

7. Species in the wider countryside: wetlands

Type: State indicator

Indicator Description

The first part of this indicator shows changes in the abundance of breeding wetland bird species and wintering waterbird species.

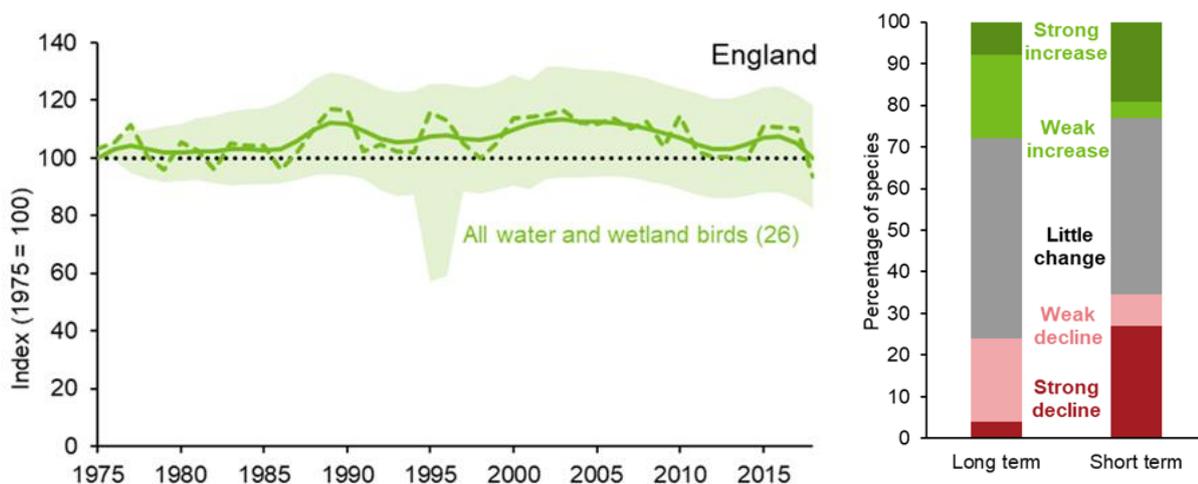
Wetlands, including rivers, lakes, ponds, reedbeds, grazing marshes and lowland raised bogs provide important habitats for breeding wetland birds. The term waterbirds refers to species of birds that depend on water or its adjacent habitats. Some species of waterbirds that overwinter along England's coasts and on inland water bodies also breed in England, but many only come to England for the winter.

7a. Populations of wetlands species (National Statistics)

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 2018 the water and wetland bird index was 9% lower than in 1975 (Figure 7.1). Numbers rose slightly in the early 2000s with the smoothed index showing a non-significant 2% increase between 2012 and 2017.

In the winter of 2017/18, the wintering waterbird index was 69% higher than in 1975/76 (Figure 7.2). The index peaked in the late 1990s, and has declined since, with the smoothed index falling 6% in the short term between 2011/12 and 2016/17.

Figure 7.1: Breeding wetland birds in England, 1975 to 2018



Notes:

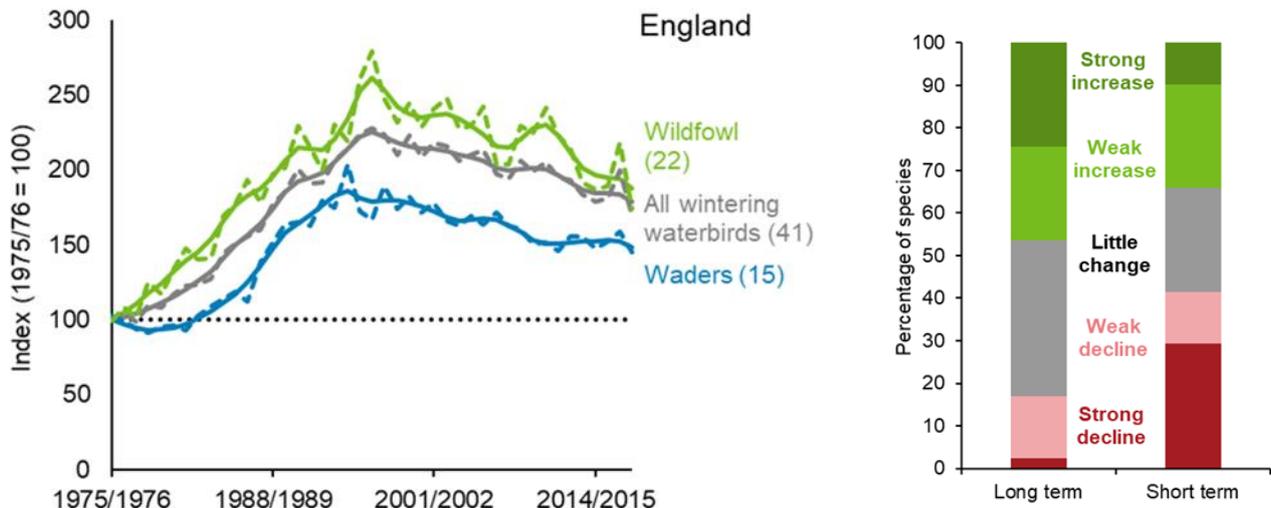
1. The line graph shows the unsmoothed trend (dashed line) and the smoothed trend (solid line) together with its 95% confidence interval (shaded).
2. The figure in brackets shows the number of species in the index.
3. The bar chart shows the percentage of species within the indicator that have increased, decreased or shown little 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.

For the 25 species for which a long-term trend can be calculated, 28% of species increased, 48% showed little 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 2017/18



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. These are 2 grebes (little and great crested), one rail species (coot) and cormorant. These are neither wildfowl nor wader 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 little 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 little 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 of species in the wilder countryside (wetlands)

Breeding wetland birds: Long term (1975 to 2017): No overall change; Short term (2012 to 2017): No overall change; Latest year (2018) Decreased.

Wintering waterbirds: Long term (1975/76 to 2016/17): Improving; Short term (2011/12 to 2016/17) Deteriorating; Latest year (2017/18) Decreased.

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 2017 (breeding wetland birds) and 2016/17 (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.

Indicator Description

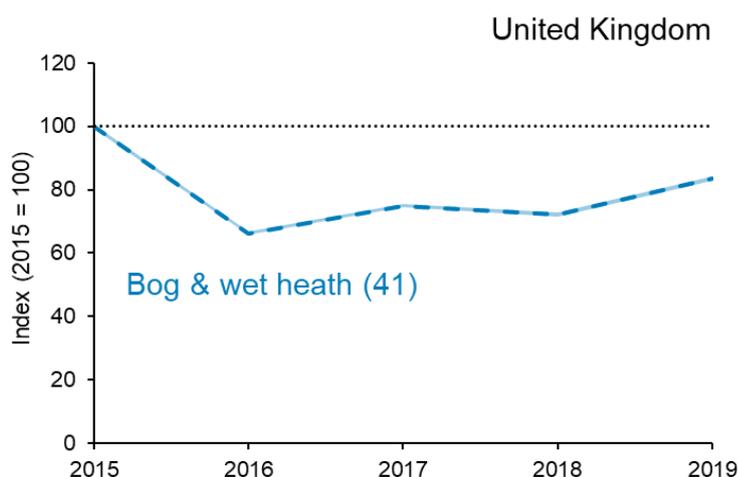
The second part of this indicator measures, in small plots, change in the abundance of plant species considered indicