%, 30% and 17%, respectively.

The increasing trends for wintering wildfowl and related species from 1975/76 to 1996/97 is thought to be due to improved protection of wetlands internationally, better regulation of hunting and changes in agricultural practices. The downturn since the 1990s may in part be due to a range of factors including conditions in the high latitude countries where they breed, with breeding productivity increasing for species including black-tailed godwit, but decreasing for others such as Greenland white-fronted geese. There is good evidence of a strong climate change impact on the indicator in recent years, with milder winters leading to some species shifting their wintering ranges northeast and away from the UK.

Table 7.2: Bird species included in the wintering waterbird indicator

<table>
<thead>
<tr>
<th>Wildfowl (22)</th>
<th>Waders (15)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bewick’s swan (Cygnus columbianus)</td>
<td>Avocet (Recurvirostra avosetta)</td>
</tr>
<tr>
<td>British/Irish greylag goose (Anser anser anser)</td>
<td>Bar-tailed godwit (Limosa lapponica)</td>
</tr>
<tr>
<td>Dark-bellied brent goose (Branta bernicla bernicla)</td>
<td>Black-tailed godwit (Limosa limosa)</td>
</tr>
<tr>
<td>Eider (Somateria mollissima)</td>
<td>Curlew (Numenius arquata)</td>
</tr>
<tr>
<td>European white-fronted goose (Anser albifrons albifrons)</td>
<td>Dunlin (Calidris alpina)</td>
</tr>
<tr>
<td>Gadwall (Anas strepera)</td>
<td>Golden plover (Pluvialis apricaria)</td>
</tr>
<tr>
<td>Goldeneye (Bucephala clangula)</td>
<td>Grey plover (Pluvialis squatarola)</td>
</tr>
<tr>
<td>Goosander (Mergus merganser)</td>
<td>Knot (Calidris canutus)</td>
</tr>
<tr>
<td>Mallard (Anas platyrhynchos)</td>
<td>Lapwing (Vanellus vanellus)</td>
</tr>
<tr>
<td>Mute swan (Cygnus olor)</td>
<td>Oystercatcher (Haematopus ostralegus)</td>
</tr>
<tr>
<td>Pink-footed goose (Anser brachyrhynchus)</td>
<td>Purple sandpiper (Calidris maritima)</td>
</tr>
<tr>
<td>Pintail (Anas acuta)</td>
<td>Redshank (Tringa totanus)</td>
</tr>
<tr>
<td>Pochard (Aythya ferina)</td>
<td>Ringed plover (Charadrius hiaticula)</td>
</tr>
<tr>
<td>Red-breasted merganser (Mergus serrator)</td>
<td>Sanderling (Calidris alba)</td>
</tr>
<tr>
<td>Scaup (Aythya marila)</td>
<td>Turnstone (Arenaria interpres)</td>
</tr>
<tr>
<td>Shelduck (Tadorna tadorna)</td>
<td>Other wintering waterbirds (4)</td>
</tr>
<tr>
<td>Shoveler (Anas clypeata)</td>
<td>Coot (Fulica atra)</td>
</tr>
<tr>
<td>Svalbard light-bellied brent goose (Branta bernicla hrota)</td>
<td>Cormorant (Phalacrocorax carbo)</td>
</tr>
<tr>
<td>Teal (Anas creca)</td>
<td>Great crested grebe (Podiceps cristatus)</td>
</tr>
<tr>
<td>Tufted duck (Aythya fuligula)</td>
<td>Little grebe (Tachybaptus ruficollis)</td>
</tr>
<tr>
<td>Whooper swan (Cygnus cygnus)</td>
<td></td>
</tr>
<tr>
<td>Wigeon (Anas penelope)</td>
<td></td>
</tr>
</tbody>
</table>
Web links for further information

<table>
<thead>
<tr>
<th>Organisation</th>
<th>Subject</th>
</tr>
</thead>
<tbody>
<tr>
<td>British Trust for Ornithology</td>
<td>Volunteer-led surveys</td>
</tr>
<tr>
<td>British Trust for Ornithology</td>
<td>Waterways Breeding Bird Survey</td>
</tr>
<tr>
<td>British Trust for Ornithology</td>
<td>Wetland Bird Survey</td>
</tr>
<tr>
<td>British Trust for Ornithology &amp; Royal Society for the Protection of Birds</td>
<td>Technical Background Document</td>
</tr>
<tr>
<td>Defra</td>
<td>Populations of wild birds</td>
</tr>
<tr>
<td>Wildfowl and Wetlands Trust</td>
<td>National water bird estimates</td>
</tr>
</tbody>
</table>

Last updated: September 2019

Latest data available: breeding wetland birds – 2017, wintering waterbirds – 2016/17
8. Species in the wider marine environment

Type: State indicator

In 2016, the Seabird Monitoring Programme (SMP) Steering Group made the decision to put the analysis and publication of the annual SMP report on hold for 2 years. The reason for this was to enable staff time to be dedicated to the current breeding seabird census, Seabirds Count. Although SMP data is still being collected, and in higher volumes for the census, the absence of analysed data for 2016 and 2017 means this indicator has not been updated.

Populations of breeding seabirds

In 2015, the breeding seabird index in England was 22% higher than in 1986, the highest level recorded (Figure 8.1). Although fluctuating, the indicator has increased steadily since the late 1990s driven mainly by increases in subsurface feeders. In the short term, the index showed no significant change between 2009 and 2014.

Figure 8.1: Population trends of seabirds in England, 1986 to 2015

Notes:

1. The line graph shows the unsmoothed trend. No smoothed trend is available for seabirds as individual species population trends are analysed using an imputation procedure that does not include smoothing.
2. The figure in brackets shows the number of species in the index.
3. The bar chart shows the percentage of species within the indicator that have increased, decreased or shown no change, based on set thresholds of annual change.
4. The England trend published here is not directly comparable with the England seabird trend published in 2013 due to changes in species included (see “Species breakdown’ section for more information).
Conservation on land and at sea

Source: Seabird Monitoring Programme (co-ordinated by Joint Nature Conservation Committee), British Trust for Ornithology, Defra, Royal Society for the Protection of Birds.

The overall index hides considerable variation in individual species trends; the bar chart provided alongside the habitat chart above shows the percentage of species within the indicator that have increased, decreased or shown no change. Figure 8.2 illustrates how subsurface feeders have fared better than surface feeders.

Indicator assessment

Assessment of change in abundance and diversity of species in the wider marine environment

The traffic light assessment for the seabirds measure has been removed until a way of assessing variability is devised. This follows a recommendation in a quality assurance science panel report, dated January 2016.

Relevance

Bird populations have long been considered to provide a good indication of the broad state of wildlife. Birds occupy a wide range of habitats and there are considerable long-term data on changes in bird populations, which help in the interpretation of shorter-term fluctuations in numbers. As they are a well-studied taxonomic group, drivers of change for birds are better understood than for other species groups, which allows for better interpretation of any observed changes. Birds also have huge cultural importance and are highly valued as a part of England’s natural environment by the general public.

The indicator shows progress with commitments to improve the status of our wildlife and habitats. It is relevant to outcomes 2 and 3 of Biodiversity 2020: A strategy for England’s wildlife and ecosystem services (see Annex A). It is also relevant to the global targets in the Convention on Biological Diversity Strategic Plan (international goals and targets) (see Annex B of the aforementioned publication).

Background

The indicator is based on combined trends of 11 seabirds (Table 8.1 below) and has been compiled by the British Trust for Ornithology (BTO), the Royal Society for the Protection of Birds (RSPB) and the Joint Nature Conservation Committee (JNCC). Data are obtained from the Seabird Monitoring Programme.

Within the indicator, each species is given equal weighting, and the annual index is the geometric mean of the individual species indices for that year. The individual species indices are largely derived by modelling of count data and estimates are revised when new data or improved methodologies are developed and applied retrospectively to earlier years.

Whether an individual species is increasing or decreasing has been decided by its rate of annual change over the time period (long or short) of interest. If the rate of annual change would lead to a population decrease of 50% (halving), or a population increase of 100% (doubling) or more over 25 years, the species is said to have shown a ‘strong decline’ or a ‘strong increase’ respectively. Rates of change less than these but above +33% (increase) or below -25% (decrease) are labelled ‘weak’. Asymmetric thresholds are used for declines and increases to represent an equivalent symmetrical proportional change in an index. These thresholds for declines are based on the rates used in the Birds of Conservation Concern status assessment for birds in the UK.

Species breakdown

There are 11 species of bird included in the England seabird indicator, including the rapidly increasing gannet trend for the only English colony at Bempton Cliffs, Yorkshire, which has
had a marked positive effect on the indicator. A breakdown by feeding behaviour (Figure 8.2) shows a 15% decline in seabirds that forage on the surface of the sea (surface feeders) in contrast with a 150% increase in those that forage by diving (subsurface feeders). Species have had mixed fortunes; for example, black-legged kittiwakes, which are surface feeders, have declined by 37% between 1986 and 2014, their decline linked to increases in sea surface temperatures. However, kittiwakes have fared better in the short term, showing no change between 2009 and 2014. The northern fulmar also shows a decline of 60% since 1986. In contrast, common guillemots, which dive for fish, increased by 158% and gannet numbers increased 15-fold between 1986 and 2014. Note that due to lack of representative data, the indicator does not include many burrow-nesting seabirds or non-colonial coastal species which may show different trends.

Table 8.1: Seabird species included in the indicator

<table>
<thead>
<tr>
<th>Surface feeders (5)</th>
<th>Subsurface feeders (4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arctic tern (<em>Sterna paradisaea</em>)</td>
<td>Common guillemot (<em>Uria aalge</em>)</td>
</tr>
<tr>
<td>Black-legged kittiwake (<em>Rissa tridactyla</em>)</td>
<td>European shag (<em>Phalacrocorax aristotelis</em>)</td>
</tr>
<tr>
<td>Common tern (<em>Sterna hirundo</em>)</td>
<td>Great cormorant (<em>Phalacrocorax carbo</em>)</td>
</tr>
<tr>
<td>Little tern (<em>Sternula albifrons</em>)</td>
<td>Gannet (<em>Morus bassanus</em>)</td>
</tr>
<tr>
<td>Sandwich tern (<em>Sterna sandvicensis</em>)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Other feeding type (2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northern fulmar (<em>Fulmarus glacialis</em>)</td>
</tr>
<tr>
<td>Herring gull (<em>Larus argentatus</em>)</td>
</tr>
</tbody>
</table>

The seabird index may not yet fully reflect the low breeding success rates of some species observed during recent years, because seabirds take several years to reach maturity. There will therefore be a lag before the results of reduced breeding success manifest themselves as a decline in breeding adults. In most species, poor breeding success is a direct result of food shortages during the breeding season, but it is not clear for all species whether over-fishing, climate change, or some combination of both is the ultimate cause.

Since the 2014 update of the England Biodiversity Indicators, the England seabird indicator has been standardised as much as possible to the equivalent UK indicator by applying the same definition of seabird, indexing from the same 1986 baseline, and excluding species for which there is no reliable trend data since the last census in 2000. This resulted in 2 species additions (gannet and herring gull) to the England seabird indicator.

Despite these changes, the seabirds index in England in 2015 continues to show a different pattern to the UK index and one of the main reasons for this difference remains species composition. Some species breed only in Scotland whereas others are more widespread but have the bulk of their populations in northern parts of the British Isles, and there may be insufficient data to generate an England-only trend. Furthermore, it was also possible to generate an England trend for gannet based on reliable data from a single large colony, but there are insufficient data representative of the UK population to produce a reliable UK trend. The inclusion of the rapidly increasing gannet trend in the England indicator has had a marked positive effect.
Figure 8.2: Population trend of seabirds in England, subsurface feeders and surface feeders, 1986 to 2015

Notes:
1. The line graph shows the unsmoothed trend (solid line) - no smoothed trend is available for seabirds as individual species population trends are analysed using an imputation procedure that does not include smoothing.
2. The figures in brackets show the number of species in the index.

Source: Seabird Monitoring Programme (co-ordinated by Joint Nature Conservation Committee), British Trust for Ornithology, Defra, Royal Society for the Protection of Birds.

Web links for further details

<table>
<thead>
<tr>
<th>Organisation</th>
<th>Subject</th>
</tr>
</thead>
<tbody>
<tr>
<td>Royal Society for the Protection of Birds, British Trust for Ornithology and Joint Nature Conservation Committee</td>
<td>The State of UK’s Birds 2017</td>
</tr>
<tr>
<td>Defra</td>
<td>Populations of wild birds – England</td>
</tr>
<tr>
<td>Defra</td>
<td>Populations of wild birds – UK</td>
</tr>
<tr>
<td>Joint Nature Conservation Committee</td>
<td>Seabird Monitoring Programme</td>
</tr>
</tbody>
</table>

Last updated: August 2017

Latest data available: 2015
9. Biodiversity and ecosystem services: terrestrial

Type: Benefit indicator

Removal of greenhouse gases by forests in England

It is estimated that since 1990, forests in England have (cumulatively) removed the equivalent of 217 million tonnes of carbon dioxide (MtCO₂e) from the atmosphere (Figure 9.1). In 2017, English forests are estimated to have removed 8.3 MtCO₂e (Figure 9.2).

The proportion of greenhouse gases removed from the atmosphere by broadleaf woodland has increased since the time series began; accounting for 74% (6.2 MtCO₂e) of the estimated annual removals in 2017 compared to 64% (3.8 MtCO₂e) of removals in 1990 (Figure 9.2).

Figure 9.1: Cumulative net removals of greenhouse gases by forests in England, 1990 to 2017

Indicator Description

Forests are a large store of carbon and also act as an active carbon 'sink', removing carbon dioxide (CO₂), a greenhouse gas, from the atmosphere and storing it as carbon in living biomass, leaf litter and forest soil. This sequestration of CO₂ is an essential ecosystem service.

This indicator shows the cumulative net removal of greenhouse gases from the atmosphere by forests in England since 1990. It is split between type of woodland (conifer and broadleaf). Showing greenhouse gas removals by type of woodland is interesting from a biodiversity perspective as it allows a clearer presentation of the contribution made to greenhouse gas removals by broadleaf woodland, most of which constitutes priority habitat.

Notes:
1. Estimated cumulative net removals of greenhouse gases (carbon dioxide (CO₂), methane (CH₄) and nitrous oxide (N₂O)) from the atmosphere by forests in England, expressed as million tonnes of CO₂ equivalent (Mt CO₂e).
2. Revised in 2015 to reflect improved modelling of greenhouse gas emissions and removals.
3. Revised in 2017 due to improvements made to the forestry sector of the 1990 to 2015 Land Use, Land Use Change and Forestry (LULUCF) greenhouse gas inventory.
4. Revised in 2018 due to improvements in the CARBINE model used to calculate the forest carbon stock figures for the 1990 to 2016 LULUCF greenhouse gas inventory.
5. Revised in 2019 due to further improvements in the CARBINE model (see background section for details).
6. These results are therefore not directly comparable with those in previous publications.
**Conservation on land and at sea**

**Source:** Department of Business, Energy & Industrial Strategy (BEIS) – Land Use, Land Use Change and Forestry (LULUCF) greenhouse gas inventory.

**Indicator assessment**

<table>
<thead>
<tr>
<th>Assessment of change in cumulative net removal of greenhouse gases</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cumulative net removal of greenhouse gases by forests</strong></td>
</tr>
<tr>
<td>Long term</td>
</tr>
</tbody>
</table>

**Note:** Long and short-term assessments are based on a 3% rule of thumb. The base years for these assessments use a 3-year average. See Assessing Indicators.

**Indicator Description**

The data presented here are from the UK’s Land Use, Land Use Change and Forestry (LULUCF) greenhouse gas inventory, which provides estimates of the annual emissions and removals of greenhouse gases (carbon dioxide (CO$_2$), methane (CH$_4$) and nitrous oxide (N$_2$O)) from the atmosphere by forests in the UK between 1990 and 2017 (Figures 9.1 and 9.2). LULUCF emissions and removals are given in terms of carbon dioxide equivalent (CO$_2$e). The CO$_2$e of a mixture of greenhouse gases is the quantity of CO$_2$ that would have the same global warming potential.

**Relevance**

The benefits that humans receive from the environment have become more widely recognised. The Millennium Ecosystem Assessment and the more recent UK National Ecosystem Assessment both highlighted that ecosystems and the services they deliver underpin our very existence. We depend on them to produce our food and timber, regulate water supplies and climate, and breakdown waste products. We also value them in less obvious ways: contact with nature gives pleasure, provides recreation and is known to have a positive impact on long-term health and happiness. Measuring the status of ecosystem services is therefore a critical aim of the indicator set. Greenhouse gas removal is a regulating ecosystem service that contributes to reducing the scale and future impacts of climate change (climate change mitigation).

The indicator is relevant to outcomes 1 and 1c in Biodiversity 2020, the strategy for England’s wildlife and ecosystem services (PDF 2.66 MB). The indicator is also relevant to international goals and targets (see Annex A and B of the aforementioned publication).

**Background**

English forests are a large store of carbon and also act as an active carbon ‘sink’, removing CO$_2$, a greenhouse gas, from the atmosphere and storing it as carbon in living biomass, leaf litter and forest soil. This sequestration of CO$_2$ is an essential ecosystem service.

National Inventories of human-induced sources and sinks of greenhouse gases are submitted by Parties, including the UK, to the United Nations Framework Convention on Climate Change (UNFCCC) every year. This system was set up to meet the reporting obligations of the Convention and is used to report on progress in meeting Kyoto Protocol commitments. The Kyoto Protocol, which entered into force in 2005, obliges industrialised countries that have ratified the accord to reduce their emissions of 6 greenhouse gases, the major contributors being CO$_2$, CH$_4$ and N$_2$O. The LULUCF greenhouse gas inventory covers emissions and removals of these 3 greenhouse gases resulting from direct human-induced land use, land-use change and forestry activities. The LULUCF estimates are compiled for the Department for Business, Energy and Industrial Strategy (BEIS) by the Centre for Ecology & Hydrology (CEH) and Forest Research (FR).
The forestry figures in the 1990 to 2017 LULUCF inventory have been revised and therefore the figures presented here are not directly comparable to those in previous publications. These revisions are due to improvements in the FR CARBINE model used for calculating changes in forest carbon stocks that include:

- Corrections to the double counting of deadwood inputs in the year of harvesting;
- Changes to the post-harvest calculations for turnover of foliage, branches and roots to ensure there is no double-counting; and
- Minor adjustments to the volume calculations for managed non-clearfell areas.

There have also been improvements to the process for allocating forest management activities. These improvements have led to changes in assumptions about the proportions of forest area allocated to new planting and felling over time. The reported area of forest has varied slightly over time as has the proportion of forest on mineral and organic soils.

The result of these model changes is a decrease in both the broadleaf and conifer forest sinks for all years between 1990 and 2016. More specifically, decreases to the conifer sink were of a greater magnitude than those to the broadleaf sink and decreases to both sinks are more pronounced in the later years of the time series.

Figure 9.2 shows the annual breakdown of the cumulative removals shown in Figure 9.1. Although the indicator is assessed as improving in both the long term and short term since cumulative greenhouse gas removals have continued to increase, it should be noted that annual rates of removal have remained relatively static over the last 15 years. It is also worth noting that the proportion of removals attributed to broadleaf woodland has been increasing since the time series began in 1990.

Figure 9.2: Annual net removals of greenhouse gases by forests in England, 1990 to 2017

Notes:
1. Estimated annual net removals of greenhouse gases (carbon dioxide (CO₂), methane (CH₄) and nitrous oxide (N₂O)) from the atmosphere by forests in England, expressed as million tonnes of CO₂ equivalent (Mt CO₂e).
2. The step change in 2012 arises from modelling challenges in matching estimates of wood production. The National Forest Inventory has a base year of 2011 and prior to this the felled area is constrained based on wood production. After the base year the felled area is driven by rotation lengths and the assumed percentage of forest managed for no-thin or no-fell. One of the aims for the next inventory is to develop a robust methodology to smooth these transitions.
3. Revised in 2015 to reflect improved modelling of greenhouse gas emissions and removals.
4. Revised in 2017 due to improvements made to the forestry sector of the 1990 to 2015 Land Use, Land Use Change and Forestry (LULUCF) greenhouse gas inventory.
5. Revised in 2018 due to improvements in the CARBINE model used to calculate the forest carbon stock figures for the 1990 to 2016 LULUCF greenhouse gas inventory.
6. Revised in 2019 due to further improvements in the CARBINE model (see background section for more details).
7. These results are therefore not directly comparable with those in previous publications.

Source: Department of Business, Energy & Industrial Strategy (BEIS) – Land Use, Land Use Change and Forestry (LULUCF) greenhouse gas inventory.

Showing greenhouse gas removals by type of woodland is interesting from a biodiversity perspective as it allows a clearer presentation of the contribution made to greenhouse gas removals by broadleaf woodland, most of which constitutes priority habitat.

National Forest Inventory

The estimated carbon stock of trees in England can be used as a complementary measure of carbon storage. Information on current carbon stocks of forests in England was first calculated in 2014 using National Forest Inventory (NFI) data, based on a sample of woodlands equal to or greater than 0.5 hectares in size.

The total carbon stock of all species of tree within English forests as at 31 March 2019, is estimated to be 123 Mt of carbon (452 Mt CO₂e) (see Figure 9.3). Broadleaf trees, with an estimated carbon stock of 94 Mt (344 Mt CO₂e) are responsible for a greater proportion of the total England carbon stock than conifer trees, which are estimated to have a total stock of 30 Mt (109 Mt CO₂e). This difference reflects the fact that in England, the total ‘growing stock volume’ (and area) of broadleaved woodland covered by the NFI is greater than that of conifer woodland.

Figure 9.3: Total carbon stocks in living conifer and broadleaved woodland trees in England, 1990 to 2019

Notes:
1. Estimated total carbon in all living trees within woodlands of England.
2. The time series is non-linear (indicated by the dashed vertical lines on the x axis).

Source: National Forestry Inventory (Forestry Commission).

Fieldwork for the current NFI began in 2009 and is being conducted on a 5 year cycle. The assessment of woodland carbon stocks from this inventory has formed a new baseline for carbon.
accounting within British forests and woodlands. Estimates of carbon stocks are determined by the total growing stock volume of woodland; a function of:

- Woodland area; and
- Woodland characteristics (e.g. number of trees, tree height and tree diameter) within this area.

The current NFI fieldwork cycle began in 2015 and will run until 2020. The NFI assessment of woodland carbon stocks was used in the development of the reporting on LULUCF emissions and removals. However, as there are differences in both the scope and the data sources used for LULUCF (sequestration) and NFI (stock) figures, they are not directly comparable. More information can be found in the Forest Research Report (PDF, 1.29Mb).

**Web links for further information**

<table>
<thead>
<tr>
<th>Organisation</th>
<th>Subject</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forestry Commission</td>
<td>Carbon in live woodland trees in Britain: National Forest Inventory Report (PDF, 1.29 Mb)</td>
</tr>
<tr>
<td></td>
<td>Understanding the carbon and greenhouse gas balance of forests in Britain (PDF, 7.24 Mb)</td>
</tr>
<tr>
<td>Millennium Ecosystem Assessment</td>
<td>Millennium Ecosystem Assessment</td>
</tr>
<tr>
<td>National Atmospheric Emissions Inventory</td>
<td>LULUCF Greenhouse Gas Inventory</td>
</tr>
<tr>
<td>UK National Ecosystem Assessment</td>
<td>UK National Ecosystem Assessment</td>
</tr>
</tbody>
</table>

**Last updated:** September 2019

**Latest data available:**

- Greenhouse gas removals by forests in England (LULUCF) – 2017;
- Carbon stocks of forests in England (NFI) – 2019
10. Biodiversity and ecosystem services: pollination

Type: State / Benefit indicator

Distribution of pollinators in the UK

This indicator has been updated to include 14 additional species of hoverfly across the entire time series; this update has impacted on the long-term and short-term trends.

There was an overall decrease in the pollinators indicator from 1987 onwards. In 2016, the indicator had declined by 31% compared to its value in 1980. The long-term trend was assessed as declining (Figure 10.1).

Between 2011 and 2016, the indicator showed a decrease of 10%; the short-term trend was also assessed as declining.

Over the long term, 14% of pollinator species became more widespread (5% showed a strong increase), and 44% became less widespread (20% showed a strong decrease). Similarly, a greater proportion of species were decreasing than increasing over the short term, with 46% of species decreasing and 38% of species increasing.

Figure 10.1: Change in the distribution of UK pollinators, 1980 to 2016

Notes:

1. The line graph shows the unsmoothed composite indicator trend with variation around the line (shaded) within which we can be 90% confident that the true value lies (credible interval).
2. The figure in brackets shows the total number of species included in the index (137 wild bee and 228 hoverfly species).
3. The bar chart shows the percentage of species within the indicator that have increased, decreased or shown no change in occupancy, based on set thresholds of change.
4. This indicator is not directly comparable with the previous publication. Hoverfly trends have been updated to 2016 (previously 2013) and 14 additional hoverfly species have been included across the entire time series, increasing the total number of hoverfly species in the indicator from 214 to 228.
Indicator assessment

<table>
<thead>
<tr>
<th>Assessment of change in the distribution of pollinators in the UK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distribution of pollinating insects</td>
</tr>
<tr>
<td>Long term</td>
</tr>
</tbody>
</table>

**Note:** Analysis of the underlying trends is carried out by the data providers – see Assessing Indicators.

**Indicator description**

As individual pollinator species become more or less widespread, the communities in any given area become more or less diverse, and this may have implications for pollination as more diverse communities are, in broad terms, more effective in pollinating a wider range of crops and wild flowers. Despite the inter-annual variation, the overall trend for pollinators remains downward.

The indicator occupancy index was also produced for the bee (Figure 10.2) and hoverfly (Figure 10.3) species separately. The bee index was relatively stable up to 2006, before undergoing several years of decline. From 2013 onwards, there was evidence of a recovery, however, the bee index in 2016 was estimated to be 17% lower than in 1980. A larger proportion of bee species had decreased than increased over the long term (37% decreased and 20% increased), however, over the short term, a greater number increased (46%) than decreased (33%).

**Figure 10.2: Change in the distribution of wild bee species in the UK, 1980 to 2016**

Notes:

1. The line graph shows the unsmoothed composite indicator trend with variation around the line (shaded) within which we can be 90% confident that the true value lies (credible interval).
2. The figure in brackets shows the number of species included in the index.
3. The bar chart shows the percentage of species within the indicator that have increased, decreased or shown no change in occupancy, based on set thresholds of change.

Source: Bees, Wasps & Ants Recording Society; Biological Records Centre (supported by Centre for Ecology & Hydrology and Joint Nature Conservation Committee).

There was a noticeable decline in the bee index from 2007 to 2014. Loss of foraging habitat is understood to be a major driver of change in bee distribution (Vanbergen et al., 2014) and pesticide...
Conservation on land and at sea

use has been shown to have an effect on bee behaviour and survival (Stanley et al., 2015). Weather effects, particularly wet periods in the spring and summer, are also likely to have had an impact. Further research would help to better understand the relative importance of these potential drivers of change.

In contrast to bees, the hoverfly index (Figure 10.3) shows a gradual decline between 1987 and 2000. In 2000, the composite index was approximately 82% of the value in 1980. The trend was then relatively stable up to 2009, before declining again, ending 39% lower than the value in 1980. A greater proportion of hoverflies have declined than increased in occupancy over both the long and short term (1980 to 2016: 49% decreased and 10% increased; 2011 to 2016: 54% decreased and 32% increased). It is not clear why hoverflies show a different trend to bees, although differences in the life cycle will mean they respond differently to weather events and habitat change.

Figure 10.3: Change in the distribution of hoverfly species in the UK, 1980 to 2016

Notes:
1. The line graph shows the unsmoothed composite indicator trend with variation around the line (shaded) within which we can be 90% confident that the true value lies (credible interval).
2. The figure in brackets shows the number of species in the index.
3. The bar chart shows the percentage of species within the indicator that have increased, decreased or shown no change in occupancy, based on set thresholds of change.
4. This indicator is not directly comparable with the previous publication because 14 additional species of hoverfly have been included across the entire time series, increasing the total number from 214 to 228.

Source: Hoverfly Recording Scheme; Biological Records Centre (supported by Centre for Ecology & Hydrology and Joint Nature Conservation Committee).

Relevance

Nature is essential for human health and well-being. Pollination is an important ecosystem service that benefits agricultural and horticultural production, and is essential for sustaining wild flowers. Bees and hoverflies are also popular insects and people enjoy seeing them in towns, cities and the wider countryside. Insect pollination depends on the abundance, distribution and diversity of pollinators. Knowledge of the population dynamics and distribution of those species that provide the service, the pollinators, helps us assess the risk to these values. Many wild bees and other insect pollinators have become less widespread, particularly those species associated with semi-natural habitats. At the same time, a smaller number of pollinating insects have become more widespread. This may have implications for the pollination service they provide to crops and wild flowers and is an area of active research (Potts et al., 2010; Garratt et al., 2014).

This indicator shows progress towards commitments to improve the status of our wildlife and habitats. It is relevant to outcomes 1 and 3 in Biodiversity 2020: A strategy for England’s wildlife and...


**Conservation on land and at sea** (see Annex A). It is also relevant to a number of international targets (see Annex B of the aforementioned publication for further details).

**Background**

Occupancy of pollinators refers to the overall area where each species is found and does not refer directly to their abundance. The reduction in the index shows that overall pollinators are becoming more restricted in their distributions so that on average, in any one place the diversity of pollinator species found is reduced.

The indicator is the average trend across all 365 species included in the analysis. Individual species within the indicator will have different time-series trends (i.e. some may be increasing while others may show strong declines). The shaded region on Figures 10.1, 10.2 and 10.3 is the 90% credible interval of the annual occupancy estimates and represents the statistical uncertainty surrounding the annual occupancy estimates. Credible intervals are similar to the confidence intervals used in parametric statistics, but are the appropriate metric to use with Bayesian statistics. Estimates will be revised as new data become available.

The Bayesian occupancy approach is an established analytical method that enables an estimation of species occurrence even though the data utilised in this indicator were collected without a standardised survey design (van Strien et al., 2013; Isaac et al., 2014). For each species, records were extracted at the 1km grid cell scale with day precision, and an annual time-series of the proportion of sites occupied was calculated. Each species-specific time-series was scaled so the first value in 1980 was set to 100. The annual index (the pollinator occupancy indicator) was estimated as the arithmetic mean of the scaled species-specific occupancy estimates. Each species was given equal weighting within the indicator. Uncertainty in the species-specific annual occupancy estimates is represented by the 90% credible intervals. See the technical background document and the Bayesian technical report for further detail on the production of this indicator.

As species become more or less widespread, individual grid squares will have richer (more species) or poorer (fewer species) pollinator communities; pollination services are generally likely to be higher where the pollinator community is richer (Vanbergen et al., 2013). The area occupied does not necessarily relate to pollinator abundance, as a species with one individual in each of 10 grid squares would receive the same occupancy score as a species with 100 individuals in each of the same grid squares, although generally, species with greater occupancy are likely to be more abundant. National level data on changes in abundance of pollinators is not currently available.

The short-term trends tend to have fewer species falling into the ‘stable’ category than the long-term trends. This is likely to be a result of the high level of short-term variation in invertebrate populations. The species-specific trends were calculated as the mean percentage change in occupancy per year, therefore across a 36-year period, the influence of short-term variation on the trend is reduced compared to its influence on a shorter 5-year period.

**Web links for further information**

<table>
<thead>
<tr>
<th>Reference</th>
<th>Title</th>
<th>Website</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bees, Wasps &amp; Ants Recording Society</td>
<td>BWARS homepage</td>
<td><a href="http://www.bwars.com/">http://www.bwars.com/</a></td>
</tr>
</tbody>
</table>
Conservation on land and at sea

<table>
<thead>
<tr>
<th>Reference</th>
<th>Title</th>
<th>Website</th>
</tr>
</thead>
<tbody>
<tr>
<td>Centre for Ecology &amp; Hydrology</td>
<td>Biological Records Centre homepage</td>
<td><a href="http://www.brc.ac.uk/">http://www.brc.ac.uk/</a></td>
</tr>
<tr>
<td>Hoverfly Recording Scheme</td>
<td>HRS homepage</td>
<td><a href="http://hoverfly.org.uk/portal.php">http://hoverfly.org.uk/portal.php</a></td>
</tr>
</tbody>
</table>

References


**Last updated:** September 2019

**Latest data:** 2016
11. Biodiversity and ecosystem services: marine

Type: State/benefit indicator

Fish size in the North-western North Sea

Since the previous publication additional data have been provided for the North Sea, Celtic sea, Irish Sea and Scottish Continental Shelf. The entire dataset has been revised, and updated to include all available years. The assessment value thresholds are specific to time periods and therefore change with any updates.

In 2017, large fish in the North Sea survey made up 12% of the weight of the fish community (Figure 11.1). This is approaching the value of 15% recorded in 1983 and shows a noticeable increase from a low of 2% in 2001. While there was a clear decline in the indicator from 1983 to 2001, there has been recovery since, and this pace of recovery accelerated after 2012.

Figure 11.1: Percentage of large fish (equal to or larger than 50 cm), by weight, in the North Sea, 1983 to 2017

Note: The line graph shows the unsmoothed trend (dashed line) and a LOESS smoothed trend (solid line) with the shaded area showing the 95% confidence intervals around the smoothed trend. The horizontal dotted line shows the assessment thresholds from OSPAR (2017). LOESS is a non-parametric regression method; it may be understood as standing for “LOcal regressIOn”.

Source: Centre for Environment, Fisheries and Aquaculture Science; Marine Scotland.

The indicator shows changes in the proportion, by weight, of large individuals equal to or over 50cm in length in demersal (bottom-dwelling) fish populations in the North Sea. Changes in the size structure of fish populations and communities reflect changes in the state of the fish community. Fluctuations in values between years are expected given inter-annual fluctuations in the distribution and abundance of North Sea fish populations and sampling variation.
North Sea fish community included cod (*Gadus morhua*), ling (*Molva molva*), haddock (*Melanogrammus aeglefinus*), saithe (*Pollachius virens*), anglerfish (*Lophius piscatorius*) and rays (*Batoidea*). Recently, lesser spotted dogfish (*Scyliorhinus canicula*), hake (*Merluccius merluccius*) and smoothhounds (*Mustelus* spp.) have also formed a substantial part of the large fish catches in the North Sea.

The measure for the North Sea is used as the main indicator because it is based on the largest dataset that includes an assessment target period (early 1980s), and it is supported by publications, and therefore provides the most reliable indicator of change.

Figure 11.1 presents the LOESS smoothed trend that is used to assess both long-term and short-term trends in the proportion of large individuals in North Sea fish populations.

**Indicator assessment**

<table>
<thead>
<tr>
<th>Fish size in the North-western North Sea</th>
<th>Long term</th>
<th>Short term</th>
<th>Latest year</th>
</tr>
</thead>
</table>

**Note:** The long-term and short-term assessments have been made by the Centre for Environment, Fisheries and Aquaculture Science (Cefas) by fitting a LOESS smoothed trend to the index (see the note section under Figure 11.1).

**Relevance**

Change in the relative abundance of large fishes is likely to affect marine ecosystems in several ways. Fewer large fish will reduce the amount of predation on smaller prey species and allow increases in their abundance and biomass. In turn, this will affect the structure and stability of the ecosystem. The indicator responds to fishing impacts on the fish community because larger fish are more likely to be caught by trawls, and because larger species of fish are more likely to decline in number for a given rate of fishing (Engelhard *et al*., 2015; Greenstreet *et al*., 2011, 2012). When fish communities are more heavily fished the proportion of large fish is expected to fall, and when fishing is reduced the proportion of large fish is expected to rise, albeit with a multi-year delay. Some variation in the proportion of large fish will be driven by environmental variation and, in the long-term, increases in temperature may lead to decreased body-size of demersal fish in the North Sea (Queirós *et al*., 2018). However, in the short term (over periods of a few years), environmental effects on this indicator are expected to be relatively small in relation to fishing effects.

The indicator is relevant to outcomes 2 and 2c in Biodiversity 2020: A strategy for England’s wildlife and ecosystem services (see Annex A). The indicator is also relevant to international goals and targets (see Annex B of the aforementioned publication).

**Background**

The indicator is compiled using methods based on those developed by the International Council for the Exploration of the Sea (ICES) for the analysis of International Bottom Trawl Survey data (ICES, 2007), and further developed for the OSPAR Intermediate Assessment 2017, and since updated (Greenstreet and Moriarty, 2017; Moriarty *et al*., 2017). Data on fish length are taken from the North Sea during the first quarter of each year. All fish are measured as part of the survey.

To compile the indicator, the proportions of fish greater than or equal to 50 cm are estimated by weight. The technical paper that accompanies this indicator outlines the background to the development of the Large Fish Index (LFI). The method involves additional averaging of catch densities across hauls within ICES rectangles, prior to summation of the large and total fish components for the LFI ratio calculation. In addition, corrections have been made to the underlying
data as part of an ongoing process to improve quality control. For these reasons, absolute values of the indicator differ slightly from those reported in previous years.

The background to this indicator previously included information from sub-divisional assessments within the North Sea, but current assessments are only available at regional sea level (Figure 11.2 and 11.3). From the previous extensive OSPAR assessment, 3 otter trawl surveys were selected to provide the key data for each regional sea area, considering the length of the time-series, spatial coverage and quality of data. These surveys are: the Scottish otter trawl survey in Quarter 1 for the Scottish Continental Shelf, the Northern Irish otter trawl survey in Quarter 1 for the Irish Sea, and the northern part of the French otter trawl survey in quarter 4 for the Celtic Sea.

Figure 11.2: Proportion of large fish (survey specific threshold for ‘large’ size), by weight, in the Scottish Continental Shelf (1983 to 2016), Irish Sea (1992 to 2016) and Celtic Sea (1997 to 2016)

Note: The line graphs show the unsmoothed trend (dashed lines) and a LOESS smoothed trend (solid lines) with the shaded areas showing the 95% confidence intervals around the smoothed trends. The horizontal dotted lines show the assessment thresholds from OSPAR (2017).

Source: Centre for Environment, Fisheries and Aquaculture Science; Marine Scotland.
Figure 11.3: Areas surveyed to generate the fish size class indicator for the seas around the UK: North Sea - dark grey, Scottish Continental Shelf – dark green, Irish Sea – yellow and Celtic Sea – dark blue

Source: Centre for Environment, Fisheries and Aquaculture Science.
Key findings for the 3 survey areas (see Figure 11.2) are:

**Scottish Continental Shelf**

In 2016, large fish (≥ 35 cm) made up approximately 33% of the weight of the surveyed demersal fish community. This was lower than the 42% observed in 1985 and lower than the 50% target, but there are signs of recovery in the data. While there was a clear decline in the indicator during the 1990s to 12% in 2002, the smoothed trend has shown increases with fluctuations since that time.

**Irish Sea**

In 2016, large fish (≥ 45 cm) made up approximately 10% of the weight of the surveyed demersal fish community. This was higher than the 7% in 1992, but lower than the high in 2014 of 17%. Although recovery was prominent until 2014, a subsequent fall was observed in 2015 and 2016. This fall is due to a rapid increase in the biomass of small fish, predominately whiting *Merlangus merlangus* that do not contribute to the large fish component. The surveyed biomass of large fish has, in fact, continued to increase since 2014 but at a slower rate than the biomass of small fish.

**Celtic Sea**

In 2016, large fish (≥ 40 cm) made up approximately 19% of the weight of the surveyed demersal fish community. This was slightly higher than the 16% recorded in 1997 but below the target of 46%, and lower than the 36% recorded in 2006. Although the long-term smoothed trend has been largely stable there was a fluctuation to higher values in the mid-2000s.

**Web links for further information**

<table>
<thead>
<tr>
<th>Organisation</th>
<th>Subject</th>
</tr>
</thead>
<tbody>
<tr>
<td>OSPAR Intermediate Assessment 2017</td>
<td>Proportion of large fish (large fish index)</td>
</tr>
<tr>
<td>International Council for the Exploration of the Sea</td>
<td>ICES home page</td>
</tr>
<tr>
<td>Defra Science</td>
<td>Cotter <em>et al.</em>, 2008. Development of a Marine Trophic Index for UK waters and recommendations for further indicator development. Project code: WC0604</td>
</tr>
</tbody>
</table>

**References**


**Last updated:** September 2019

**Latest data available:**

- Proportion of large fish by weight in the North Sea – 2017
- Proportion of large fish by weight in the Scottish Continental Shelf – 2016
- Proportion of large fish by weight in the Irish Sea – 2016
- Proportion of large fish by weight in the Celtic Sea – 2016
12a. Genetic resources for food and agriculture: animal genetic resources

Type: State / Benefit Indicator

Effective population size of Native Breeds at Risk in the UK

The average effective population size of the native breeds at risk included in this UK indicator:

- for pigs decreased from 176 in 2000 to 174 in 2013 and to 152 in 2018;
- for horses decreased from 178 in 2000 to 128 in 2013 and to 117 in 2018;
- for sheep increased from 245 in 2000 to 380 in 2013 and to 403 in 2018;
- for cattle increased from 88 in 2000 to 181 in 2013 and to 295 in 2018; and
- for goats the dataset starts in 2004 when it was 62, increasing to 80 in 2013 and increasing to 100 in 2018; prior to 2004, effective population size could only be calculated for one breed.

The average effective population sizes calculated between 2000 and 2018 for the native breeds at risk of goats, pigs, horses, sheep and cattle were each above 50, the figure set by the United Nations Food and Agriculture Organisation (FAO) as a threshold for concern. However, in 2018, of the Native Breeds at Risk, one breed of goat (Toggenburg), 3 breeds of horse (Cleveland Bay Horse, Eriskay Pony, and Suffolk Punch), and one breed of cattle (Vaynol), had a $N_e$ less than 50. No breeds of sheep or pig had effective population sizes below the threshold in 2018.

There has been no reported UK extinction of any breeds of pigs, horses, sheep, cattle or goats since 1973.

Indicator Description

Genetic diversity is an important component of biological diversity. Rare and native breeds of farm animals are part of our cultural heritage, are often associated with traditional land management required to conserve important habitats, and may have genetic traits of value to future agriculture.

The genetic diversity in UK breeds can be assessed by the effective population size ($N_e$), which accounts for the total number of animals in a population and the relative numbers of sires and dams (male and female parents). A low effective population size signifies a greater likelihood of in-breeding and risk of loss of genetic diversity.

This indicator shows the change in the average effective population sizes for breeds of goats, pigs, horses, sheep and cattle classified by the UK Farm Animal Genetic Resources Committee as Native Breeds at Risk (NBAR).
Figure 12a.1: Average effective population size ($N_e$) of Native Breeds at Risk in the UK, 2000 to 2018

Notes:

1. The number of breeds included in the indicator varies year by year as a result of data availability for both sires and dams (data for both are needed to calculate effective population size). The maximum number of breeds included in each measure is shown in brackets after the species name in the legend. The annual data collection for the 2018 data only relates to a third of the total breeds and these are for 4 goat breeds, 11 pig breeds, 13 horse breeds, 30 sheep breeds, and 18 cattle breeds. Further details of how many breeds are included in each year can be found in the technical background document and the datasheet.

2. Data for 2015, 2016 and 2017 in the previous publication of this indicator was provisional. However, two-thirds of the breeds data has now been collected through the 3-yearly survey in October 2018. Data for 2018 are provisional, hence the last part of the lines are showed as ‘dashed’. It is expected that the 2018 data can be confirmed in late 2021 when the next triennial exercise has taken place.

3. Based on data in the UK Farm Animal Genetic Resources Breed Inventory published on 8 May 2019.

4. Historic data for some breeds have been revised. As a result, this indicator is not directly comparable with the previous publication. The Breed Inventory Results published on 8 May 2019 can be accessed through the following link: [https://www.gov.uk/government/statistics/uk-farm-animal-genetic-resources-fangr-breed-inventory-results](https://www.gov.uk/government/statistics/uk-farm-animal-genetic-resources-fangr-breed-inventory-results). The Excel dataset provides information on revisions.

5. The dotted black line shows effective population size ($N_e$) equal to 50; the level set by the United Nations Food and Agriculture Organisation as a threshold for concern. The dark grey line is an average of all 86 Native Breeds at Risk for which $N_e$ could be calculated; this is included to provide context but is not assessed.

Source: British Pig Association, Defra, Grassroots Systems Ltd., Rare Breeds Survival Trust, and participating breed societies.
Indicator assessment

<table>
<thead>
<tr>
<th>Native Breeds at Risk</th>
<th>Long term</th>
<th>Short term</th>
<th>Latest year</th>
</tr>
</thead>
</table>

Note: Long and short-term assessments are based on a 5% rule of thumb. The base years for these assessments use a 3-year average. See Assessing Indicators.

Further detail

The indicator shows the change in the average effective population sizes (N_e) for breeds of goats, pigs, horses, sheep and cattle classified by the UK Farm Animal Genetic Resources Committee as Native Breeds at Risk (NBAR). The UK Farm Animal Genetic Resources (FAnGR) Committee breed inventory was first published in 2014 with information for pigs, goats and horses, and was expanded in 2015 to include sheep and cattle.

In the inventory published in 2019, all 5 native breeds of goats, all 11 native breeds of pigs, 14 of 19 native horse breeds, 46 of 59 native sheep breeds, and 26 of 34 native cattle breeds were classified as NBAR (for definitions of native breeds, and native breeds at risk, see Appendix 1 of the UK Country Report on Farm Animal Genetic Resources 2012).

For goats and pigs, data to calculate effective population size is available for all years for all breeds included in the indicator (from 2004 to 2018 for 4 goat breeds, and from 2000 to 2018 for 11 pig breeds). However, for horses, sheep and cattle, the number of breeds contributing to the indicator increases over time as more data becomes available (for details see the technical document).

Data in the inventory are sourced from individual breed society records. As all pedigree animals need to be registered with their respective society to receive their pedigree certificate, the breed society records are comprehensive. To maximise efficiency in data collection, central database suppliers who maintain the breed society databases supply the data to the Defra Farm Animal Genetic Resources team. Breed societies have given their permission for these companies to supply the data every year for this exercise. In addition, data for additional breeds is collected from individual breed societies on a 3-yearly basis, the latest in October 2018. The most recent triennial exercise collected data for two thirds of the breeds for 2015, 2016 and 2017, so for some breeds there are missing values for these three years and the most recent year. It is anticipated that the next triennial exercise will be in late 2021, and will collect new data for the years 2018, 2019 and 2020.

Effective population size is a calculation which takes account of the total number of animals in a population and the relative number of sires and dams (male and female parents). A low effective
population size signifies a greater likelihood of in-breeding and risk of loss of genetic diversity. A larger effective population size implies a lower risk of inbreeding and higher genetic diversity.

The assessment of change for the indicator was made by applying a 5% rule of thumb. The arithmetic mean of the first 3 years of the data series for each species was compared with the last point to determine the assessment for the long-term trend, and an arithmetic mean of the year 5 years back in the time series and the year either side calculated to compare with the last point to assess the short-term trend. A 5% rule of thumb was chosen to recognise the human element in the choice of which sires breed with which dams (which is not random for non-feral breeds), and because this level has already been chosen by the Rare Breeds Survival Trust to identify changes from the previous year’s Watchlist publication. It should be noted that single year variations in the measures are not hugely meaningful, due to the human element in which sires breed with which dams.

The FAO recommends a minimum effective population size ($N_e$) of at least 50 individuals to reduce the rate of inbreeding to less than 1% and ensure the long-term survival of a breed. Figure 12a.1 shows that, on average, all 5 species have $N_e$ greater than 50. However, examination of the data for the individual breeds (Figure 12a.2) reveals that there are a small number of breeds with $N_e$ less than 50 in many years. The breeds which are represented in Figure 12a.2 may change from year to year; see the downloadable datasheet for details. In 2018, one breed of goat (Toggenburg), 3 breeds of horse (Cleveland Bay Horse, Eriskay Pony, and Suffolk Punch), and one breed of cattle (Vaynol), had a $N_e$ less than 50. No breeds of sheep or pig had effective population sizes below the threshold in 2018.

**Pigs**

No NBAR pig breeds have had an $N_e$<50 since 2004. There was a dip in pig numbers in 2001 as a result of foot and mouth disease, and a peak in 2007 as a result of breeding for export. Four pig breeds have increased in $N_e$ since 2000 (the biggest increase was for Oxford Sandy and Black), 5 breeds have remained stable and 2 breeds have decreased – Landrace from 651 in 2000 to 102 in 2018 and Large White from 907 in 2000 to 243 in 2018.

**Horses**

Ten of the 14 horse breeds in the indicator have had declines in $N_e$, and this is why the assessment for horses is a decrease for both the short and long term. The Eriskay pony has had an effective population size of less than 50 each year since 2000 with the $N_e$ for 2016 and 2018 being 4. Since 2001 when it joined the indicator, the Suffolk Punch has had an $N_e$ of less than 50 every year but one (2009, when the value was 53). The $N_e$ for New Forest Pony has declined from 716 in 2000 to 309 in 2018. The $N_e$ for Shetland ponies continued to fall from 4,048 in 2005 to 1,789 in 2018. The $N_e$ for Clydesdale Horse increased from 119 in 2002 to 174 in 2018, an increase of 46%. The $N_e$ for British Percheron/Percheron, for which there are only 6 years’ worth of data (2012 to 2017), has an effective population size range of between 18 and 22.

**Sheep**

As with pigs, there was a dip in numbers for sheep breeds in 2001 as a result of foot and mouth disease. The time series for these breeds varies in length; of the 25 breeds with at least 10 years of data, 18 breeds have had an increase in $N_e$ (for example, Boreray, Shropshire, Hebridean, and Castlemilk Moorit) and 5 a decrease (Black Welsh Mountain, Border Leicester, Cotswold, Manx Loaghtan and Whitefaced Woodland), with 2 breeds stable (Llanwenog a 1% decrease and Norfolk Horn a 5% increase). There has been a strong increase in the $N_e$ for Boreray, from a low of 15 in 2001 to 182 in 2018. There are 6 years of data (2012 to 2017) for Cambridge, but $N_e$ is low (ranging between 34 and 42) for all 6 years.
**Cattle**

As with sheep, the time series for the cattle breeds contributing to the indicator varies in length. Of the 16 breeds with at least 10 years of data, 14 have increased (for example, Belted Galloway and Lincoln Red including Lincoln Red (Original), and one breed has decreased (Galloway) with the remaining breed (British White) stable (less than a 5% change). The effective population size of Vaynol has been in single figures since it was included in the indicator in 2008 apart from 2016 where it was 10 and in 2017 it was 13. The effective population size of Chillingham for which there are only 3 years data (2012 to 2014) is 3 for each of those years.

**Goats**

The average $N_e$ of the 4 goat breeds in the indicator is above 50, and has increased in the short term. Three of the 4 breeds increased. Bagot increased in $N_e$ from 48 in 2000 to 129 in 2018. Golden Guernsey increased in $N_e$ from 196 in 2004 to 283 in 2018. Saanen increased in $N_e$ from 43 in 2004 to 56 in 2018. Toggenburg has remained stable.

*Figure 12a.2: Number of NBAR breeds in the UK with $N_e < 50$ within the overall trends, 2000 to 2018*
Relevance

Genetic diversity is an important component of biodiversity. The UK genetic diversity indicator focuses on the diversity of Native Breeds at Risk of a number of farm animal species (cattle, sheep, goats, horses and pigs). Genetic diversity in livestock breeds is important for a number of reasons. Aside from their cultural importance, local adaptation and links to breed specific products, native or rare livestock breeds provide a resource from which to develop new breeds or improve existing breeds.

UK farm animal genetic resource is a key asset in economic, environmental, social and cultural terms. Native breeds of farm animals are often associated with traditional land management required to conserve important habitats. The indicator is relevant to the commitments on conservation of native breeds in the UK National Action Plan on Farm Animal Genetic Resources (FAnGR).

The indicator is also relevant to outcome 3 in *Biodiversity 2020: A strategy for England’s wildlife and ecosystem services* and a number of international targets (see Annex A and B of the aforementioned publication).

Background

The UK is home to some of the richest and most diverse farm animal genetic resources in the world, with approximately 700 breeds including cattle, sheep, goats, pigs, horses and ponies and poultry; the UK contains more than 9% of the total of global livestock breeds. There are some 200 native breeds according to the definition adopted by the UK Farm Animal Genetic Resources (FAnGR) Committee, the majority of which are considered to be “at risk”. A list of known breeds in the UK is given in Appendix 2 of the 2012 UK Country Report on Farm Animal Genetic Resources and in the Annex of the 2010 Poultry in the UK report. Defra and its FAnGR Committee monitor the status of UK breeds to determine if they are native, exotic, at risk or not; and ensure that eligible species/breeds:

- Are offered potential protection in an outbreak of an exotic disease (as far as possible within the constraints of controlling the disease).
- Have potential access to a grazing supplement under agri-environment schemes.

Many of the UK’s habitats that are now valued for their biodiversity were created by, or for, farm animals. These habitats include various types of upland and lowland grasslands and heathlands, hay meadows and pasture-woodlands. Other habitats, such as sand dunes, salt marshes and even woodlands may also benefit from light grazing. If these habitats are not grazed they may lose their special conservation value as they become invaded and eventually dominated by scrub and trees through the process of ecological succession.

Although it is not possible to measure the genetic variation in all traits of interest, the average rate of loss in genetic variation can be estimated, since this rate can be described by calculating the ‘effective population size’.

The UK Farm Animal Genetic Resources (FAnGR) Breed Inventory is an electronic monitoring system. It was first published by Defra in July 2014 and updated annually since then. The monitoring system contains data on the status and trends in the domestic pig, goat, horse, sheep and cattle farm animal genetic resources with continuous data from 2000 to 2018 for around 100 breeds which are present in the UK.

Defra and the Farm Animal Genetic Resources Committee will continue to monitor populations of UK livestock breeds regularly; the list of Breeds considered to be at Risk is kept under annual
review using the monitoring data collected, with Breeds at risk potentially eligible for protection in an outbreak of an exotic disease (within the constraints of controlling the disease).

The number of cattle breeds included in the indicator has fallen in 2018 ([results published on 8 May 2019]) due to some breeds no longer being present and or merged with another breed in the Inventory. Both Guernsey (Island) and Jersey (Island) are no longer present in the Inventory because the FAnGR committee decided they are genetically the same as the non-Island variety and therefore provide the same information. There are issues with the breed Shorthorn and therefore Defra no longer recognise this as a breed. Lincoln Red (original population) has been merged and is now part of the all Lincoln Red cattle breed.

**Supplementary information from the Rare Breeds Survival Trust Watchlist**

The Rare Breeds Survival Trust (RBST) works to conserve and protect the United Kingdom’s rare native breeds of farm animals from extinction as a resource for future generations and for the benefit of agriculture. Between 1900 and 1973, the United Kingdom lost 26 of its native breeds. This was caused by changing farming methods and a much more intensive approach to food production. Since the formation of the Trust in 1973 no other native livestock breed has become extinct in the UK.

The RBST publishes an annual watchlist, which highlights changes in breed population trends. The watchlist is divided into 6 categories: Critical; Endangered; Vulnerable; At Risk; Minority; and Other Native Breeds. Breeds are placed into categories based on species and the total number of registered breeding females in the United Kingdom. Population genetic factors (such as inbreeding and genetic erosion) and current trends in breed density and distribution (geographical concentration in a small area) can mean a breed will be vulnerable to disease outbreaks. These factors are also included in making assessments of status.

Within categories 1 to 5, the 2019-20 watchlist includes 25 breeds of sheep, 14 cattle, 11 pigs, 2 goats and 12 horse breeds. Of these, 21 breeds of sheep, 13 breeds of cattle, all 11 breeds of pig, both goats, and all 12 breeds of horse are included in the indicator. For those which are not included, the reason is that there are no data in the inventory for one or both of the number of dams or sires, so effective population size cannot be calculated.

**Web links for further information**

<table>
<thead>
<tr>
<th>Reference</th>
<th>Title</th>
<th>Website</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reference</td>
<td>Title</td>
<td>Website</td>
</tr>
<tr>
<td>---------------------------------</td>
<td>-----------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------</td>
</tr>
<tr>
<td>European Farm Animal Biodiversity Information System (EFABIS)</td>
<td>UK page</td>
<td><a href="http://efabis.vet.agri.ee/">http://efabis.vet.agri.ee/</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Note: Statistical data in the UK EFABIS database is automatically carried over to the clone database systems at the European level and global levels.</td>
</tr>
<tr>
<td>Rare Breeds Survival Trust</td>
<td>Rare Breeds Survival Trust Watchlist</td>
<td><a href="https://www.rbst.org.uk/rbst-watchlist">https://www.rbst.org.uk/rbst-watchlist</a></td>
</tr>
</tbody>
</table>

**Last updated:** September 2019  
**Latest data:** 2018
12b. Genetic resources for food and agriculture: plant genetic resources

Type: State / Benefits Indicator

No update since previous publication.

UK Enrichment Index

There was a 15% increase in the Enrichment Index between 2013 and 2018. A rapid rise in the Enrichment Index since 2000 can be attributed to a concerted collection effort by the Millennium Seed Bank.

There is considerable annual variability in the number of new accessions into UK germplasm collections. The total number of accessions has risen since 1960, totalling 93,786 accessions by June 2018.

Figure 12b.1: Cumulative Enrichment Index of plant genetic resource collections held in the UK and annual number of accessions into UK germplasm collections, 1960 to 2018

Notes:

1. Data was obtained from EURISCO, which collates information across Europe from national germplasm collections, including the UK National Inventory of Plant Genetic Resources. The UK National Inventory includes food crop genetic resources such as crops, forages, wild and weedy species (including crop wild relatives), medicinal and ornamental plants, but does not include forest genetic resources.

2. The UK 2018 update of EURISCO includes information which had previously not been submitted as a result of improvements within the holding institutes to catalogue their holdings. The indicator is therefore not directly comparable with the versions previously published.
**Conservation on land and at sea**

*Source:* EURISCO Catalogue [http://eurisco.ipk-gatersleben.de/apex/f?p=103:1](http://eurisco.ipk-gatersleben.de/apex/f?p=103:1); date of data download 7 June 2018; based on UK contributions from: Genetic Resources Unit, Aberystwyth; Heritage Seed Library, Garden Organic; Commonwealth Potato Collection, The James Hutton Institute; Germplasm Resources Unit, John Innes Centre; Nottingham Arabidopsis Stock Centre; Millennium Seed Bank Partnership; Science and Advice for Scottish Agriculture, Scottish Government; Warwick Crop Centre, Genetic Resources Unit.

### Indicator assessment

| Assessment of change in status of ex situ conservation of cultivated plants and their wild relatives in the UK |
|-------------------------------------------------|-------------------|-------------------|

*Note:* Long and short-term assessments are based on a 3% rule of thumb. The base years for these assessments use a 3-year average. See [Assessing Indicators](#).

### Indicator description

- Genetic diversity is an important component of biological diversity. The genetic diversity of UK plant resources includes domesticated plants and their wild relatives, as well as socio-economically and culturally valuable plant species. These encompass plants grown in a farming or horticultural setting, or both, as well as commercial cultivars, landraces and traditional varieties and their wild relatives.

- *Ex situ* conservation of cultivated plants and their wild relatives is one method used to preserve genetic diversity. In the context of this indicator, the term *ex situ* means off-site conservation of genetic material.

- The Enrichment Index is a proxy measure of genetic diversity based upon the assumption that genetic diversity increases (to a greater or lesser extent) with originality of accessions, which is estimated based on: the number of species collected; the number of accessions collected; the number of countries collected from; and the area from which collection took place.

- As a result of discussions in the UK Plant Genetic Resources Group, a revised indicator is being considered; this was not available for 2018 or the 2019 publication, but it is hoped that a new indicator will be available for the 2020 publication.

The indicator presents the genetic diversity of cultivated plants and their wild relatives in the UK, including other socio-economically and culturally valuable plant species, by assessing the genetic diversity of target plants held in UK germplasm collections. Effectively, it is a measure of the status of *ex situ* conservation of cultivated plants and their wild relatives in the UK. Any plant which grows in or is cultivated in the UK, or has been grown in or has been cultivated in the UK, could be included in the indicator.

The indicator is based on an Enrichment Index developed by the United Nations Food and Agriculture Organisation (FAO, 2010a&b) to describe the enhancement of *ex situ* plant germplasm collections. The method factors in duplication and similarity to existing accessions. An upward trending line indicates diversity is being added to collections – the steeper the line, the greater the diversity being incorporated. A horizontal line indicates no accessions, and hence no diversity, being added, and a downward trending line indicates diversity is being lost from collections. The total number of accessions illustrates the yearly collection effort added to the genetic resources institutes, without taking into account genetic diversity within those collections.

---

6 Not all accessions of target species are included in the Enrichment Index, as some were excluded due to poor or insufficient data. Full calculation procedures are provided in the technical background paper.
Data were obtained from EURISCO, which collates information across Europe from national germplasm collections, including the UK National Inventory of Plant Genetic Resources. The UK National Inventory includes food crop genetic resources such as crops, forages, wild and weedy species (including crop wild relatives), medicinal and ornamental plants, but does not include forest genetic resources. Cultivars, landraces, farmers’ varieties, breeding lines, genetic stocks and research material are also included (EURISCO 2013). The method of calculating the Enrichment Index almost exclusively tracks the content of the Millennium Seed Bank (MSB) figures as that is where the highest additions to taxon diversity are coming from.

EURISCO data (http://eurisco.ipk-gatersleben.de/apex/f?p=103:1:) is freely accessible, and provides accession-level information on germplasm maintained in *ex situ* plant collections in Europe. The last UK update to EURISCO was on 5 June 2018. The EURISCO database only displays current holdings of collections, so is a snapshot in time. Any accessions which are removed from collections, for example as a result of reduced viability, will therefore not show after an update of EURISCO has taken place, and therefore will not be included in a future download of data. The UK 2018 update of EURISCO included information which had previously not been submitted as a result of improvements within the holding institutes to catalogue their holdings. The indicator is therefore not directly comparable with the versions previously published.

The arithmetic mean of the first 3 years of the data series was compared with the most recent data point to determine the assessment for the long-term trend, and the arithmetic mean of the data 5 years back in the time series and the year to either side was compared with the most recent data point in order to assess the short-term trend.

**Relevance**

The UK is relatively rich in wild relatives of crops, landraces of cereal, vegetable and fruit crops, and traditional orchard trees. Maintaining genetic diversity of UK plants is important for conservation of biological diversity, as well as for economic and cultural reasons. The UK is a Party to the International Treaty on Plant Genetic Resources for Food and Agriculture, and has also committed to a five-point action plan in response to the Foresight (2011) report on the future of food and farming (Environmental Audit Committee 2011) which includes actions on conserving plant genetic resources.

The indicator is also relevant to outcome 3 in *Biodiversity 2020: A strategy for England’s wildlife and ecosystem services* and a number of international targets (see Annex A and B of the aforementioned publication).

**Background**

Defra funds a number of plant genebanks which conserve and provide access to a variety of plant genetic material, and aims to further increase the accessibility to and utilisation of these genebanks in the future, as well as making use of new genomic technologies. Supporting genebanks helps ensure the UK meets its international agreements to protect important crops and safeguard global food security.

The National Fruit Collection at Brogdale in Kent is curated and maintained by the University of Reading. It is one of the largest fruit collections in the world with over 3,500 varieties of named apple, pear, plum, cherry, bush fruit, vine and cob nut cultivars. Unlike other genebanks where plant genetic material is stored as seeds, the National Fruit Collection is a live collection of plants open to the public as a visitor attraction.

The UK Vegetable Genebank is held at the University of Warwick. It manages a collection of around 14,000 samples of vegetable crops, stored as frozen seeds. The genebank supplies materials to plant breeders, researchers and growers, as well as Genetic Improvement Networks (supported by Defra) which facilitate the transfer of genetic variations from collections of plant genetic resources into new varieties.
The pea collection at the John Innes Centre comprises over 3,500 accessions of wild and semi-cultivated material.

EURISCO means 'I find' in ancient Greek. It was developed as a catalogue of information on plant genetic resources maintained *ex situ* in Europe through a European Union Fifth Framework Programme project. EURISCO was publicly launched in September 2003. It is intended to be regularly updated from National Inventories of plant genetic resources and to be easily accessible via the internet.

The number of accessions (germplasm samples) per taxon is often used as a proxy for the level of genetic diversity in *ex situ* germplasm collections taking into account the threat of losing reference material through reduced seed viability. However, the Enrichment Index provides a better reflection of genetic diversity held in gene banks than the number of accessions as reduced weight is given to samples of taxa already present in the collection, particularly those originating from the same country.

It is assumed that there are positive relationships between the level of genetic diversity and the:

- number of accessions held;
- number of taxa held; and
- geographical distribution of collection sites.

The Enrichment Index first identifies duplicate accessions, i.e. samples belonging to the same taxon with the same collection date and country of origin. Each subsequent duplication is given a reduced weight. For each taxon present, the number of samples is weighted, with accessions from the same country of origin being given a reduced weight depending on the land area of the country of origin (duplicates from smaller countries of origin are given less weight than those from larger countries of origin). The weights of the accessions are compared with those of preceding years and summed to produce an assessment of the genetic diversity present in the collections each year.

The Index is a valuable method for assessing the efforts made to conserve genetic diversity of target plants through *ex situ* storage. However, the following points should be taken into consideration when interpreting it:

- The indicator does not assess the effectiveness of conservation in the field and therefore overlooks the importance of *in situ* conservation (i.e. conserving genetic diversity in the wild), which not only includes species but also the habitats in which they live.
- The indicator makes the assumption that the number of accessions per taxon is positively related to the level of genetic diversity stored *ex situ*. However, this relationship may not always exist, particularly for commercial cultivars, since many cultivars are bred for the same market and hence are phenotypically and probably genetically very similar. Crop wild relative populations are considered to contain far more genetic diversity than crops themselves (Hopkins and Maxted, 2010). Without detailed investigation it is difficult to assess how much genetic variation is present in a collection.
- The indicator focuses on *ex situ* conservation in germplasm collections, which will represent only a small proportion of the total genetic diversity of UK crops and their wild relatives. The EURISCO catalogue is the most comprehensive database available, containing more than half of the *ex situ* accessions maintained in Europe (EURISCO 2012). However, it is not a comprehensive data set for the UK.
- Not all genetic resource collections are stored as seed. For example, the National Fruit Collection (NFC) of more than 3,900 named apple, pear, plum, cherry, bush fruit, vine and cob nut cultivars owned by Defra is kept as a field collection. Consequently, a value for country of origin is often not available and, due to a requirement for this by the Enrichment Index in use these are underrepresented.
- The genetic diversity of crop wild relatives is expected to be higher than for cultivated plants. Ideally a separate enrichment index would be produced separately for cultivated plants and...
crop wild relatives. However, it is not possible to determine in every case whether an accession is wild sourced or from a cultivated stock, so the indicator currently considers them together. A consequence of this is that the indicator potentially underrepresents the crop based genetic resource collections.

- Wild relatives of cultivated plants are those falling within taxon groups 1 to 3 as defined in the taxon group concept (Maxted et al., 2006). In this indicator, a slightly broader scope based on genus of the taxa is used, as within the taxon group concept, groups 1 to 3 go to subgenus (which would add to the complexity of filtering the results downloaded from EURISCO).

Plant Heritage’s National Plant Collections contain, among other internationally significant socio-economically and culturally valuable resource, 2,395 taxa in 7 Annex 1 genera across 14 locations (Plant Heritage 2018). In the past year these increased by 512 taxa at 3 locations newly registered within the scheme.

Unpublished data (2011 to 2018) held within Plant Heritage’s Threatened Plants Project (Seymour 2012) and publicly available data additional shows that 9,000 relevant taxa in 54 genera are held across 185 other locations throughout the UK, including significant holdings by the National Trust and National Trust for Scotland, the Royal Horticultural Society, national, university and other botanic gardens and arboreta, the Sir Harold Hillier Gardens and the Eden Project.

Figure 12b.2 shows the number of accessions per year contributing to the Enrichment Index by a number of UK holding institutes. Note that accessions which do not have full information available (see technical document for details) for calculation of the Enrichment Index have been filtered out in advance of production of these figures.

Figure 12b.2: Number of accessions added per year at selected UK holding institutes, 1960 to 2018

---

Conservation on land and at sea

Source: EURISCO Catalogue http://eurisco.ipk-gatersleben.de/apex/f?p=103:1; date of data download 7 June 2018; based on UK contributions from: Genetic Resources Unit, Aberystwyth; Heritage Seed Library, Garden Organic; Commonwealth Potato Collection, The James Hutton Institute; Germplasm Resources Unit, John Innes Centre; Nottingham Arabidopsis Stock Centre; Millennium Seed Bank Partnership; Science and Advice for Scottish Agriculture, Scottish Government; Warwick Crop Centre, Genetic Resources Unit.

There are 2 significant developments captured in Figure 12b.2. Chronologically, the first is the development of the collections represented by the Department of Applied Genetics, John Innes Centre. This represents amalgamation of older working collections from a wide range of institutes and industry into the first custom built seed store facility based formerly at the Plant Breeding Institute in 1978 and their move to a newer facility at the John Innes Centre in 1990. The rate of accessions added since 1990 has been consistently at a lower level. The second relates to the development of the Millennium Seed Bank (MSB), which now holds samples of nearly all UK seed-bearing plants. Non MSB institutes are less likely to contribute significantly to the Enrichment Index as these institutes are more focused on diversity within a taxon; which the index is weighted against.

Supplementary data on the Millennium Seed Bank

This section provides supplementary information of the conservation of plant resources in the Millennium Seed Bank project managed by the Royal Botanic Gardens, Kew. The Millennium Seed Bank (MSB) is one of the largest ex situ conservation projects in the World. It aims to collect seeds, herbarium specimens and data from species worldwide, including the entire UK seed-bearing flora, and to conserve these collections to international standards. These include the rarest, most threatened and most useful species.

The MSB already holds seeds from species thought to be extinct in the wild. In addition, seed banks provide a controlled source of plant material for research, education and public awareness.

The MSB manages an active UK seed banking programme. The current strategy is to maintain, augment and improve the UK collections held in the MSB, to make them more genetically comprehensive and of sufficient number to be of use for UK science and conservation.

The UK Flora Project seeks to add to the MSB UK species which are currently missing, particularly targeting rare and threatened species which may be confined to just a handful of isolated locations. In addition, new provenance collections for species already banked at the MSB, for which better geographic coverage and hence genetic diversity are required are being sought.

The MSB is also leading a new initiative, the UK National Tree Seed Project, which undertakes in-depth sampling of the UK woody flora. For each target species multi-provenance seed collections are being made from right across its UK distribution. In many cases seeds from individual trees are being stored separately. These seeds will be available to research organisations working on solutions to the threats facing UK trees, such as the control of pests and diseases and to help foresters and conservationists develop woodland more resilient to environmental change.

Kew's UK Native Seed Hub aims to increase the quality, quantity and diversity of native plants and seeds available for conservation and habitat restoration by providing high quality UK native plant material. The initiative supplies seeds and plugs, with a focus on species which are not easily available through commercial native seed suppliers, and supports other UK native seed and plant producers and conservation organisations.

Figure 12b.3 shows the number of distinct geographic areas (hectads) from which collections of threatened seed-bearing plants have been made across the UK. A hectad is an area of 10km x 10km. Threatened seed-bearing plants are those listed as critically endangered, endangered or vulnerable in the Great Britain Vascular Plant Red List (PDF, 950kb). This is a measure of the conservation of genetic diversity of UK threatened species because the greater the number of hectads, the wider the sampling area and the more likely it is that the total sample contains greater genetic diversity. The number of sampled hectads almost doubled between 1995 and 2000 as a
result of a lot of collecting effort in the run-up to the millennium, and has subsequently increased by 24% since 2010.

**Figure 12b.3: Number of species from around the world conserved in the Millennium Seed Bank, 2001 to 2017**

Notes: Data up to 1 March 2018.
Source: Royal Botanic Gardens, Kew.

**Figure 12b.4: Number of UK Seed Collections in the Millennium Seed Bank, 1995 to 2017**

Notes: Data up to 1 March 2018.
Source: Royal Botanic Gardens, Kew.

Seed collections representing 96% of the UK’s currently known circa 1,300 native, orthodox, seed-bearing species (excluding microspecies) are stored at the Millennium Seed Bank. The total number
of UK seed collections in the Millennium Seed Bank is 7,434 collections, as shown in Figure 12b.4. Seeds are collected according to a written protocol that ensures a representative sample is taken from each site (see the Seed Collection Manual (PDF, 250kb)).

The UK native seed conservation network consists of a range of organisations and private individuals. Through this network, Kew is actively engaged in UK conservation activities. A tangible result is increased awareness of seed banking and use of high quality seed collections from priority species. Longstanding links exist with Natural England, the Botanical Society of Britain and Ireland, the Royal Botanic Garden Edinburgh, the Forestry Commission, Plantlife, the Wildlife Trusts, the National Trust and local authorities.

The MSB UK Programme makes a significant contribution to the achievement of Target 8 of the Global Strategy for Plant Conservation targets for the UK: At least 75% of threatened plant species in ex-situ collections, preferably in the country of origin, and at least 20% available for recovery and restoration programmes. 87% of UK threatened species, defined as critically endangered, endangered, or vulnerable flowering plant and conifer species as listed on the Great Britain Vascular Plant Red Data List (excluding hybrids and microspecies), are conserved as seed collections in the MSB with 44% available for use.

Web links for further information

<table>
<thead>
<tr>
<th>Reference</th>
<th>Title</th>
<th>Website</th>
</tr>
</thead>
<tbody>
<tr>
<td>UK National Plant Inventory</td>
<td>Summary Statistics</td>
<td><a href="https://www.google.com/fusiontables/DataSource?docid=1WYDRRhsRq2oAe6jhB4rV4c1eRc1yMzlhcCCUp7s#chartnew:id=8">https://www.google.com/fusiontables/DataSource?docid=1WYDRRhsRq2oAe6jhB4rV4c1eRc1yMzlhcCCUp7s#chartnew:id=8</a> (this link will not work unless it is pasted directly into the browser window)</td>
</tr>
<tr>
<td>Commonwealth Potato Collection, The James Hutton Institute</td>
<td>Home page</td>
<td><a href="https://ics.hutton.ac.uk/germinate-cpc/#home">https://ics.hutton.ac.uk/germinate-cpc/#home</a></td>
</tr>
<tr>
<td>Genetic Resources Unit, Institute of Biological Environmental &amp; Rural Sciences, Aberystwyth University</td>
<td>Home page</td>
<td><a href="https://www.aber.ac.uk/en/ibers/">https://www.aber.ac.uk/en/ibers/</a></td>
</tr>
</tbody>
</table>
Conservation on land and at sea

<table>
<thead>
<tr>
<th>Reference</th>
<th>Title</th>
<th>Website</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nottingham Arabidopsis Stock Centre</td>
<td>Home page</td>
<td><a href="http://arabidopsis.info/">http://arabidopsis.info/</a></td>
</tr>
<tr>
<td>John Innes Centre</td>
<td>Germplasm Resources Unit</td>
<td>Germplasm Resource Unit</td>
</tr>
<tr>
<td>University of Reading</td>
<td>National Fruit Collection</td>
<td><a href="http://www.nationalfruitcollection.org.uk/">http://www.nationalfruitcollection.org.uk/</a></td>
</tr>
<tr>
<td>Science and Advice for Scottish Agriculture, Scottish Government</td>
<td>Home page</td>
<td><a href="http://www.sasa.gov.uk/">http://www.sasa.gov.uk/</a></td>
</tr>
<tr>
<td>Warwick Crop Centre, Genetic Resources Unit</td>
<td>Home page</td>
<td><a href="http://www2.warwick.ac.uk/fac/sci/lifesci/wcc/gru">http://www2.warwick.ac.uk/fac/sci/lifesci/wcc/gru</a></td>
</tr>
<tr>
<td>Joint Nature Conservation Committee</td>
<td>Vascular Plant Red List</td>
<td><a href="http://jncc.defra.gov.uk/PDF/pub05_speciesstatus_vpredlist3_web.pdf">http://jncc.defra.gov.uk/PDF/pub05_speciesstatus_vpredlist3_web.pdf</a> (PDF, 950kb)</td>
</tr>
<tr>
<td>Convention on Biological Diversity</td>
<td>Global Strategy for Plant Conservation</td>
<td><a href="https://www.cbd.int/gspc/">https://www.cbd.int/gspc/</a></td>
</tr>
</tbody>
</table>

References


Conservation on land and at sea


Last updated: July 2018

Latest data available: Enrichment Index – June 2018; Millennium Seed Bank – December 2018.
13. Awareness, understanding and support for conservation

Type: Response indicator

This indicator could not be updated in time for the 2019 publication (published 5 September 2019) as there was an inconsistency which needed investigation. This has now been resolved and the resulting changes have affected the ‘not aware’ and ‘some engagement’ categories. An error was discovered in the method used to assign records to one of the 5 discrete groups; not all of the responses were being accounted for, in particular some of those relating to the ‘day to day’ actions to support and protect biodiversity.

Figure 13.1: Public engagement with biodiversity loss: awareness, concern and action, 2014 and 2017

Notes:
1. Groups are defined as: ‘not aware’; ‘not engaged’; ‘some engagement’; and ‘high engagement’, according to responses to survey questions described in the background section below.
2. The results of this indicator differ from the indicator published in the Monitor of Engagement with the Natural Environment by Natural England as the latter relates to levels of awareness and concern rather than awareness and engagement.

Source: Monitor of Engagement with the Natural Environment Survey (MENE), (Natural England).

In 2017, 9% of people in England were highly engaged with the issue of biodiversity loss compared with 5% in 2014. These are people who are aware of the threat to biodiversity in England, are concerned about the loss of biodiversity and take actions to support and protect biodiversity, including some actions requiring higher effort.
In 2017, 45% of people in England showed some engagement with the issue of biodiversity loss; no change from 2014. These are people who are aware of the threat to biodiversity in England, are concerned about the loss of biodiversity and take some ‘day-to-day’ actions to support and protect biodiversity. In 2017, 10% of people were aware of the threat to biodiversity but not concerned about it compared with 12% in 2014. In 2017, 35% of survey respondents stated that they were not aware of the threat to biodiversity in England compared with 38% in 2014.

Indicator assessment

<table>
<thead>
<tr>
<th>Assessment of change in the percentage of people highly engaged with the issue of biodiversity loss</th>
<th>Long term</th>
<th>Short term</th>
<th>Latest year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage of people highly engaged</td>
<td>☐ ☐</td>
<td>☐ ☐ ☐</td>
<td>Not assessed</td>
</tr>
</tbody>
</table>

Note: There are currently insufficient data points available for this indicator to carry out any assessments. See Assessing Indicators.

Relevance

Public understanding and opinion on the value of biodiversity has strong implications for the acceptance and adoption of conservation measures. People value the natural environment in different ways and for different reasons. They may simply value it for its own sake, because it makes our local environment more attractive, or because they enjoy experiencing nature-rich green places for recreation. Regular opportunities to experience the natural environment are known to have positive impacts on human health and well-being.

This indicator is relevant to outcome 4 in Biodiversity 2020: A strategy for England’s wildlife and ecosystem services (see Annex A). The indicator is also relevant to international goals and targets (see Annex B of the aforementioned publication).

Background

In May 2013, Defra published a research report titled Engaging people in biodiversity issues. In this study, a system was defined with a set of evidence-based criteria and decision rules that can be used to assign people from the general population into 5 discrete groups, based on their responses to a survey developed as part of the study. The system reflects different levels of awareness of, and engagement in, biodiversity issues. The definitions of the 5 groups developed give internally consistent findings in terms of attitudes and behaviours. Within the research, the groups were of sufficient size to allow further analysis and policy targeting. This study, which captured all parts of the awareness, concern and action spectrum, has been used as a template for the development of the indicator presented here.

The indicator groups respondents as follows:

- Group 1: Does not anticipate a loss of biodiversity in England.
- Group 2: Believes there will be a loss of biodiversity in the future but is not concerned about the loss of biodiversity.
- Group 3: Believes there will be a loss of biodiversity, is concerned about a loss of biodiversity and performs 0 to 2 ‘day-to-day’ actions to support and protect biodiversity.
- Group 4: Believes there will be a loss of biodiversity, is concerned about that loss and performs all 3 ‘day-to-day’ actions or 1 to 2 ‘day-to-day’ actions and at least one ‘higher effort’ action.
Group 5: Believes there will be a loss of biodiversity, is concerned about that loss and performs all 3 ‘day-to-day’ actions as well as 1 to 2 ‘higher effort’ actions.

Respondents that fall into group 1 are labelled as ‘not aware’, respondents in group 2 are labelled as ‘not engaged’, respondents in group 3 are said to show ‘some engagement’ and respondents in group 4 or group 5 are combined and said to show ‘high engagement’.

A ‘higher effort’ action is a behaviour that has the capability to persuade others and lead to changes that might impact on biodiversity loss at a national level. Higher effort behaviours require the participant to act outside the realms of regular daily life and are adopted by only a niche group of people. The higher effort actions asked about in the questions used to inform this indicator are; volunteering with a project or organisation to help protect the environment/wildlife; and signing of a conservation petition or participation in a conservation campaign (online or other).

‘Day-to-day’ behaviours are more a measure of engagement rather than of behaviours that will actually prevent biodiversity loss. The day-to-day behaviours asked about in the questions used to inform this indicator are: wildlife gardening; green consumerism; and membership of an organisation that helps to look after wildlife or the natural environment.

Questions on awareness of, concern for, and actions taken to prevent biodiversity loss, which were based on questions used to define the ‘Public Engagement with Loss of Biodiversity’ system in the Defra Engaging people in biodiversity issues report, have been incorporated into the Monitor of Engagement with the Natural Environment (MENE) survey. More information about the MENE survey, including sample size, and the exact wording of the questions, can be found in the technical background paper. The MENE survey will be replaced by a new people and nature survey. This data will be collected by Natural England and will begin fieldwork in 2020. This will build on MENE and incorporate feedback from stakeholders as part of a strategic review.

### Web links for further information

<table>
<thead>
<tr>
<th>Organisation</th>
<th>Subject</th>
</tr>
</thead>
<tbody>
<tr>
<td>Defra Awareness research</td>
<td>Engaging people in biodiversity issues</td>
</tr>
<tr>
<td>UK National Ecosystem Assessment</td>
<td>UK National Ecosystem Assessment</td>
</tr>
<tr>
<td>Natural England</td>
<td>Monitor of Engagement with the Natural Environment</td>
</tr>
</tbody>
</table>

**Last updated:** December 2019

**Latest data available:** 2017
14. Taking action for the natural environment

Type: Response indicator

14a. Conservation volunteering

The amount of time people spend volunteering to assist with conservation in part reflects society’s interest in and commitment to biodiversity.

Between 2000 and 2017, the amount of time volunteers contributed to conservation activities in England has increased by 40% (Figure 14.1). It also increased by 10% in the 5 years to 2017 and by 4% in the most recent year for which data are available.

Figure 14.1: Index of volunteer time spent on conservation activities with selected environmental organisations in England, 2000 to 2017

Indicator Description

The first part of this indicator shows the amount of volunteer time spent undertaking conservation activities for 10 organisations across the environmental sector in England (including National Parks England which represents all the English National Parks – see background section for a full list). The work undertaken by conservation volunteers includes assisting with countryside management, carrying out surveys and inputting data, assisting with administrative tasks, and fundraising. The second part of this indicator provides an estimate for the number of households in England that encourage wildlife in their garden.

Notes:

1. The index is calculated using a non-weighted aggregation across organisations. It is therefore strongly dependent on which organisations are included and on the trends reported by the organisations recording large amounts for total volunteer hours.
2. Historical data were not available for all organisations in all years. To make best use of available data and to allow a combined index to be compiled, interpolation estimates have been used to fill any gaps. Further details are given in the background section.
3. Data provided by The Conservation Volunteers, Canal & River Trust (formerly British Waterways), National Parks England, Natural England, RSPB and The Wildlife Trusts were for financial years rather than calendar years. Financial year data have been assigned to the first calendar year (e.g. 2017/18 data were allocated to 2017).
4. Data for the Canal & River Trust (formerly British Waterways) include volunteering carried out in Wales.

5. The data series was revised in 2018 due to some organisations, most notably The Wildlife Trusts, providing updated figures for previous years (see background section for further details). The methodology used to calculate the interpolated estimates was also revised in 2018. This chart is therefore not comparable to those presented in publications prior to 2018.


A decrease in time spent volunteering between 2000 and 2001 can be attributed to a decline in all conservation activity due to controls on countryside access during the Foot and Mouth Disease outbreak. The small peak in volunteer time in 2007 is largely driven by an increase in volunteer numbers at The Conservation Volunteers which initiated a number of large youth programmes in that year. The 2011 high point, however, was driven by increases in the volunteer hours reported by 6 of the 10 organisations in the indicator and the subsequent decrease in 2012 was due to a drop in the number of volunteers across 7 of the organisations, most notably: the British Trust for Ornithology, The Wildlife Trusts, The Conservation Volunteers and the RSPB. These changes reflect: (i) the cyclical nature of some projects undertaken, such as tree planting and work on specific nature reserves and (ii) the revised methodologies used to survey and record the number of volunteer hours.

More recently, the indicator remained relatively stable between 2012 and 2015 and showed a gradual increase in 2016 and 2017. Finally, although the indicator has increased by almost 10% in the 5 years since 2012, the trends reported by the individual organisations vary considerably, from an increase of over 125% for the Canal & River Trust (formerly known as British Waterways) that have been actively recruiting additional volunteers since 2011 to a decrease of almost 40% for The Conservation Volunteers – continuing the decline in volunteer hours for this organisation that began in 2008.

14b. Households encouraging wildlife in their garden in England

In March 2009, Natural England, Defra and the Forestry Commission jointly initiated a survey called Monitor of Engagement with the Natural Environment (MENE) to provide baseline and trend data on how people use the natural environment in England. This indicator uses data sourced from the MENE survey to provide estimates of the number of households encouraging wildlife in their garden in England.

In 2014/15, 87% of MENE respondents said they owned a garden, shared a garden with others or had access to a private outdoor space (e.g. balcony, yard or patio area); this increased slightly to 88% of respondents in 2017/18 (Figure 14.2). Of those with access to a garden or outdoor space, 35% agreed that ‘they encouraged wildlife’ in these areas (e.g. through feeding areas or planting) in 2014/15. This figure also increased slightly in 2017/18 to 36% of respondents with access to a garden or outdoor space.
Figure 14.2: Percentage of the population with access to a private garden, private communal garden or private outdoor space and the percentage of those people who encourage wildlife in that garden or outdoor space, 2014/15 to 2017/18

Notes:
1. Data from questions E7 (I have access to a private garden, private communal garden or private outdoor space) and E8 (I encourage wildlife in my private garden, communal garden or outdoor space). Base: All respondents, quarterly questions (2014/15 n = 3,419; 2015/16 n = 3,488; 2016/17 n = 3,588; 2017/18 n = 3,666).
2. Data for 2013/14 have no longer been included in this measure due to quality issues with questions E7 and E8.

Source: Natural England – Monitor of Engagement with Natural Environment (MENE) survey.

Indicator assessment

<table>
<thead>
<tr>
<th>Assessment of change in conservation volunteering and wildlife gardening</th>
<th>Long term</th>
<th>Short term</th>
<th>Latest year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wildlife gardening</td>
<td></td>
<td></td>
<td>Increased (2017/18)</td>
</tr>
</tbody>
</table>

Note: Long and short-term assessments for the conservation volunteering measure are based on a 3% rule of thumb. The base years for these assessments use a 3-year average. See Assessing Indicators.

Relevance
Volunteer time is one way of assessing the level of public engagement with biodiversity. Volunteering for conservation charities is critical to the successful delivery of many of the objectives of Biodiversity 2020 – for example, volunteers collect much of the data used for monitoring the status of species and also work to conserve threatened habitats.
People and policy

Gardens offer a good case study on the benefits and impacts that individual, everyday decisions can have on the natural environment. It is estimated that 22.7 million households in the UK have access to a garden. Gardens cover up to a quarter of the land surface in our towns and cities (a total area of 432,924 hectares) and they contain about 3 million ponds and almost a quarter of all trees outside woodlands (Owen, 2010). They also support a wide range of plants and animals, one study identified 2,673 different species in a medium-sized garden (Davies et al., 2009).

Biodiversity 2020 recognises that people have a critical role in conserving biodiversity and geodiversity. To this end, ‘putting people at the heart of biodiversity policy’ is a priority in the strategy. The indicator is relevant to outcome 4 in Biodiversity 2020, A strategy for England’s wildlife and ecosystem services (see Annex A of the publication). The indicator is also relevant to international goals and targets (see Annex B of the publication).

Background

The indicator is based on data on volunteer hours supplied by 10 conservation charities and public bodies operating in England:

- Bat Conservation Trust
- Botanical Society of Britain & Ireland (formerly Botanical Society of the British Isles)
- The Conservation Volunteers
- British Trust for Ornithology
- Canal & River Trust (formerly British Waterways)
- National Parks England
- Natural England
- Plantlife
- RSPB
- The Wildlife Trusts

National Park data for England is now collected through the National Parks England Head Office, rather than by contacting individual National Parks directly.

Some organisations were able to provide accurate figures for the number of hours worked; others provided estimates based on the number of volunteers and an estimate of average days worked by their volunteers each year.

Data are not available for all organisations in all years. For the current indicator, missing values have been estimated by Defra statisticians. In the historical dataset estimates have been used in the index calculations for Canal & River Trust (2000 to 2009), The Conservation Volunteers (2000 to 2005), Natural England (2000 and 2002), National Parks England (2000 to 2008), Plantlife (2000 to 2006), British Trust for Ornithology (2000 to 2011), and The Wildlife Trusts (2000 to 2003, 2006). The estimates were based on (a) the trend in the data provided by the organisation, and (b) the trend in the data provided by other organisations for the missing years. The number of volunteer hours has been converted to an index (set to 2000 = 100).

Some larger organisations are unable to report volunteering effort for England separately and report only for the Great Britain or the UK. Such organisations have been excluded from the England index, which affects the trend in volunteering in England compared with the UK as a whole.

The methodology used by conservation charities can change from year to year. This can cause fluctuations in the data, particularly where there are revised methods used by charities that have previously recorded large amounts for total volunteer hours. While none of the charities reported any changes to their methodologies during the 2019 update, data were revised in 2018 to account for earlier methodological improvements made by The Wildlife Trusts. The charts and assessments presented here together with the accompanying dataset are therefore not comparable to those published prior to the 2018 update of this indicator.

In broad terms, the type of work undertaken by volunteers falls into 4 categories:
People and policy

1. Countryside management & advisory support;
2. Surveys, data input & analysis;
3. Administrative or office support; and
4. ‘Other conservation work’, which includes activities such as fundraising, training and educational events.

Not every organisation provides the breakdown of volunteering hours shown in Figure 14.3, and therefore the trends shown in this figure are different from the overall assessment in Figure 14.1.

Figure 14.3: Index of volunteer time spent on conservation activities with selected environmental organisations in England by category of work, 2000 to 2017

Notes:

1. Interpolated estimates have been used to fill missing years for the British Trust for Ornithology (2000–2011), Natural England (2000 and 2002) and Plantlife (2000–2006).
2. The data series was revised in 2018, due to some organisations providing updated figures for previous years (see background section for further details). The methodology used to calculate the interpolated estimates was also revised in 2018. This chart is therefore not comparable to those presented in publications prior to 2018.


Volunteer hours relating to all 4 categories of conservation work have increased in 2017. The ‘countryside management & advisory support’ and ‘other conservation work’ categories have shown the greatest increases whereas the ‘survey, data input & analysis’ and ‘administrative or office support’ categories have shown smaller increases (Figure 14.3). The sharp fall in ‘countryside management & advisory support’ in 2010 was mainly driven by the RSPB reporting a lower than average number of volunteer hours for this category. Finally, the 2011 peak in volunteer hours relating to ‘administrative or office support’ was driven by the RSPB reporting an increased number of volunteers in this category and the British Trust for Ornithology reporting a sharp fall in numbers the following year when the ‘Bird Atlas Project’ ended. Historically, organisations have reported that some changes are due to shifts in strategic focus that result in significant adjustments to projects such as tree planting. They have also cited the need to consider changes to volunteer numbers in order to comply with health and safety regulations.
Other engagement with the natural environment

The MENE survey also records respondents' engagement with pro-environmental behaviours such as recycling and preferring to buy seasonal or locally grown food (Figure 14.4).

Figure 14.4: Percentage of respondents engaging with pro-environmental behaviours, 2009/10 to 2017/18

In 2017/18, of those reporting that they undertook one or more of the pro-environmental behaviours specified in Figure 14.4, 75% indicated that they usually recycled items rather than throwing them away, 45% reported that they chose to walk or cycle instead of using their car and 34% stated that they usually bought seasonal or locally grown food. Far fewer reported that they were a member of an environmental/conservation organisation and/or that they volunteered to help care for the environment (7% and 5% respectively).

Notes:
1. Data from question E4: Which of the following environment related activities do you do?

Source: Natural England – Monitor of Engagement with the Natural Environment (MENE).

Web links for further information

<table>
<thead>
<tr>
<th>Reference</th>
<th>Title</th>
<th>Website</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bat Conservation Trust</td>
<td>Home page</td>
<td><a href="http://www.bats.org.uk/">http://www.bats.org.uk/</a></td>
</tr>
<tr>
<td>Botanical Society of Britain &amp; Ireland</td>
<td>Home page</td>
<td><a href="https://bsbi.org/">https://bsbi.org/</a></td>
</tr>
</tbody>
</table>


![People and policy](https://www.bto.org/)

### Reference

<table>
<thead>
<tr>
<th>Reference</th>
<th>Title</th>
<th>Website</th>
</tr>
</thead>
<tbody>
<tr>
<td>British Trust for Ornithology</td>
<td>Home page</td>
<td><a href="http://www.bto.org/">http://www.bto.org/</a></td>
</tr>
<tr>
<td>Canal &amp; River Trust</td>
<td>Home page</td>
<td><a href="http://canalrivertrust.org.uk/">http://canalrivertrust.org.uk/</a></td>
</tr>
<tr>
<td>National Parks England</td>
<td>Home page</td>
<td><a href="http://www.nationalparksengland.org.uk/">http://www.nationalparksengland.org.uk/</a></td>
</tr>
<tr>
<td>RSPB</td>
<td>Home page</td>
<td><a href="http://www.rspb.org.uk/">http://www.rspb.org.uk/</a></td>
</tr>
<tr>
<td>The Conservation Volunteers</td>
<td>Home Page</td>
<td><a href="http://www.tcv.org.uk/">http://www.tcv.org.uk/</a></td>
</tr>
<tr>
<td>The Wildlife Trusts</td>
<td>Home page</td>
<td><a href="http://www.wildlifetrusts.org/">http://www.wildlifetrusts.org/</a></td>
</tr>
<tr>
<td>Woodland Trust</td>
<td>Home page</td>
<td><a href="http://www.woodlandtrust.org.uk/">http://www.woodlandtrust.org.uk/</a></td>
</tr>
</tbody>
</table>

### References


**Last updated:** September 2019

**Latest data available:**

14a volunteering 2017 (and financial year 2017/18);

14b wildlife gardening 2017/18
15. Funding for biodiversity

Type: Response indicator

Public sector expenditure
In 2017/18, £311 million of public sector funding was spent on biodiversity in England; a real-term increase of 61% compared to the £194 million (at 2017/18 prices) spent in 2000/01 (Figure 15.1).

Real-term, public sector expenditure on biodiversity increased considerably from 2000/01 to a peak of £489 million in 2008/09. It then decreased a little over the next 4 years, peaked again in 2013/14 at an all-time high of £497 million and then decreased over the most recent 4 years to its current level of £311 million.

![Figure 15.1: Public sector expenditure on biodiversity in England, 2000/01 to 2017/18](image)

Notes:
1. Deflated using UK Gross Domestic Product (GDP) deflator.
2. There may be minor inconsistencies in the reporting of biodiversity expenditure from one year to the next (see background section for further details).
3. Revisions to past data series as a result of improved methodology or access to additional data mean the chart (and figures) are not directly comparable to those presented in previous publications (see background section for further details).

Source: Defra, HM Treasury.

Payments made to farmers and land managers under agri-environment schemes (Countryside Stewardship and Environmental Stewardship) fell in 2017/18. This was because (i) the old Environmental Stewardship schemes were closed to new entrants in December 2014 (although existing agreements will continue to be honoured until they expire) and (ii) the new Countryside...
Stewardship schemes were not fully implemented until 2016. At the same time, many of the 5-year entry-level Environmental Stewardship schemes have been coming to an end and there has been a slower than expected uptake of the Countryside Stewardship schemes. These changes account for almost 50% of the fall in the indicator value between 2016/17 and 2017/18.

Biodiversity related expenditure by the Heritage Lottery Fund also fell considerably in 2017/18, accounting for a further 31% reduction in the value of the indicator since 2016/17\(^8\).

**Non-governmental organisation expenditure**

Spending on biodiversity in the UK by non-governmental organisations (NGOs) with a focus on biodiversity and/or nature conservation was £239 million (net of government funding) in 2017/18 (Figure 15.2). This figure represents no real-term change since 2016/17 but a 24% increase in biodiversity related spending over the last 5 years.

**Figure 15.2: Non-governmental organisation expenditure on biodiversity in the United Kingdom, 2010/11 to 2017/18**

![Graph showing non-governmental organisation expenditure on biodiversity in the United Kingdom, 2010/11 to 2017/18]

**Notes:**

1. Deflated using UK Gross Domestic Product (GDP) deflator.
2. Wherever possible, non-governmental organisation spend is net of government funding.
3. There may be minor inconsistencies in the reporting of biodiversity expenditure from one year to the next (see background section for further details).
4. Revisions to past data series as a result of improved methodology or access to previously unavailable data mean the chart (and figures) are not directly comparable to those presented in previous publications (see background section for further details).

**Source:** Defra, HM Treasury.

---

\(^8\) It should be noted that the biodiversity related element of Heritage Lottery funding has tended to fluctuate considerably from one year to the next.
Indicator assessment

<table>
<thead>
<tr>
<th>Assessment of change in expenditure on biodiversity</th>
<th>Long term</th>
<th>Short term</th>
<th>Latest year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-governmental organisation spending on biodiversity in the UK</td>
<td></td>
<td>2012/13–2017/18</td>
<td>No change (2017/18)</td>
</tr>
</tbody>
</table>

**Note:** The long-term and short-term assessment of these measures is based on a 3% rule of thumb. The base years for these assessments use a 3-year average, see Assessing Indicators.

**Relevance**

Spending is just one way of assessing the government’s commitment to biodiversity. Funding for conservation work is critical to the delivery of England’s biodiversity strategies. The indicator shows progress with commitments to improve the status of our wildlife and habitats. It is relevant across a range of outcomes in Biodiversity 2020: A strategy for England’s wildlife and ecosystem services as it underpins the actions needed to achieve those outcomes. The indicator is also relevant to international goals and targets (see Annex B of the aforementioned publication).

**Background**

The public sector expenditure indicator is based on a combination of expert opinion together with published and unpublished data from organisations across England. The data are collated by Defra statisticians to provide estimates of public sector spend on biodiversity in England between 2000/01 and 2017/18.

In 2014, Defra developed a measure of spend on UK biodiversity by NGOs with a focus on biodiversity and/or nature conservation. Although the measure does not include all the NGOs working in this field, it does compile data on biodiversity spending from 41 different organisations. These include 13 of the 47 Wildlife Trusts with the largest annual turnover, together with other well-known organisations such as RSPB, the Woodland Trust and WWF-UK. The data are used to provide estimates of spending on biodiversity in the UK between 2010/11 and 2017/18; wherever possible these figures are net of any government-funded spend. NGO support for, and action on biodiversity, some of which is funded by businesses and private individuals, is an important contribution to achieving biodiversity targets. Therefore, capturing the contribution of NGOs is a key element of tracking the UK’s conservation efforts and including this source of expenditure gives a more complete picture of biodiversity expenditure in the UK. It is not currently possible to disaggregate this measure to country level or to reliably report NGO spending on international biodiversity.

The public sector and NGO indicators include direct expenditure on nature reserves and conservation measures together with spending on relevant research and development; they generally exclude expenditure on administration and training. Where possible, indirect expenditure (e.g. transfers to other organisations) has also been excluded from the indicator in order to avoid any double counting of financial flows. Judgment has been employed to finalise some components of the totals and the figures should be taken as approximate.

Restructuring of government departments, changes to funding streams and/or projects and the outsourcing of work relating to biodiversity (e.g. research and development) mean that there may be some inconsistencies in the reporting of biodiversity expenditure from one year to the next. The limited coverage of the NGO indicator together with the complexities involved in both defining and identifying expenditure on biodiversity also mean that the public sector and NGO figures are likely to be an underestimation; they do however provide a clear trend of biodiversity expenditure since the
beginning of 2000/01 (public sector) and 2010/11 (NGOs). Ongoing development work should lead to improvements in the overall accuracy of future publications.

A full list of public sector and non-governmental organisations included in this indicator together with further details of the methodology used to produce the totals are available in the technical background document.

The GDP deflator is a measure of general inflation in the domestic economy – it captures the price changes over a period of time. The deflator is expressed in terms of an index number. It is used here to convert historic prices into constant, 2017/18 prices, thereby allowing meaningful comparisons to be made between biodiversity expenditure in different years. It does, however mean that data presented here are not directly comparable to those in previous publications because a new deflator is used to prepare each annual update.

Web links for further information

<table>
<thead>
<tr>
<th>Reference</th>
<th>Website</th>
</tr>
</thead>
<tbody>
<tr>
<td>Defra</td>
<td>Technical background document: Funding for biodiversity in England</td>
</tr>
</tbody>
</table>

Last updated: September 2019

Latest data available: Financial year 2017/18
16. Integrating biodiversity considerations into local decision making

**Type:** Response indicator

**Local Sites under positive conservation management**

In 2017/18, 48% of Local Sites across England were in positive conservation management, an increase of 16 percentage points since the beginning of the time series in 2008/09 and of 1.5 percentage points since 2012/13 (Figure 16.1).

**Indicator Description**

This indicator shows the proportion of the total number of Local Sites in England where positive conservation management is being implemented or has been implemented in the last 5 years. Local Sites are non-statutory areas identified and selected for their substantive local nature conservation value (Local Wildlife Sites) and/or their local geological value (Local Geological Sites). Assessing the extent of positive management can help to identify sites where positive management is lacking and will help to focus the efforts of local authorities and Local Site Partnerships in ensuring Local Sites are managed and their biodiversity/geological value is maintained or enhanced.

**Figure 16.1: Proportion of Local Sites under positive conservation management, 2008/09 to 2017/18**

<table>
<thead>
<tr>
<th>Year</th>
<th>Percentage of sites</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008/09</td>
<td>30</td>
</tr>
<tr>
<td>2009/10</td>
<td>40</td>
</tr>
<tr>
<td>2010/11</td>
<td>45</td>
</tr>
<tr>
<td>2011/12</td>
<td>46</td>
</tr>
<tr>
<td>2012/13</td>
<td>46</td>
</tr>
<tr>
<td>2013/14</td>
<td>46</td>
</tr>
<tr>
<td>2014/15</td>
<td>46</td>
</tr>
<tr>
<td>2015/16</td>
<td>47</td>
</tr>
<tr>
<td>2016/17</td>
<td>48</td>
</tr>
<tr>
<td>2017/18</td>
<td>48</td>
</tr>
</tbody>
</table>

**Notes:**

1. In 2017/18, 55% of local authorities submitted data on Local Sites. Where a local authority did not submit data in 2017/18, the most recently submitted data were used provided they had been supplied within the last 3 years.
2. The total number of responding local authorities and number of sites varies between years. In 2017/18, 101 (67%) local authorities were included in the analysis.
3. There have been revisions to past data presented in the chart. See background section for further details.

**Source:** Defra, Local Authority Single data list 160-00 on local nature conservation/biodiversity.
## Indicator assessment

<table>
<thead>
<tr>
<th>Assessment of change in extent and condition of protected areas and local sites</th>
<th>Long term</th>
<th>Short term</th>
<th>Latest year</th>
</tr>
</thead>
</table>

**Note:** The long-term and short-term assessment of these measures is based on a 3% rule of thumb. The base years for these assessments use a 3-year average, see Assessing Indicators.

## Relevance

The indicator is relevant to outcome 1 in *Biodiversity 2020: A strategy for England’s wildlife and ecosystem services* (see Annex A). It is also relevant to strategy priority action 2.2:

- Promote taking better account of the values of biodiversity in public and private sector decision-making, including by providing tools to help consider a wider range of ecosystem services.

The indicator is relevant to international goals and targets (see Annex B of the aforementioned publication for further details).

## Background

Local Sites are non-statutory areas designated at local level for their substantive nature conservation and/or geological value. They include both Local Wildlife Sites (designated for significant biodiversity value) and Local Geological Sites (designated for their significant geological value). Local Site systems are operated at a local level, with local authorities working with Local Sites Partnerships made up of key stakeholders.

There are more than 40,000 local sites in England, covering contrasting landscapes in coastal, rural and urban situations. Although they do not have any statutory status, many are equal in quality to the representative sample of sites that make up the series of statutory Sites of Special Scientific Interest (SSSIs). They are an important component of England’s ecological network and have an important role to play in meeting our national biodiversity objectives.

There are currently a number of different terms in use locally to describe these sites, including Sites of Importance for Nature Conservation (SINCs), Sites of Nature Conservation Importance (SNCIs) and Regionally Important Geological Sites (RIGS), although Defra uses the common term Local Site.

The data allow assessment of the proportion (percentage) of the total number of Local Sites in England where positive conservation management is being implemented, or has been implemented in the last 5 years. Evidence that positive (rather than active) conservation management is being or has been undertaken is required and is used as a proxy for positive biodiversity outcomes (for example, site management plans, management schemes such as agri-environment or conservation management agreement or schemes and management guidance and advice).

The data for 2010/11 to 2017/18 were collected by Defra from unitary and higher tier local authorities. Data for 2008/09 and 2009/10, previously published by the Department for Communities and Local Government, are also included here.

In order to try and improve the response rate, Defra updated contact details from a review carried out by the Local Government Association. In 2017/18, 55% of local authorities submitted data on Local Sites, compared with 48% in 2016/17. Where local authorities did not submit data in 2017/18, the most recently submitted data for those local authorities were used to calculate the percentage of
sites in positive conservation management in that local authority. Where a local authority has not submitted data for 3 consecutive years they have been excluded from the analysis as their most recent estimate can no longer be relied upon to reflect the current situation. A total of 101 local authorities were included in the analysis in 2017/18 and 49 local authorities were excluded due to not providing data for 3 consecutive years.

Minor revisions (bold italics) have been made to previous data imputation, affecting the results as follows.

<table>
<thead>
<tr>
<th>Year</th>
<th>Percentage of Local Sites in positive conservation management</th>
<th>Previously published data</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008/09</td>
<td>32</td>
<td>32</td>
</tr>
<tr>
<td>2009/10</td>
<td>39</td>
<td>39</td>
</tr>
<tr>
<td>2010/11</td>
<td>43</td>
<td>43</td>
</tr>
<tr>
<td>2011/12</td>
<td>45</td>
<td>45</td>
</tr>
<tr>
<td>2012/13</td>
<td>46</td>
<td>46</td>
</tr>
<tr>
<td>2013/14</td>
<td><strong>49</strong></td>
<td><strong>47</strong></td>
</tr>
<tr>
<td>2014/15</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>2015/16</td>
<td>50</td>
<td><strong>48</strong></td>
</tr>
<tr>
<td>2016/17</td>
<td><strong>51</strong></td>
<td>50</td>
</tr>
<tr>
<td>2017/18</td>
<td>48</td>
<td></td>
</tr>
</tbody>
</table>

Web links for further information

<table>
<thead>
<tr>
<th>Organisation</th>
<th>Subject</th>
</tr>
</thead>
<tbody>
<tr>
<td>Defra</td>
<td>Local Sites guidance</td>
</tr>
</tbody>
</table>

Last updated: September 2019

Latest data: 2017/18
17. Global biodiversity impacts of UK consumption

Type: Pressure indicator

Summary

Additional research work undertaken in 2018/19.

Indicator Description

Indicator under development. Production and consumption in the UK has an impact on the natural environment beyond our shores through the import and export of goods and services. A range of research work has been undertaken, but it has not at present been possible to develop an indicator.

Following the adoption of the Strategic Plan for Biodiversity 2011–2020 by the Conference of the Parties to the Convention on Biological Diversity (CBD) in 2010, the UK biodiversity indicators were reviewed, and a programme of work was put in place to develop and refine the indicator set for future reporting to the CBD. In this review, a small number of gaps were identified where there were no current indicators for particular CBD goals and targets. One such gap related to indicators for reporting on global impacts of consumption and production.

Progress to date

Research has been undertaken to (i) assess how patterns of UK consumption impact on the key drivers of biodiversity change overseas and (ii) identify options for mitigating those impacts. This research includes:

- Analysis and modelling of trade pathways and supply chains for goods and services in order to identify important sources of production; and
- Identification of the potential impact of key production systems and products on biodiversity.

An assessment framework has been developed to provide information on the direct and indirect links between consumption of goods and services in the UK and the environmental impacts that occur due to the production of these goods and services in other countries. A global trade model that retains product-level production detail and quantitative links to associated environmental impacts has been developed to allow top-down assessment of potential impacts. This model facilitates the selection of priority commodities and regions which can then be investigated in more detail using a case-study approach. Further research was undertaken in 2014 to develop this approach at a Scotland level.

During 2018/19, work was undertaken under contract to the Joint Nature Conservation Committee (JNCC) to review literature and test the extension of multi-regional input-output modelling to measure environmental impact. The aim was to develop an indicator to support the 25 Year Environment Plan. Results of the contract are being peer-reviewed.

Relevance

Production and consumption in the UK has an impact on the natural environment beyond our shores through the range of imports and exports of goods and services. Each of the countries of the UK has introduced or is introducing policies to promote sustainable production and consumption and thereby reduce our impact on biodiversity and promote sustainable use of natural resources.
The 25 Year Environment Plan highlights the government’s commitment to “leave a lighter footprint on the global environment by enhancing sustainability and supporting zero deforestation supply chains” in a way which “avoids improving our domestic environment at the expense of the environment globally.” In order to fulfil this commitment, a greater understanding of the global environmental impacts of UK consumption is required.

The indicator is relevant to a number of outcomes in Biodiversity 2020: A strategy for England’s wildlife and ecosystem services (see Annex A). The indicator is also relevant to international goals and targets (see Annex B of the aforementioned publication for further details).

**Web links for further information**

<table>
<thead>
<tr>
<th>Organisation</th>
<th>Subject</th>
</tr>
</thead>
<tbody>
<tr>
<td>Defra</td>
<td>'A Green Future: Our 25 Year Plan to Improve the Environment'</td>
</tr>
<tr>
<td>Defra-funded research study</td>
<td>Currently being peer reviewed</td>
</tr>
</tbody>
</table>

**Last updated:** September 2019

**Latest data available:** N/A
18. Climate change impacts

Type: Pressure indicator

Spring index

Since 1999, the annual mean observation dates have been around 7 days in advance of the average dates in the first part of the 20th Century.

The advancement of spring events is strongly linked to warmer temperatures in March and April. The mean observation dates in 2011 were the earliest for which there are records, being 0.2 days earlier than the previously most advanced dates in 1945. The warmest April in the Central England Temperature series (1659 onwards) occurred in 2011 and was almost certainly influential.

Figure 18.1: Index of the timing of biological events in England, 1891 to 1947 and 1999 to 2018

Note: * Number of days after 31 December (e.g. day 121 = May 1).

Indicator assessment

<table>
<thead>
<tr>
<th>Assessment of change in the timing of spring events</th>
</tr>
</thead>
<tbody>
<tr>
<td>No assessment – indicator provided for context only</td>
</tr>
</tbody>
</table>

Relevance

According to the UK Climate Impacts Programme, evidence for the warming of the global climate is unequivocal, with global average temperatures having risen by nearly 0.8 °C since the late 19th century, and rising at about 0.2 °C each decade over the past 25 years. These changes will impact on the distribution, condition and behaviour of our wildlife.

The indicator shows progress with commitments in Biodiversity 2020: A strategy for England’s wildlife and ecosystem services to reduce pressures on biodiversity and to integrate biodiversity considerations into other sectors of decision making such as climate change adaptation (see Annex A of the aforementioned report). The indicator is also relevant to the following global target in the Strategic Plan for Biodiversity 2011–2020:

- **Target 10**: By 2015, the multiple anthropogenic pressures on coral reefs, and other vulnerable ecosystems impacted by climate change or ocean acidification are minimized, so as to maintain their integrity and functioning.

Background

Phenology is the study of the timing of recurring natural events in relation to climate and such observations provide year-on-year information on how nature is responding to a changing climate. The Spring Index is based on the annual mean observation dates for 4 natural events: first flowering of hawthorn (Crataegus monogyna), first flowering of horse chestnut (Aesculus hippocastanum), first sighting of a swallow (Hirundo rustica) and first recorded flight of an orange tip butterfly (Anthocharis cardamines). These events were chosen as they include both early and late spring events, have long-term data sets from a large number of locations, include a variety of taxa – 2 trees, a bird and a butterfly – and are thought to be representative of wider phenological changes.

The pre-1948 data were mostly collected by the Royal Meteorological Society (RMS) and the more recent data by the UK Phenology Network (UKPN). In 1998, the Centre for Ecology & Hydrology revived the UK Phenology Network (UKPN) in the UK, which was launched by the Woodland Trust as a web-based project in 2000. The UKPN has grown since its inception, and now records a series of events in both spring and autumn through the Nature’s Calendar survey.

The Index shows a strong relationship with mean March-April temperature, and it advances more rapidly when mean March-April temperature equals or exceeds 7°C (Figure 18.2). Since 1999, the annual mean observation dates have been around 7 days in advance of the average dates in the first part of the 20th Century. The average advance in dates for the Spring Index is 3.3 days for every one degree Celsius when March to April temperature is below 7°C, and 7.2 days for every one degree Celsius when above 7°C.
Figure 18.2: Relationship between Spring Index and Central England Temperature (CET), 1891 to 1947 and 1999 to 2018

![Graph showing relationship between Spring Index and CET](image)

Notes:

1. Day number = number of days after 31 December (e.g. day 121 = 1 May).
2. CET = Central England Temperature series, in degrees Celsius.


The Living with Environmental Change (LWEC) project has produced a series of report cards which detail the evidence for climate change and its impact on the environment. The terrestrial biodiversity climate change card evaluates the amount of, and strength of evidence of climate change impact on terrestrial biodiversity. It complements the climate change impact report card produced by the Marine Climate Change Impacts Partnership.

Web links for further information

<table>
<thead>
<tr>
<th>Organisation</th>
<th>Subject</th>
</tr>
</thead>
<tbody>
<tr>
<td>Defra</td>
<td>Technical Background Document</td>
</tr>
<tr>
<td>Environmental Change Network (ECN)</td>
<td>UK Environmental Change Network Index</td>
</tr>
<tr>
<td>Royal Meteorological Society</td>
<td>Weather and climate</td>
</tr>
<tr>
<td>UK Climate Impacts Programme</td>
<td>Recent climate trends</td>
</tr>
<tr>
<td>UK Phenology Network</td>
<td>Nature’s Calendar</td>
</tr>
</tbody>
</table>

Last updated: September 2019

Latest data available: Spring Index – spring 2018
19. Trends in pressures on biodiversity: pollution

Type: Pressure indicator

19a. Air pollution

This indicator has been updated with the 2016 data which due to timing could not be included in the original publication released on 5 September 2019. The percentage of sensitive habitat areas in England exceeding critical load for acidification fell from 76% in 1996 to 58% in 2016 (Figure 19.1)\(^9\).

Over the same period, the percentage area of sensitive habitats where nutrient nitrogen deposition exceeded critical load showed little change (98% in 1996 and 95% in 2016).

**Figure 19.1: Percentage area of sensitive habitats in England where critical loads for acidity and nutrient nitrogen were exceeded, 1996 to 2016\(^1\)**

**Indicator Description**

The first part of this indicator shows changes in pressures on biodiversity from air pollution in England. Critical loads are air pollution thresholds above which significant harmful effects may occur on sensitive habitats. The pollutants arise mainly from burning fossil fuels in industry and road transport, and from emissions from livestock waste. Approximately 18,600km\(^2\) of terrestrial habitat areas are sensitive to acid deposition and about 19,500km\(^2\) are sensitive to nutrient nitrogen; many areas are sensitive to both.

**Notes:**

1. Since 2000, nitric acid has been included and since 2003, aerosol deposition of sulphate, nitrate and ammonium have been included in deposition estimates. These additional components of overall deposition led to some increases in critical load exceedance compared with earlier periods.
2. Each bar represents a 3-year average of deposition data to reduce year-to-year variability.

\(^9\) For ease of reference, time periods are usually referred to using the middle year of the 3 years used to calculate the mean. For example, “1996” refers to the period 1995 to 1997. In figure 19.1, “1996 to 2016” refers to the period 1995–97 to 2015–17.
3. There are a few inconsistencies between years due to changes in methods used to derive deposition estimates, and some minor alterations to the acidity critical loads. This information should be taken into account when interpreting the trends results.

**Source:** Centre for Ecology & Hydrology.

In the past 5 years, the percentage of sensitive habitat area exceeding critical loads for acid pollution decreased, from 63% in 2011 to 58% in 2016. There was little short-term change in the percentage of sensitive habitat area where nutrient nitrogen pollution exceeded critical load (97% in 2011 and 95% in 2016).

**Indicator assessment**

<table>
<thead>
<tr>
<th>Assessment of change in area exceeding air pollution critical loads</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Long term</strong></td>
</tr>
<tr>
<td>----------------</td>
</tr>
</tbody>
</table>

**Note:** Long and short-term assessments are based on a 3% rule of thumb. The base years for these assessments use a 3-year average. See [Assessing Indicators](#).

**19b. Marine pollution**

The combined inputs of all 6 hazardous materials into marine environments have shown a long-term decrease of 86% since 1990 (Figure 19.2). Inputs of all 6 of these substances show decreases in the short term since 2012.

Levels of all 6 substances declined over the period 1990 to 2017: lindane by 97%; both mercury and cadmium by 91%; zinc by 71%; copper by 68% and lead by 58% (Figure 19.3).

In the short term, inputs of hazardous substances decreased by 47% from 2012 to 2017 (using a 3-year average for 2012). Inputs of all 6 hazardous substances declined in the short term: lindane had the highest percentage decrease (-89%), followed by cadmium which decreased by 33%, and then lead (-30%), both mercury and zinc decreased by 28%, and copper by 25% since 2012.
Reducing pressures

Figure 19.2: Combined input of hazardous substances to the UK marine environment, as an index of estimated weight of substances per year, 1990 to 2017


Indicator assessment

| Assessment of change in the input of hazardous substances to the UK marine environment |
|---------------------------------|-----------------|-----------------|-----------------|
|                                 | Long term       | Short term      | Latest year     |
| substances                      |                 |                 |                 |

Note: Long and short-term assessments are based on a 3% rule of thumb. The base years for these assessments use a 3-year average. See Assessing Indicators.

Indicator description

Inputs into the marine environment are estimated from concentrations and flow rates in rivers entering the sea and those from estuarine and coastal point sources. Riverine inputs reflect both point and diffuse sources upstream of the sampling point and tend to be strongly influenced by flow rates. Flow rates are heavily affected by rainfall patterns so year to year fluctuations in pollutant loads are likely.

A detailed illustration of changing levels of each input is seen in Figure 19.3. The low point in 2003 is thought to be a consequence of reduced river flows during an exceptionally dry year. Conversely, levels increased in 2012 and again in 2014 corresponding with years of heavy rainfall. In 2012, England had the wettest year since records began in 1910; the summer was the wettest since 1912. Increased rainfall in November and December contributed to extensive flooding. In 2014, the winter period (January to February) was the wettest since records began.
Reducing pressures

Figure 19.3: Inputs of hazardous substances to the UK marine environment, as an index of weight of substance per year, 1990 to 2017


Relevance

The indicator shows progress with commitments to reduce pressure from a range of sources as set out in Biodiversity 2020: A strategy for England’s wildlife and ecosystem services (see Annex A). The indicator is also relevant to international goals and targets (see Annex B of the aforementioned publication).

Background

Air pollution impacts on sensitive habitats

Critical loads have been established separately for nutrient nitrogen (eutrophication effects) and for acidification. The pollutants causing eutrophication and acidification mainly arise as a result of emissions from burning fossil fuels, and from livestock waste. Land which is currently used for intensive agriculture or for urban purposes such as housing is not assessed for sensitivity. Of the land area of England, around 14% contains habitats which are assessed as sensitive to acid deposition, and 15% contains habitats assessed as sensitive to eutrophication; much of this area is sensitive to both impacts. The 3 main steps in the assessment of the area of sensitive habitat exceeding critical loads are: the calculation of critical loads for each of the sensitive habitats; the mapping of the habitats and the identification of the area of habitat where deposition exceeds the critical load.

Critical loads for acidity and nutrient nitrogen are calculated for 14 broad habitats (Table 19.1) considered sensitive to acidification and/or eutrophication. A range of methods are used to calculate critical loads, based on either empirical (observational or experimental data) or mass balance (input/output) data. Critical loads of nutrient nitrogen were updated in 2011; further information on how critical loads are calculated can be found on the Critical Loads and Dynamic Modelling website.

To identify the area exceeding critical loads, deposition maps based on a 5km x 5km grid covering the UK are produced based on the sum of wet, dry and cloud deposition. These deposition data are
Reducing pressures

overlain on maps of critical loads for each habitat to calculate critical load exceedances and the areas of habitat exceeded. Critical load exceedance maps are available on the Critical Loads and Dynamic Modelling website.

Since 2002 (2001–2003), the inclusion of nitric acid deposition in the assessment has increased the area of estimated critical load exceedance compared with earlier periods. The deposition values from 2003 (2002–2004) additionally include aerosol deposition of ammonium (NH₄), nitrates (NO₃) and sulphates (SO₄). In all years, the 3-year average deposition is used to smooth substantial year-to-year variability.

Table 19.1: The 14 habitats considered sensitive to acidification and/or eutrophication for which critical loads are calculated

<table>
<thead>
<tr>
<th>Habitats (14)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Acid grassland</td>
<td>Beech (Fagus) woodland (unmanaged)</td>
</tr>
<tr>
<td>Calcareous grassland</td>
<td>Acidophilous oak woodland (unmanaged)</td>
</tr>
<tr>
<td>Dwarf shrub heath</td>
<td>Scots Pine woodland (unmanaged)</td>
</tr>
<tr>
<td>Bog</td>
<td>Other unmanaged woodland</td>
</tr>
<tr>
<td>Montane</td>
<td>Dune grassland (eutrophication only)</td>
</tr>
<tr>
<td>Coniferous woodland (managed)</td>
<td>Saltmarsh (eutrophication only)</td>
</tr>
<tr>
<td>Broadleaved woodland (managed)</td>
<td>Freshwaters (425 sites only) (acidification only)</td>
</tr>
</tbody>
</table>

Hazardous substances in the marine environment

The data presented relate to the UK as a whole; separate data are not readily available for England. Although data for total UK (direct plus riverine) inputs to the marine environment are available as lower and upper estimates, for ease of interpretation only upper (i.e. maximum) values have been used in this assessment, rather than presentation of the data range for each substance.

Web links for further information

<table>
<thead>
<tr>
<th>Organisation</th>
<th>Subject</th>
</tr>
</thead>
<tbody>
<tr>
<td>Centre for Ecology &amp; Hydrology</td>
<td>Data on critical loads modelling and mapping</td>
</tr>
<tr>
<td>Defra</td>
<td>Clean Seas: hazardous substances</td>
</tr>
<tr>
<td>Defra</td>
<td>Technical Background Document</td>
</tr>
<tr>
<td>OSPAR</td>
<td>Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR)</td>
</tr>
<tr>
<td>United Nations Economic Commission for Europe</td>
<td>Convention on Long-range Transboundary Air Pollution</td>
</tr>
</tbody>
</table>

Last updated: December 2019

20. Trends in pressures on biodiversity: invasive species

Type: Pressure Indicator

Invasive species in Great Britain

There are 3,208 non-native species in Great Britain, 2,005 of which are classified as established (reproducing in the wild). This indicator contains 193 non-native species that are considered to be exerting a negative impact on native biodiversity (46 freshwater species, 39 marine species and 108 terrestrial species). The majority (187) of these species are established; six\(^{10}\) are long-term residents but not known to breed in the wild.

Over the period 1960 to 2018, invasive non-native species have become more prevalent in the countryside. Since 1960, the number of these species established in or along 10% or more of Great Britain’s land area or coastline has increased in the freshwater, terrestrial and marine (coastal) environments, thereby increasing the likely pressure on native biodiversity (Figure 20.1).

Figure 20.1: Number of invasive non-native species established in or along 10% or more of Great Britain's land area or coastline, 1960 to 2018

Indicator Description

Non-native species are those that have reached Great Britain by accidental human transport, deliberate human introduction, or which arrived by natural dispersal from a non-native population in Europe. Species that have arrived since 1500 are included within this indicator.

Most non-native species are considered benign or positive, but some have a negative impact on native species through the spread of disease, competition for resources, or by direct consumption, parasitism or hybridisation; such species are termed invasive. Invasive non-native species have one or more of these negative impacts and a high capacity to spread to natural and semi-natural habitats.

This indicator shows the change in number of invasive non-native species established across 10% or more of the land area of Great Britain, or along 10% or more of the extent of its coastline.

\(^{10}\) The 6 long-term resident species included the indicator are 2 species of terrapin (Emys orbicularis, Trachemys scripta) and 4 freshwater fish (Ameiurus melas, Leuciscus idus, Salvelinus fontinalis, Oncorhyncus gorbuschas).

Notes: The last time period covers a shorter period than the other bars (from 2010 to 2018).

Source: Botanical Society of Britain & Ireland, British Trust for Ornithology, Centre for Ecology & Hydrology, Marine Biological Association, National Biodiversity Network.

Comparing the latest period (2010 to 2018) with the previous one (2000 to 2009), the number of invasive non-native species established in or along 10% or more of Great Britain’s land area or coastline has remained constant in terrestrial environments (at 56 species), and has increased in both freshwater (from 12 to 13 species) and marine environments (from 24 to 28 species).

Assessment

| Assessment of change in the number of invasive non-native species established in or along 10% or more of Great Britain’s land area or coastline |
|-------------------------------------------------|----------------|----------------|
|                                    | Long term | Short term | Latest year |
| Freshwater invasive species                        | 1960–2018 | Not assessed | Not assessed |
| Marine (coastal) invasive species                  | 1960–2018 | Not assessed | Not assessed |
| Terrestrial invasive species                        | 1960–2018 | Not assessed | Not assessed |

Note: Analysis of the underlying long-term trends is carried out by the data providers – see Assessing Indicators. Short-term trends and latest-year changes are not assessed.

Indicator description

The indicator (Figure 20.1) shows the change in number of invasive non-native species established across 10% or more of the land area of Great Britain, or along 10% or more of the extent of its coastline. The short-term trend and latest year’s change are not assessed.

Relevance

The indicator shows progress with commitments to improve the status of our wildlife and habitats. It is relevant to outcomes 1, 2 and 3 in Biodiversity 2020: A strategy for England’s wildlife and ecosystem services; it is also relevant to a number of international targets (see Annex A and B of the aforementioned publication for further details).

The United Nations Convention on Biological Diversity (CBD) identifies invasive non-native species as a major threat to biodiversity. Many non-native species do not threaten biodiversity, but invasive non-native species can spread disease (e.g. signal crayfish *Pacifastacus leniusculus*), modify ecosystems (e.g. rhododendron *Rhododendron ponticum*), drastically reduce populations of native species (e.g. American mink *Mustela vison*), or hybridise with native species (e.g. ruddy duck *Oxyura jamaicensis*).

Under the CBD, the United Kingdom has an international obligation to address the impacts of invasive non-native species. In 2008, the UK government published the Invasive Non-native Species Framework Strategy for Great Britain.

Background

The indicator and background charts are based on species distribution data available through the National Biodiversity Network (NBN), supplemented by expert knowledge and in-house datasets of the Botanical Society of Britain and Ireland (BSBI), British Trust for Ornithology (BTO), Centre for Ecology & Hydrology (CEH), the Environment Agency (EA) and Marine Biological Association (MBA). Trends in the extent of invasive non-native species, as presented in Figure 20.1 and 20.2
were derived through a 2-stage process. The number of invasive non-native species included within the indicator was substantially expanded from the 49 species used in the indicator published in 2009 (Hill et al., 2009). An initial list was derived from the GB Non-native Species Information Portal (GB-NNSIP) (Roy et al., 2014) by selecting all non-native species within the database that are noted to have, or potentially have, a negative or strongly negative ecological effect, including all 49 species from the original indicator. This list was subsequently reviewed by experts, species for which there was a high degree of uncertainty with respect to negative impact were removed and new species were added as deemed appropriate. The revised list in 2014 comprised of 179 species, but has been subsequently amended in 2015, 2017 and 2018 to now comprise of 193 species (see technical background document).

Invasive non-native species were categorised according to the extent of the land area or coastline of Great Britain in which they were found in the decades of 1960 to 1969, 1970 to 1979, 1980 to 1989, 1990 to 1999, 2000 to 2009 and the present period of 2010 to 2017 (see Table 20.1). The categorisation was achieved by combining assessment of modelled distributions based on data available from the NBN with expert opinion and the use of additional datasets where available (for more details see the technical background document).

**Table 20.1: Invasion extent of non-native species**

<table>
<thead>
<tr>
<th>Definition</th>
<th>Interpretation</th>
<th>Extent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not present in territory</td>
<td>Absent</td>
<td>0</td>
</tr>
<tr>
<td>Present in territory and either not established or with established populations that have not spread more than 10km from their source</td>
<td>Not or scarcely established</td>
<td>1</td>
</tr>
<tr>
<td>Established populations represent less than 10% of territory, with some having arrived from further than 10km from their source; or if more widespread then populations scattered and sparse</td>
<td>Established but still generally absent or at most occasional</td>
<td>2</td>
</tr>
<tr>
<td>Established populations present in 10% to 50% of the territory</td>
<td>Established and frequent in part of the territory</td>
<td>3</td>
</tr>
<tr>
<td>Established in more than 50% of the territory</td>
<td>Widespread</td>
<td>4</td>
</tr>
</tbody>
</table>

Figure 20.2 shows the number of species in each decade in each extent category listed in Table 20.1. The indicator is compiled from those invasive non-native species established in or along 10% or more of Great Britain’s land area or coastline (i.e. extent categories 3 and 4). There are limitations to this approach:

- The list of invasive non-native species has been derived through the rapid assessment of impacts based on expert opinion. A semi-quantitative approach is currently being developed to improve the certainty and reliability of the list.

- The extent value is based on relatively broad categories. The extent of some species can increase multi-fold within a single category, for example, the number of invasive non-native species in 10% to 50% of the land area of Great Britain, which can reduce the sensitivity of the indicator.

- The occurrence data obtained from the NBN may not be representative of the species distribution in each decade, especially for both the earlier and most recent time periods, because there is often a time lag before occurrence data appear on the NBN. Furthermore, the availability of occurrence data reflects the intensity of survey effort applied in a time period that has subsequently been submitted to the NBN. The attribution of extent categories has, however been supplemented by expert opinion and in some cases by more complete datasets.
Figure 20.2: Changes in the extent of invasive non-native species in marine (coastal), freshwater and terrestrial environments of Great Britain, 1960 to 2018

Notes:

1. Extent levels are defined as follows:
   1. Present in territory and either not established or with established populations that have not spread more than 10km from their source.
   2. Established populations represent less than 10% of territory, with some having arrived from further than 10km from their source; or if more widespread then population scattered and sparse.
   3. Established populations present in 10% to 50% of the territory.
   4. Established in more than 50% of the territory.
2. The last time period covers a shorter period than the other bars (from 2010 to 2018).

Source: Botanical Society of Britain and Ireland, British Trust for Ornithology, Centre for Ecology & Hydrology, Marine Biological Association, National Biodiversity Network.

Web links for further information

<table>
<thead>
<tr>
<th>Reference</th>
<th>Title</th>
<th>Website</th>
</tr>
</thead>
<tbody>
<tr>
<td>Defra</td>
<td>Developing an indicator of the abundance,</td>
<td><a href="http://nora.nerc.ac.uk/7796/1/HillN007796CR.pdf">http://nora.nerc.ac.uk/7796/1/HillN007796CR.pdf</a> (PDF, 382kb)</td>
</tr>
<tr>
<td></td>
<td>extent and impact of invasive non-native</td>
<td></td>
</tr>
<tr>
<td></td>
<td>species</td>
<td></td>
</tr>
<tr>
<td>EC 6th Framework Programme</td>
<td>Delivering Alien Invasive Species Inventories for Europe (DAISIE)</td>
<td><a href="http://www.europe-aliens.org/">http://www.europe-aliens.org/</a></td>
</tr>
</tbody>
</table>
### References


**Last updated:** September 2019  
**Latest data available:** 2018
21. Trends in pressures on biodiversity: surface water status

Type: State indicator

Summary

There has been a decrease in the proportion of surface water bodies in England awarded high or good ecological status since the indicator was first prepared in 2009; the indicator has also declined in the short term, between 2013 and 2018 (Figure 21.1). In 2018\textsuperscript{11}, 16% of surface water bodies assessed under the Water Framework Directive (WFD) were in high or good status compared with 25% in 2009 and 23% in 2013.

In 2015, England adopted the new monitoring and classification standards laid out in cycle 2 of the WFD. This explains part of the step change in classification results. Figure 21.1 shows the data for both cycle 1 and cycle 2 in 2015; the change in reporting accounted for 3.3 of the 8.7 percentage-points decrease in the indicator since 2009.

Indicator Description

The Water Framework Directive (WFD) is an important mechanism for assessing and managing the water environment in the EU, through a 6-yearly cycle of planning and implementing measures to protect and improve the water environment.

The indicator shows the percentage of English water bodies in each status classification and assesses the change in the percentage of water bodies awarded a good or high surface water status classification under the WFD. Around 5,000 water bodies were assessed in each year of the indicator; including rivers, canals, lakes, estuaries and coastal waters.

Figure 21.1: Status classifications of surface water bodies in England under the Water Framework Directive, 2009 to 2018

\textsuperscript{11} In 2016, the Environment Agency moved to a triennial reporting system and will report next in late 2019. As classifications are valid until they are next assessed, the latest available data from 2016 have been carried forward to 2018.
Notes:

1. Based on the numbers of surface water bodies classified under the Water Framework Directive (WFD) in England. These include rivers, canals, lakes, estuaries and coastal water bodies, but exclude sites of special scientific interest (SSSI) ditches and surface water transfers.
2. A water body is a management unit, as defined by the relevant authorities.
3. Water bodies that are heavily modified or artificial (HMAWBs) are included in this indicator alongside natural water bodies. HMAWBs are classified as good, moderate, poor or bad ‘ecological potential’. Results have been combined; for example, the number of water bodies with a good status classification has been added to the number of HMAWBs with good ecological potential.
4. The results published each year relate to data reported in that year under the WFD; data reported in a given year relate to data collected over the previous year. In 2016, the Environment Agency moved to a triennial reporting system and will report next in late 2019. As classifications are valid until they are next assessed, the latest available data from 2016 have been carried forward.
5. The percentage of water bodies in each status classification has been calculated based on the total number of water bodies assessed in each year.
6. The total number of assessments varies slightly from year to year: in 2009, 5,805 water bodies were assessed; in 2010, 5,739 were assessed; in 2011, 5,760; in 2012, 5,692; in 2013, 5,735; in 2014, 5,769; in 2015, 5,738 under cycle 1 and 4,656 under cycle 2. The results from the 4,656 water bodies assessed in 2016 have been carried forward to 2017 and 2018.
7. The relatively large reduction in the number of assessments in 2015 was due to England adopting the monitoring and classification standards laid down in cycle 2 of the WFD. This means that data from 2015 onwards are not directly comparable to those in earlier years.

Source: Environment Agency

Indicator assessment

<table>
<thead>
<tr>
<th>Assessment of change in status of surface water bodies in England</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long term</td>
</tr>
<tr>
<td>------------</td>
</tr>
<tr>
<td>Percentage surface water bodies in 'High' or 'Good' ecological status</td>
</tr>
</tbody>
</table>

Note: The short-term assessment is based on a 3% rule of thumb. The base year for this assessment uses a 3-year average. See Assessing Indicators.

Indicator description

The WFD specifies the quality elements that can be used to assess the surface water status of a water body. Quality elements can be biological (e.g. fish, invertebrates and plants), chemical (e.g. heavy metals, pesticides and nutrients) or indicators of the condition of the habitats and water flows and levels (e.g. presence of barriers to fish migration and modelled lake level data). Classifications indicate where the quality of the environment is good, where it may need improvement and what may need to be improved. They can also be used, over the years, to plan improvements, show trends and monitor progress.

Surface water status is a composite measure that looks at both the chemical status and the ecological (including biological and habitat condition) status of a water body.

Relevance

Surface waters with good status support a diverse assemblage of aquatic invertebrates, fish, mammals and birds. The EU Water Framework Directive aims to improve and integrate the way water bodies are managed throughout Europe. Member States aim to reach good chemical and ecological status in inland and coastal waters by 2027 at the latest. England is striving to improve and protect the condition of the water environment: objectives to improve and protect each water body have been set; and measures defined to ensure meeting the objectives.
Reducing pressures

The indicator shows progress towards commitments to reduce environmental pressures and protect freshwater ecosystems. It is relevant to outcomes 1, 2 and 3 of *Biodiversity 2020: A strategy for England’s wildlife and ecosystem services* (see Annex A). The indicator is also relevant to international goals and targets (see Annex B of the aforementioned publication for further details).

**Background**

The WFD came into force in December 2000 and became part of English, Welsh, Scottish and Northern Irish law in December 2003. It requires the UK to plan and deliver a better water environment. The WFD has a number of water quality objectives. The key aspects for the EU are the protection of:

- aquatic ecology;
- specific unique and valuable habitats;
- drinking water resources; and
- bathing water.

In 2018, 743 surface water bodies (16%) in England were in high or good status (Figure 21.1). A breakdown of the headline measure by water body type is presented in Figure 21.2 and Table 21.1. In 2018, 15% of rivers and canals, 16% of lakes and 30% of estuaries and coastal water bodies in England were in high or good status.

**Figure 21.2: Status classifications of surface water bodies in England, by water body type, under the water framework directive, 2009 to 2018**

Notes:

1. Based on numbers of surface water bodies classified under the Water Framework Directive (WFD) in England. Includes rivers, canals, lakes, estuaries and coastal water bodies, but excludes SSSI ditches and surface water transfers.
2. A water body is a management unit, as defined by the relevant authorities.
3. Water bodies that are heavily modified or artificial (HMAWBs) are included in this indicator alongside natural water bodies. HMAWBs are classified as high, good, moderate, poor or bad ‘ecological potential’. Results have been combined; for example, the number of water bodies with a high status classification has been added to the number of HMAWBs with high ecological potential.
4. The results published each year relate to data reported in that year under the WFD; data reported in a given year relate to data collected over the previous year.
5. The percentage of water bodies in each status classification has been calculated based on the total number of that type of water body assessed in each year.

6. The total number of water bodies assessed varies slightly from year to year.

7. Data from 2015 onwards are not directly comparable to those in earlier years because of the move to reporting under cycle 2 of the WFD.

Source: Environment Agency.

Table 21.1: Percentage of surface water bodies in England awarded each status classification in 2018; by water body type

<table>
<thead>
<tr>
<th>Status classification</th>
<th>Rivers and canals</th>
<th>Estuaries and coastal</th>
<th>Lakes</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>0.1%</td>
<td>1.2%</td>
<td>0.2%</td>
<td>0.2%</td>
</tr>
<tr>
<td>Good</td>
<td>15.2%</td>
<td>28.3%</td>
<td>16.3%</td>
<td>15.8%</td>
</tr>
<tr>
<td>Moderate</td>
<td>62.1%</td>
<td>65.1%</td>
<td>71.5%</td>
<td>63.4%</td>
</tr>
<tr>
<td>Poor</td>
<td>19.3%</td>
<td>1.8%</td>
<td>11.2%</td>
<td>17.7%</td>
</tr>
<tr>
<td>Bad</td>
<td>3.3%</td>
<td>3.6%</td>
<td>0.8%</td>
<td>3.0%</td>
</tr>
<tr>
<td>Total number of water bodies</td>
<td>3,901</td>
<td>166</td>
<td>589</td>
<td>4,656</td>
</tr>
</tbody>
</table>

Source: Environment Agency

In England, WFD status classification is based on information obtained from monitoring of water quality and biological elements in both long-term surveillance networks and more risk-based operational networks.

The programme of monitoring that takes place in a given period is informed by the results of the previous cycle of monitoring and risk assessments. Where it is known with high certainty that a water body is in good status or in less-than-good status, monitoring effort can be refocused to areas at higher risk. This helps to target resources where they are needed most in the environment.

Surveillance water bodies are monitored more intensively. One objective of surveillance monitoring is to look for signs of impact from pressures in order to validate risk assessments and provide a consistent, long-term monitoring network of sites. At water bodies chosen for the surveillance network, data collectors aim to monitor all quality elements over a river basin management plan cycle.

If there are no sampling data for a particular classification period, results from previous classifications may be rolled-over into the classification assessment. For example, river phosphorus results are calculated from data from the previous 3 years. If there are no data in that sampling period, the last classification assessment is rolled forward.

During 2013 and 2014, England introduced the Ecological Status Indicator (ESI) monitoring program in order to establish a new fixed network of sampling points and provide a complete baseline of ecological status, covering every river water body in England. This new monitoring program significantly increased the number of samples that would normally be collected in any single year. This improved confidence in the classification of ecological status and reported statistics of environmental change in river water bodies from 2014. It also resulted in the step changes to the number of rivers assessed in 2013 and 2014 as being in each of the status classifications (see Figures 21.1 and 21.2).
Reducing pressures

The introduction of new WFD monitoring data and classification standards (including a new baseline adopting all of the new standards, tools, designations and water body boundaries) in 2014 has led to a step change in the number of water bodies assessed as being in each status classification in following years. It also led to a reduction in the total number of water bodies being assessed because under the new WFD guidance, water bodies below the 10km$^2$ catchment area no longer need to be included. The formal reporting of new standards in cycle 2 of the WFD uses the second cycle plans published in 2015. The Environment Agency reported using cycle 2 for the first time in 2015, alongside reporting for the end of cycle 1 in both 2015 and 2016.

Information on the objectives to improve and protect each water body, as well as measures defined to ensure the objectives are met, can be found on the Environment Agency website (see links below). Information on status from more than 127,000 surface water bodies across Europe has been combined into an EU level report.

Web links for information

<table>
<thead>
<tr>
<th>Reference</th>
<th>Website</th>
</tr>
</thead>
<tbody>
<tr>
<td>GOV.UK</td>
<td>Improving water quality</td>
</tr>
<tr>
<td>European Commission</td>
<td>Water Framework Directive</td>
</tr>
<tr>
<td>Environment Agency</td>
<td>River Basin Management Plans</td>
</tr>
</tbody>
</table>

Last updated: September 2019

Latest data available: 2018\(^\text{12}\)

---

\(^{12}\) In 2016, the Environment Agency moved to a triennial reporting system and will report next in late 2019. As classifications are valid until they are next assessed, the latest available data from 2016 have been carried forward to 2018.
22. Agricultural and forest area in environmental management schemes

Type: Response indicator

22a. Area of land in agri-environment schemes

Between 2005 and the end of 2014, agri-environment activities were promoted through Environmental Stewardship (ES). This scheme had 2 strands; Entry Level Schemes (ELS) and Higher Level Schemes (HLS). Whilst ELS encouraged farmers and other land managers to undertake a broad range of activities to provide environmental benefits, HLS was a more targeted scheme. ELS agreements last for 5 years, whereas HLS agreements are 10 years in duration.

The ES scheme closed to new agreements in December 2014. Existing agreements continue to be honoured until they expire. Between the end of 2015 and the end of 2018, the number of ES agreements fell from 37,700 to 12,500. This decline was largely associated with ELS only agreements.

In 2015, a new agri-environment scheme, new Countryside Stewardship, was launched. The first agreements went live in 2016. This is a more targeted and competitive scheme. The strands of the scheme reported here are Mid-Tier and Higher-Tier. At the end of 2018, uptake of Countryside Stewardship had increased with almost 10,000 agreements managing just over 502,000 hectares of land. In addition, a further 26,000 hectares were being managed under the Woodland Management Plans strand of the scheme. The areas quoted exclude co-located supplementary options. If these were included, the total area in Countryside Stewardship would be falsely inflated.

Fluctuations in areas of land under agri-environment agreements over time can occur as a result of the introduction of new schemes and the ending of previous scheme agreements. Existing agreements will continue until they expire.

Higher level or targeted agri-environment schemes

In 2018, the total area of land in all higher-level or targeted agri-environment agreements operating in England was 1.6 million hectares. Figure 22.1 shows the area of land under the previous higher level, targeted schemes and the new Countryside Stewardship schemes. The expiring schemes include the HLS strand of ES and the ‘Classic’ schemes, namely Environmentally Sensitive Areas and the previous Countryside Stewardship Scheme. The chart shows that the area under targeted agri-environment schemes has gradually increased over time.
Figure 22.1: Area of land under expiring and new targeted agri-environment scheme agreements in England, 1987 to 2018

Notes:
1. Schemes are not directly comparable as they have different reporting requirements and different objectives.
2. Systematic data collection started in 1992; areas from 1987 to 1991 are estimated. Uptake figures are the cumulative area assessed in December of year shown.
3. (a) includes Freestanding HLS and HLS linked to ELS.
4. (b) new Countryside Stewardship schemes (HT, Higher-Tier; MT, Mid-Tier) – for 2016 only, co-located options are included. Taking account of co-location gives an actual area of 76,498 hectares.

Source: Defra, Natural England.

Entry level agri-environment schemes

In 2018, the total area of farms with entry level agreements was 2.2 million hectares. Figure 22.2 shows the area under ELS. The area of land in ELS has shown a significant increase since pilot schemes were introduced in 2003/04, reaching around 6.5 million hectares in 2013. Existing agreements will continue to be honoured until they expire.


**Figure 22.2: Area of land under the expiring Entry Level Stewardship Scheme, 2003 to 2018**

![Graph showing area of land under the expiring Entry Level Stewardship Scheme, 2003 to 2018](image)

**Notes:**

1. Uptake figures are the cumulative area assessed in December of year shown.
2. The area under ELS includes ELS, Organic Entry Level Stewardship (OELS), Uplands Entry Level Stewardship (UELS) from 2010, and HLS linked to ELS.

**Source:** Defra, Natural England.

**22b. Area of forestry land under certified sustainable management schemes**

In March 2019, there were 325,000 hectares of certified woodland across England, representing 25% of the total woodland area. The proportion of woodland certified as sustainably managed has remained between 25% and 28% since 2008.

Certification of woodlands promotes responsible forest management to safeguard forests’ natural heritage and protect threatened species. Since 2001, the percentage of woodland certified as sustainably managed in England has increased from 23% to 25% in 2019.

The total area certified can change if new woodlands are certified, if existing certificate holders decide not to renew, or if there is a delay in renewal of an existing certificate.

**Indicator Description**

The second part of this indicator shows the percentage of the woodland area in England that is certified against agreed environmental standards. Woodland certification schemes promote good forest practice and are used to demonstrate that wood or wood products come from well-managed forests.
Figure 22.3: Percentage of woodland in England certified as sustainably managed, 2001 to 2019

Notes:
1. This indicator is taken from the Forestry Commission National Statistics publication ‘Woodland Statistics’.
2. All figures relate to data at 31 March, apart from 2001 (31 December) and 2002 (30 September), with regular data collection from 2004.

Source: Forestry Commission.

Indicator assessment

| Assessment of change in the numbers of environmental management schemes and the area of sustainably managed woodland |
|---|---|---|---|
| Higher level or targeted agri-environment schemes | Long term | Short term | Latest year |

Notes:
1. Assessment of the individual measures is based on a 3-year average from the baseline, using the 3 earliest consecutive years available. See Assessing Indicators.
2. An assessment of ELS is not included as this scheme has closed. The new Countryside Stewardship scheme does not contain a similar strand for such an assessment to be continued in the future. As a result, it is appropriate only provide an assessment of the higher level agri-environment schemes.
Reducing pressures

Relevance

The indicator shows progress with commitments to improve the status of our wildlife and habitats. It is relevant to outcome 1 in *Biodiversity 2020: A strategy for England’s wildlife and ecosystem services* (see Annex A) and it is directly relevant to the following priority actions in the strategy:

**Priority action 3.1:** Improve the delivery of environmental outcomes from agricultural land management practices, whilst increasing food production.

**Priority action 3.3:** Bring a greater proportion of our existing woodlands into sustainable management and expand the area of woodland.

The indicator is also relevant to international goals and targets (see Annex B of the aforementioned publication).

Background

**Agri-environment schemes**

Agri-environment schemes require farmers and land managers to implement environmentally-beneficial management and demonstrate good environmental practice on their farm; they have existed since the mid-1980s.

In 1992, there were 175,000 hectares of land in England in Environmentally Sensitive Areas (ESA) and the previous Countryside Stewardship Scheme (CSS). These were higher level agreements or targeted schemes. At their peak, in 2004, there was around 1.2 million hectares in these schemes.

In 2005, Environmental Stewardship (ES) was launched replacing CSS and ESAs. There were 2 strands; Entry Level Scheme (ELS) and Higher Level Scheme (HLS). ELS was a non-competitive scheme which aimed for a high level of uptake across the Country. ELS required simple and effective environmental management, designed to address environmental issues across the wider countryside such as diffuse pollution, loss of biodiversity and deterioration of landscape character and were designed to cover the majority of farmland. HLS had an increased focus on environmental outcomes, particularly for priority habitats (see indicator 4). HLS targeted environmental management to conserve wildlife, maintain and enhance landscape quality and character, promote public access and understanding of the countryside, and protect the historic environment and natural resources.

At the end of 2014, when ES closed to new applicants, there were more than 49,000 agri-environment scheme agreements covering in excess of 6.5 million hectares in England.

From 2015, a new agri-environment scheme, Countryside Stewardship, was introduced, replacing ES. The first agreements went live in 2016. Countryside Stewardship brings together many schemes including catchment-sensitive farming and woodland grants and includes Mid-Tier and Higher-Tier strands. These are more targeted; the applicant is expected to ensure the options they take address the priorities for their land. ES and CS are reported differently. ES is measured as the total area of holdings which have agreements, whereas CS is measured in terms of the total area under management options, i.e. the area of land being actively managed for environmental benefits. As a result, the schemes are not comparable. A breakdown of the area and number of agreements by scheme type is given in Table 22.1.

---

13 *Entry Level Stewardship (ELS) was designed to deliver simple environmental benefits across a significant proportion of the farmed landscape. In 2008, a review of Environmental Stewardship recognised shortfalls in this approach and concluded that the environmental performance of ELS would be improved if “... a significantly enhanced, geographically differentiated, programme of advice...” was provided. This is now in place in the form of the Environmental Stewardship Training and Information Programme (ETIP).*
Reducing pressures

Table 22.1: Overall agri-environment scheme coverage in England, December 2018

<table>
<thead>
<tr>
<th>Scheme</th>
<th>No. of agreements</th>
<th>Area (‘000 hectares)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Entry Level Stewardship (including Organic ELS, Uplands ELS and ELS plus HLS agreements)</td>
<td>11,200</td>
<td>2,167 ¹</td>
</tr>
<tr>
<td>Higher Level Stewardship (HLS) including freestanding HLS and HLS linked to ELS</td>
<td>11,600</td>
<td>1,106</td>
</tr>
<tr>
<td>Environmental Stewardship (ES) including ELS, ELS-HLS, HLS, ELS pilot and organic equivalents</td>
<td>12,500</td>
<td>2,279</td>
</tr>
<tr>
<td>New Countryside Stewardship (mid-tier)</td>
<td>8,100</td>
<td>326</td>
</tr>
<tr>
<td>New Countryside Stewardship (higher-tier)</td>
<td>1,700</td>
<td>176</td>
</tr>
</tbody>
</table>

Notes:
1. This includes 760,000 hectares of the Severely Disadvantaged Area.
2. The majority of HLS agreements are underpinned by an ELS agreement. As a result, the areas for ELS and HLS cannot simply be aggregated to provide the total area under ES.

Source: Defra, Natural England.

Sustainable woodland management

The indicator shows the percentage of the woodland area in the UK that is certified against agreed environmental standards, derived from the areas reported on certificates and more detailed assessment of selected certificate holders.

Certification in the UK began in 1996, with data collation starting in 2001 and becoming a regular annual collation in 2004. All certified woodland in 2015 is certified under the Forest Stewardship Council (FSC) scheme. Some of these woodlands are also certified under the Programme for the Endorsement of Forest Certification (PEFC) scheme. A breakdown for England of the area of woodland under certified management is given in Table 22.2. Certified woodland areas are often used as an indicator of sustainable management, however, it should be noted that woodland that is not certified may also be managed sustainably. New certificates may relate to existing woodland that was not previously certified or to newly planted areas.

In order for products made from timber to achieve certification, both forest management practices and the Chain of Custody, which tracks timber from forest to retail outlet, must be assessed.

Table 22.2: Area of woodland certified as sustainably managed in England, March 2019

<table>
<thead>
<tr>
<th>Ownership</th>
<th>Area (‘000 hectares)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forestry Commission</td>
<td>215</td>
</tr>
<tr>
<td>Private sector</td>
<td>110</td>
</tr>
<tr>
<td><strong>Total woodland area certified</strong></td>
<td><strong>325</strong></td>
</tr>
</tbody>
</table>

Note: Where possible, calculations have used the total woodland area certified, rather than the total land area certified.

Source: Forest Service, Forest Stewardship Council, Forestry Commission, Natural Resources Wales.
### Web links for further information

<table>
<thead>
<tr>
<th>Reference</th>
<th>Website</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forestry Commission</td>
<td>The UK Forestry Standard (UKFS)</td>
</tr>
<tr>
<td>Forest Stewardship Council</td>
<td>FSC Certified Forest Certificate List</td>
</tr>
<tr>
<td>Natural England</td>
<td>Environmental Stewardship</td>
</tr>
<tr>
<td>Natural England</td>
<td>New Countryside Stewardship</td>
</tr>
<tr>
<td>Programme for the Endorsement of Forest Certification (PEFC)</td>
<td>International Forest Sustainability</td>
</tr>
</tbody>
</table>

**Last updated:** September 2019  
**Latest data available:**  
22a agri-environment schemes – December 2018;  
22b certified woodland – March 2019
23. Sustainable fisheries: fish stocks harvested within safe limits

a. Percentage of marine fish (quota) stocks of UK interest harvested sustainably

b. Percentage of marine fish (quota) stocks of UK interest with biomass at levels that maintain full reproductive capacity

Type: Pressure (a) and state (b) indicator

Summary

Following on from the previous publication, the indicator uses quota-fish assessments for UK good environmental status (GES) developed to meet the needs of the Marine Strategy Framework Directive (MSFD). Data have been updated to 2017 for both fishing pressure and spawning stock biomass.

The percentage of fish stocks (including Nephrops) fished at or below levels capable of producing maximum sustainable yield ($F_{\text{MSY}}$) has increased from 7% in 1990 to 49% in 2017.

To maintain the reproductive capacity of stocks, each stock’s spawning biomass (SSB) should be at or above the level capable of producing maximum sustainable yield (i.e. $F_{\text{Bigger}}$). The percentage of stocks subject to quota management and achieving this goal increased from 32% in 1990 to 60% in 2017.

In the final year (2017), there was a 6.7% decrease in the percentage of stocks with fishing pressure < $F_{\text{MSY}}$ due to data availability and consequently more stocks classified as “unknown”. Overall, a positive trend towards a greater proportion of stocks fished sustainably and within safe biological limits is evident in both the long and short term.

Figure 23.1: Percentage of marine fish (quota) stocks of UK interest harvested sustainably, 1990 to 2017
Notes:
1. Based on 57 stocks for which data are available, derived from stock assessment reports.
2. The data series has been updated to 2017 and are different to the previous publication. When new stock assessment data are incorporated into the model to compile this time series, all data are subject to minor revisions.

Source: Centre for Environment, Fisheries and Aquaculture Science; International Council for the Exploration of the Sea.

Figure 23.2: Percentage of marine fish (quota) stocks of UK interest with biomass at levels that maintain full reproductive capacity, 1990 to 2017

Notes:
1. Based on 57 stocks for which data are available, derived from stock assessment reports.
2. The data series has been updated to 2017 and are different to the previous publication. When new stock assessment data are incorporated into the model to compile this time series, all data are subject to minor revisions.

Source: Centre for Environment, Fisheries and Aquaculture Science; International Council for the Exploration of the Sea.

Indicator assessment

| Overall assessment of change in fish stocks of UK interest harvested sustainably and at full reproductive capacity |
|-------------------------------------------------|-------------------------------|-----------------|-----------------|

Note: Long and short-term assessments are based on a 3% rule of thumb. The base years for these assessments use a 3-year average. See Assessing Indicators.
Reducing pressures

Relevance

Fish are an integral component of marine biodiversity. They are an important element of the food chain for seabirds, seals and cetaceans and are a source of food and employment for people. Sustainable fisheries will help to ensure marine ecosystems remain diverse and resilient and provide a long-term and viable fishing industry.

In 2004, the Royal Commission on Environmental Pollution advised significant and urgent action to avoid collapse of fisheries or harm to the marine environment. The assessments indicate an increase in the last 5 years in the percentage of fish stocks being harvested sustainably. However, substantial further improvements in stock status would be needed to ensure that all UK fish stocks are fished sustainably and attain biomass levels that maintain full reproductive capacity.

This indicator is relevant to outcomes 2 and 2B in *Biodiversity 2020: A strategy for England’s wildlife and ecosystem services* (see Annex A). It is also relevant to international goals and targets (see Annex B of the aforementioned publication).

The Marine and Coastal Access Act was introduced in 2009 to ensure clean, healthy, safe, productive and biologically diverse oceans and seas. As a result, better systems for delivering sustainable development of marine and coastal environment are being put in place.

Background

The indicator comprises of 2 measures: the percentage of fish stocks in seas around the UK that are harvested sustainably; and those at full reproductive capacity. It is based on a group of 20 species in 57 stocks for which there are reliable estimates of fishing mortality and spawning biomass, together with MSY reference points for fishing mortality and biomass that allow the sustainability of the stocks to be evaluated. The indicator stocks include a range of local and widely distributed species of major importance to the UK fishing industry.

The measures are assessed as follows:

1. An evaluation of the temporal trends in the exploitation level of stocks of UK interest with respect to the fishing mortality target, $F_{MSY}$. The aim is to increase the percentage of stocks fished at or below $F_{MSY}$ and reduce to zero the number of stocks of unknown status relative to $F_{MSY}$.

2. An evaluation of the temporal trends in the spawning stock biomass (SSB) of stocks of UK interest with respect to safe biological limits. The aim is to increase the percentage of stocks with SSB at or above MSY $B_{trigger}$ and reduce to zero the number of stocks that have unknown status relative to MSY reference points.

The assessments of change are made by applying a 3% rule of thumb to each measure (pressure and state) separately.

Stocks that meet both the pressure and state thresholds ($F_{MSY}$ and MSY $B_{trigger}$) are harvested sustainably and delivering the largest possible catches, on average that the stocks can provide under the prevailing environmental conditions. While pressure is directly manageable through implementation of management measures, the change in state is not wholly manageable. State changes are dependent on environmental conditions and predator-prey interactions and although conditions for recovery of stocks may be in place (i.e. through reductions in pressure) recovery time may still be extensive (many years).

This UK indicator is based on a consistent set of 57 stocks since 1990. A ‘stock’ refers to a population of a species occurring in a defined sea area; a particular species may occur in multiple stocks in waters around the UK. The stocks represent a wide range of different stocks and fisheries including demersal roundfish (e.g. cod, haddock, saithe), flatfish (sole, plaice), pelagic fish (blue whiting, mackerel) and shellfish (*Nephrops*). Table 23.1 shows the species included. Many of these stocks are extremely valuable or have a high conservation profile. The indicator is intended to provide a relative trend over time. The indicator includes stocks with ‘unknown’ status if data are not adequate to allow estimation of historical biomass and fishing mortality, or for which the International Council for the Exploration of the Sea (ICES) does not provide MSY reference points.
The ICES classifies a stock's status by comparing the quantity of mature fish (the spawning stock biomass) and the rate at which the stock is exploited (fishing mortality), in relation to agreed reference levels. The stock trends and reference levels are obtained from fishery and survey data from each zone. The UK indicator shows the percentage of the 57 stocks of UK interest that are at full reproductive capacity and harvested sustainably in each year.

Each year ICES updates the assessment of each stock with another year of fishery and survey data, or may revise an assessment to include new time-series of data or adopt an improved method of analysis. This can result in substantial changes to the trends in spawning stock biomass and rate of exploitation, causing changes to the historical values in the UK indicator series. On the basis of new evidence, ICES may also provide advice in relation to reference points for stocks for which the assessments were previously considered unreliable, or stop providing such advice for stocks for which the assessments or reference points are no longer considered reliable.

All stock data are derived from ICES advice except for cod (Gadus morhua) in Division 6.a (West of Scotland), where estimates are derived from the ICES 2018 Report of the Working Group on Celtic Seas Ecoregion (WGCSE), ICES CM 2018/ACOM:13.

### Table 23.1: Fish species and stocks included in this indicator

<table>
<thead>
<tr>
<th>Species (20)</th>
<th>Stocks (57)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black-bellied anglerfish (Lophius budegassa)</td>
<td>Anglerfish (Lophius budegassa. Lophius piscatorius) in subareas 4 and 6. and Division 3.a (North Sea. Rockall and West of Scotland. Skagerrak and Kattegat)</td>
</tr>
<tr>
<td>Blue whiting (Micromesistius poutasso)</td>
<td>Black-bellied anglerfish (Lophius budegassa) in divisions 7.b-k. 8.a-b. and 8.d (west and southwest of Ireland. Bay of Biscay)</td>
</tr>
<tr>
<td>Cod (Gadus morhua)</td>
<td>Cod (Gadus morhua) in Subarea 4. Division 7.d. and Subdivision 20 (North Sea. eastern English Channel. Skagerrak)</td>
</tr>
<tr>
<td>Pollack (Pollachius pollachius)</td>
<td>Cod (Gadus morhua) in Division 6.a (West of Scotland)</td>
</tr>
<tr>
<td>Roundnose grenadier (Coryphaenoides rupestris)</td>
<td>Cod (Gadus morhua) in Division 6.b (Rockall)</td>
</tr>
<tr>
<td>Saithe (Pollachius virens)</td>
<td>Cod (Gadus morhua) in Division 7.a (Irish Sea)</td>
</tr>
<tr>
<td>Sole (Solea solea)</td>
<td>Cod (Gadus morhua) in divisions 7.e-k (western English Channel and southern Celtic Seas)</td>
</tr>
<tr>
<td>Sprat (Sparus sprattus)</td>
<td>Spurdog (Squalus acantias) in subareas 1-10. 12 and 14 (the Northeast Atlantic and adjacent waters)</td>
</tr>
<tr>
<td>Whiting (Merlangius merlangus)</td>
<td>Haddock (Melanogrammus aeglefinus) in Division 6.b (Rockall)</td>
</tr>
<tr>
<td>Fish Species</td>
<td>Subareas/Divisions/Functional Units</td>
</tr>
<tr>
<td>--------------</td>
<td>-----------------------------------</td>
</tr>
<tr>
<td>Haddock</td>
<td>Division 7.a (Irish Sea)</td>
</tr>
<tr>
<td>Haddock</td>
<td>divisions 7.b-k (southern Celtic Seas and English Channel)</td>
</tr>
<tr>
<td>Herring</td>
<td>Subarea 4 and divisions 3.a and 7.d. autumn spawners (North Sea, Skagerrak and Kattegat, eastern English Channel)</td>
</tr>
<tr>
<td>Herring</td>
<td>in divisions 6.a and 7.b-c (West of Scotland, West of Ireland)</td>
</tr>
<tr>
<td>Herring</td>
<td>Divisions 7.a South of 52°30’N, 7.g–h, and 7.j–k (Irish Sea, Celtic Sea, and southwest of Ireland)</td>
</tr>
<tr>
<td>Herring</td>
<td>Divisions 7.a North of 52°30’N (Irish Sea)</td>
</tr>
<tr>
<td>Hake</td>
<td>Subareas 4, 6, and 7 and divisions 3.a, 8.a-b. and 8.d. Northern stock (Greater North Sea, Celtic Seas, and the northern Bay of Biscay)</td>
</tr>
<tr>
<td>Horse mackerel</td>
<td>Trachurus trachurus in Subarea 8 and divisions 2.a, 4.a, 5.b, 6.a, 7.a-c.e-k (the Northeast Atlantic)</td>
</tr>
<tr>
<td>Megrim</td>
<td>in divisions 4.a and 6.a (northern North Sea, West of Scotland)</td>
</tr>
<tr>
<td>Megrim</td>
<td>in Division 6.b (Rockall)</td>
</tr>
<tr>
<td>Ling</td>
<td>in subareas 6-9, 12, and 14. and divisions 3.a and 4.a (Northeast Atlantic and Arctic Ocean)</td>
</tr>
<tr>
<td>Mackerel</td>
<td>in subareas 1-8 and 14 and Division 9.a (the Northeast Atlantic and adjacent waters)</td>
</tr>
<tr>
<td>Megrim</td>
<td>in divisions 7.b-k, 8.a-b. and 8.d (west and southwest of Ireland, Bay of Biscay)</td>
</tr>
<tr>
<td>White anglerfish</td>
<td>Lophius piscatorius in Subarea 7 and divisions 8.a-b and 8.d (Celtic Seas, Bay of Biscay)</td>
</tr>
<tr>
<td>Norway lobster</td>
<td>Nephrops norvegicus in Division 6.a. Functional Unit 11 (West of Scotland, North Minch)</td>
</tr>
<tr>
<td>Norway lobster</td>
<td>Nephrops norvegicus in Division 6.a. Functional Unit 12 (West of Scotland, South Minch)</td>
</tr>
<tr>
<td>Norway lobster</td>
<td>Nephrops norvegicus in Division 6.a. Functional Unit 13 (West of Scotland, the Firth of Clyde and Sound of Jura)</td>
</tr>
<tr>
<td>Norway lobster</td>
<td>Nephrops norvegicus in Division 7.a. Functional Unit 14 (Irish Sea, East)</td>
</tr>
<tr>
<td>Norway lobster</td>
<td>Nephrops norvegicus in Division 7.a. Functional Unit 15 (Irish Sea, West)</td>
</tr>
<tr>
<td>Norway lobster</td>
<td>in divisions 7.b-c and 7.j-k. Functional Unit 16 (west and southwest of Ireland, Porcupine Bank)</td>
</tr>
<tr>
<td>Norway lobster</td>
<td>Nephrops norvegicus in divisions 4.b and 4.c. Functional Unit 5 (central and southern North Sea, Botney Cut-Silver Pit)</td>
</tr>
<tr>
<td>Norway lobster</td>
<td>Nephrops norvegicus in Division 4.b. Functional Unit 6 (central North Sea, Farn Deeps)</td>
</tr>
<tr>
<td>Norway lobster</td>
<td>Nephrops norvegicus in Division 4.a. Functional Unit 7 (northern North Sea, Fladen Ground)</td>
</tr>
<tr>
<td>Norway lobster</td>
<td>Nephrops norvegicus in Division 4.b. Functional Unit 8 (central North Sea, Firth of Forth)</td>
</tr>
<tr>
<td>Norway lobster</td>
<td>Nephrops norvegicus in Division 4.b. Functional Unit 9 (central North Sea, Moray Firth)</td>
</tr>
<tr>
<td>Plaice</td>
<td>Pleuronectes platessa in Subarea 4 (North Sea) and Subdivision 20 (Skagerrak)</td>
</tr>
<tr>
<td>Plaice</td>
<td>Pleuronectes platessa in Division 7.a (Irish Sea)</td>
</tr>
<tr>
<td>Plaice</td>
<td>Pleuronectes platessa in Division 7.d (eastern English Channel)</td>
</tr>
<tr>
<td>Plaice</td>
<td>Pleuronectes platessa in Division 7.e (western English Channel)</td>
</tr>
</tbody>
</table>
Reducing pressures

Plaice (*Pleuronectes platessa*) in divisions 7.f and 7.g (Bristol Channel, Celtic Sea)

Saithe (*Pollachius virens*) in subareas 4, 6 and Division 3.a (North Sea, Rockall and West of Scotland, Skagerrak and Kattegat)

Pollack (*Pollachius pollachius*) in subareas 6-7 (Celtic Seas and the English Channel)

Roundnose grenadier (*Coryphaenoides rupestris*) in subareas 6-7 and divisions 5.b and 12.b (Celtic Seas and the English Channel, Faroes grounds and western Hatton Bank)

Sole (*Solea solea*) in Subarea 4 (North Sea)

Sole (*Solea solea*) in Division 7.a (Irish Sea)

Sole (*Solea solea*) in Division 7.d (eastern English Channel)

Sole (*Solea solea*) in Division 7.e (western English Channel)

Sole (*Solea solea*) in divisions 7.f and 7.g (Bristol Channel, Celtic Sea)

Sprat (*Sprattus sprattus*) in Subarea 4 (North Sea)

Sprat (*Sprattus sprattus*) in Subarea 6 and divisions 7.a-c and 7.f-k (West of Scotland, southern Celtic Seas)

Blue whiting (*Micromesistius poutassou*) in subareas 1-9, 12, and 14 (Northeast Atlantic and adjacent waters)

Whiting (*Merlangius merlangus*) in Subarea 4 and Division 7.d (North Sea and eastern English Channel)

Whiting (*Merlangius merlangus*) in Division 6.a (West of Scotland)

Whiting (*Merlangius merlangus*) in Division 6.b (Rockall)

Whiting (*Merlangius merlangus*) in Division 7.a (Irish Sea)

Whiting (*Merlangius merlangus*) in divisions 7.b-c and 7.e-k (southern Celtic Seas and eastern English Channel)

Source: International Council for Exploration of the Sea (ICES) Advisory Committee on Fisheries Management reports; Centre for Environment, Fisheries and Aquaculture Science (Cefas).

Web links for further information

<table>
<thead>
<tr>
<th>Organisation</th>
<th>Subject</th>
</tr>
</thead>
<tbody>
<tr>
<td>Centre for Environment, Fisheries and Aquaculture Science</td>
<td>Sustainable fisheries management</td>
</tr>
<tr>
<td>Centre for Environment, Fisheries and Aquaculture Science</td>
<td>Technical Background Document</td>
</tr>
<tr>
<td>International Council for the Exploration of the Sea</td>
<td>Fisheries Statistics</td>
</tr>
<tr>
<td>Royal Commission on Environmental Pollution</td>
<td>Turning the Tide: Addressing the Impact of Fisheries on the Marine Environment. London, the Stationary Office</td>
</tr>
</tbody>
</table>

Last updated: September 2019

Latest data available: 2017
24. Biodiversity data for decision making

Type: State indicator

Summary
The number of records within the National Biodiversity Network (NBN) Gateway has increased from 15 million at the beginning of 2004 to 83 million at the beginning of 2013, and to 131.3 million at the end of March 2017, at which time the Gateway closed and was replaced by the NBN Atlas. Since the NBN Atlas opened in April 2017, there has been an increase of 89.4 million records to the end of May 2019 (Figure 24.1).

The number of publicly accessible records which are at 1km² resolution or better increased from 10.5 million at the beginning of January 2010, to 35.2 million at the end of March 2017 in the NBN Gateway. The NBN Atlas which began in April 2017 contained almost 130.0 million records at the end of May 2019 which are at 1km² resolution or better (Figure 24.1).

Figure 24.1: Cumulative number of records in the National Biodiversity Network Atlas (formerly the National Biodiversity Network Gateway), 2004 to 2019

Notes:
1. The number of records from May 2018 dropped as a result of the system behind the NBN Atlas not saving the date (timestamp field) of when the records were first created. In addition to this there were also technical challenges between the transfer of data from the Gateway to the NBN Atlas, where the NBN have had to delete records first before they are updated. Both of these problems have now been resolved.
2. The step change observed in both time series in 2017 is due to the move from the NBN Gateway to the NBN Atlas and the addition of 10 large datasets by the British Trust for Ornithology (see Indicator description section for further details).

Source: National Biodiversity Network.
Indicator assessment

<table>
<thead>
<tr>
<th>Assessment of change in biodiversity data for decision making</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Long term</strong></td>
</tr>
<tr>
<td>----------------</td>
</tr>
<tr>
<td>Cumulative number of records in the National Biodiversity Network</td>
</tr>
<tr>
<td>Number of publicly accessible records at 1km² resolution or better</td>
</tr>
</tbody>
</table>

**Note:** Long and short-term assessments are based on a 3% rule of thumb. The base years for these assessments use a 3-year average. See Assessing Indicators.

Indicator description

Millions of biological observations (records) have been recorded in the UK over the past century by a wide variety of organisations and individuals. Most of these people are volunteers who organise themselves through many national and local societies and recording schemes. The UK and devolved governments (through their conservation and environmental bodies), local government and non-government wildlife-related organisations all collect and use biodiversity data. Information is held by many different organisations and the individuals who collect it, in a variety of formats, from computer databases to handwritten record cards. This means that although a huge amount of information exists, it is not always easy to access.

This indicator provides an evaluation of the number of records added to the [NBN Atlas](https://www.nbn.org.uk) (which replaced the NBN Gateway in April 2017) in a particular year and the resolution of those data, as a proxy for the evidence available to underpin conservation decision making. Figure 24.1 shows the year that records were added to the NBN, not the date of the record.

The headline measures are evaluated by taking a 3-year average of the base year compared to the final data point. The assessment of change is evaluated against a 3% rule of thumb. If the difference is more than 3% then an increasing or decreasing assessment is made, depending on the direction of the change.

Figure 24.1 also shows the number of records which are publicly accessible at a resolution of 1km² or better. The number of publicly accessible high resolution records increased from just under 5 million at the start of February 2008 to just under 130 million at the end of May 2019. During the period between the beginning of March and the end of April 2016 a large number of new and updated datasets were loaded on the NBN Gateway (around 210 datasets), including a new UK Butterfly Monitoring Scheme (UKBMS) dataset which added 5.7 million records. The update to the Butterfly Conservation’s National Moth Recording Scheme dataset (total records around 20 million records on the NBN Gateway) may have accounted for the rise in April-May 2016, followed by a drop of 2.4 million records seen in June 2016, as the updated moth surveys were loaded before the old surveys were removed. A very large number of records were added to the NBN in April 2017 as a result of the changeover from the NBN Gateway to the NBN Atlas. Some of the large increase in the number of records is a result of the British Trust for Ornithology (BTO) adding 10 new datasets which accounted for nearly 156 million records in the Atlas. Approximately 55.8 million of the 95.5 million records that were on the Gateway were transferred to the Atlas, but other records were not transferred – due to a variety of reasons, including data providers not taking the opportunity to update the datasets and/or they had to gain permission from the data owners.

Over time more high-resolution data are becoming available, for example, protected species records have recently been uploaded – which is important since more detailed records are of more value for conservation casework. In the case of protected species this can be used to evaluate whether species are present at a particular location and thereby to assess if a proposed development might impact on the protected species.
In addition to the resolution of the records, it is important to consider how recent the records are. Current records, less than 10 years old, are more useful for advice on planning matters than older records. Figure 24.2 shows the proportion of publicly accessible records at 1km² resolution or better. The addition of a very large number of records at the point of change between the NBN Gateway and the NBN Atlas means that many older records were added at the same time as newer ones – this has decreased the proportion of records less than 5 years old in the May-19 column of Figure 24.2. For example, the 10 datasets from the BTO only went up to the end of 2015, so are not completely up-to-date, and therefore contribute more to the ‘less than 10 years old’ part of Figure 24.2.

Figure 24.2: Age of records at 1km² resolution or better sourced from the National Biodiversity Network in May 2015 to May 2019

Note: The data represented are a snapshot of the data available as at 4 May 2015, 2 May 2016, 31 May 2017, 31 May 2018 and 31 May 2019 sourced from the NBN.

Source: National Biodiversity Network.

Relevance

Good policy making and evaluation is based on evidence. Evidence will also help to engage the public, natural resource managers and business, to actively address biodiversity loss. There are therefore a range of geographic scales of decision making (from local to national) and audiences (public sector, industry, public, research, etc.) that have an interest in the availability of biodiversity data. The indicator is focused on the availability of data collated by the NBN for decision making – evaluating actual use within decision making is more difficult.

Background

The NBN works to set standards for data exchange and data accuracy, and captures wildlife data in a standard electronic form; allowing the integration of data from different sources, and use of the internet to enable data to be used in different ways by as many people as possible. History of the development of the NBN Gateway and Atlas, and a detailed timeline are available from the NBN website. Key points to note in the context of this indicator are:
• The development of a prototype NBN Gateway in 2001;
• Redevelopment and relaunch of the Gateway in November 2013 – which is the start point for the development of many of the metrics used here; and
• The switch to the NBN Atlas in April 2017.

Now registered users can request enhanced access to records of sensitive species from data providers through the NBN Atlas and if granted the users can access higher resolution data just like under the previous system, the NBN Gateway. This gives data providers control of who can use their data for particular purposes. Where requests are made to access protected species records through the NBN Atlas, this can be given however the location details are generalised in the NBN Atlas in order to protect the actual location of the protected species. Not all records can be given enhanced access through the NBN Atlas therefore users may need to contact the data providers. Government and its arms-length bodies have over recent years been moving much more to open data, and the development of the NBN Atlas fits with that agenda.

One of the principal means of collation and interpretation of this data is the network of local records centres and the Biological Records Centre (BRC) which collates and interprets data from many national recording schemes. The BRC regularly update more than 20 data resources on the NBN Atlas each month and the NBN are looking to automate this process. This process is increasing the speed that verified records from the national recording schemes are appearing on the NBN Atlas. The NBN Atlas is a free online tool that provides a platform to engage, educate and inform people about the natural world. It enables the combination of multiple sources of information about UK species and habitats and provides the ability to interrogate, combine and analyse these data in a single location. Individual records, for example for plants, mammals, birds and invertebrates, are stored on the NBN Atlas. Records can be quickly and easily accessed and displayed on a map of the UK in a number of different ways to aid understanding of the distribution of particular species in the UK.

This biological information is vital if the distribution and abundance of species and habitats is to be understood. Without it, making informed decisions on how to protect the UK’s wildlife is much more difficult.

Figure 24.3: Resolution of publicly available records on the National Biodiversity Network in May 2015 to May 2019
Note: The data represented are a snapshot of the data available as at 4 May 2015, 2 May 2016, 31 May 2017, 31 May 2018 and 31 May 2019 sourced from the NBN.

Source: National Biodiversity Network.

Figure 24.3 shows an increase in the proportion of publicly available records at 1km\(^2\) (from 14.5% in May 2015 to 58.9% at the end of May 2019) and 2km\(^2\) (from 11.8% to 19.5%), and a decrease in the proportion at 100m (17.3% in May 2015 to 7.1% in May 2019) and for 10km\(^2\) (56.5% in May 2015 to 14.5% in May 2019). This is partly as a result of a change in the data access policy by a major contributor to the NBN Gateway, Butterfly Conservation, which decided in 2015 to make approximately 5.7 million records prior to 2010 available at a 2km\(^2\) resolution, which previously had not been accessible. The vast majority of the records from the British Trust for Ornithology (BTO) were at the 1km\(^2\) resolution and as not all of the records were transferred from the Gateway to the Atlas it is likely that some of the records at 10km\(^2\) resolution were not transferred across. There has been an increase in the number of records at 100m scale between May 2018 and May 2019. This is probably due to both the Marine Biological Association (MBA) and the Centre for Environmental Data and Recording in Northern Ireland (CEDaR) uploading a number of marine datasets.

Figures 24.4 and 24.5 show the number of downloads and the number of records downloaded since November 2013 when the NBN Gateway was relaunched. The number of downloads (Figure 24.4) has increased significantly in 2018 whereas the number of records downloaded has seen a decrease (Figure 24.5). It is not entirely clear why this is and in 2018 there were 11,750 downloads from the NBN Gateway, with a total of 563.7 million records downloaded.

Figure 24.4: Number of downloads from the National Biodiversity Network, 2014 to 2018

Note: Based on the number of downloads for full calendar years from the NBN Gateway since it was relaunched in November 2013.

Source: National Biodiversity Network.
Figure 24.5: Number of records downloaded from the National Biodiversity Network, 2014 to 2018

United Kingdom

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of records downloaded (Millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>581.0</td>
</tr>
<tr>
<td>2015</td>
<td>816.9</td>
</tr>
<tr>
<td>2016</td>
<td>981.3</td>
</tr>
<tr>
<td>2017</td>
<td>576.2</td>
</tr>
<tr>
<td>2018</td>
<td>563.7</td>
</tr>
</tbody>
</table>

**Note:** Based on the number of records downloaded within full calendar years from the NBN since it was relaunched in November 2013.

**Source:** National Biodiversity Network.

**Web links for further information**

<table>
<thead>
<tr>
<th>Reference</th>
<th>Title</th>
<th>Website</th>
</tr>
</thead>
<tbody>
<tr>
<td>National Biodiversity Network</td>
<td>Home page</td>
<td><a href="http://www.nbn.org.uk/">http://www.nbn.org.uk/</a></td>
</tr>
<tr>
<td>National Biodiversity Network</td>
<td>History</td>
<td><a href="https://nbn.org.uk/about-us/what-we-do/history/">https://nbn.org.uk/about-us/what-we-do/history/</a></td>
</tr>
<tr>
<td>National Biodiversity Network Atlas</td>
<td>Home page</td>
<td><a href="https://nbnatlas.org/">https://nbnatlas.org/</a></td>
</tr>
<tr>
<td>Biological Records Centre</td>
<td>Home page</td>
<td><a href="http://www.brc.ac.uk/">http://www.brc.ac.uk/</a></td>
</tr>
</tbody>
</table>

**Last updated:** September 2019

**Latest data available:** 31 May 2019
Annex: National Statistics

Official Statistics

The Statistics and Registration Service Act 2007 defines 'official statistics' as all those statistical outputs produced by the UK Statistics Authority’s executive office (the Office for National Statistics) by central Government departments and agencies, by the devolved administrations in Northern Ireland, Scotland and Wales, and by other Crown bodies.

The Act also allows Ministers to determine, through secondary legislation, which non-Crown bodies produce official statistics so that they, too, can be subject to scrutiny and assessment by the Statistics Authority, and be eligible for assessment as 'National Statistics'. This provision is designed to ensure a broad definition of official statistics, as well as flexibility so that the scope of official statistics can be adapted over time to suit changing circumstances.

National Statistics

'National Statistics' are a subset of official statistics which have been certified by the UK Statistics Authority as compliant with its Code of Practice for Statistics – http://www.statisticsauthority.gov.uk/assessment/code-of-practice/

Accredited 'National Statistics' are identified by the following quality mark:

'Biodiversity 2020: A strategy for England’s wildlife and ecosystem services – Indicators’ compendium publication

The 'Biodiversity 2020: A strategy for England’s wildlife and ecosystem services – Indicators’ publication is a Defra National Statistics compendium. The designation does not mean that all the individual statistics presented are National Statistics in their own right. Rather, it means that the compilation and publication has been assessed by the UK Statistics Authority as compliant with the Code of Practice.

These statistics last underwent a full assessment against the Code of Practice for Statistics in 2012. See Assessment Report 173 Statistics on Sustainability and the Environment in England and the UK. Since that assessment by the Office for Statistics Regulation, we have continued to comply with the Code of Practice for Statistics.

The following individual statistics presented in the publication are National Statistics:

5. Breeding farmland birds – Assessed February 2012
6. Breeding woodland birds – Assessed February 2012
7. Wintering waterbirds – Assessed February 2012
8. Breeding seabirds – Assessed February 2012
22. Percentage of woodland certified as sustainably managed – Assessed March 2012

Although all other statistics in this compendium are not individually designated as National Statistics, they are Official Statistics, and as such have been produced in line with the Code of Practice. They are subject to rigorous quality assurance by the data owners and general quality assurance by Defra and the Joint Nature Conservation Committee. The presentation of the statistics, the commentary, and the traffic-light assessments have been overseen and quality assured by Defra Statisticians.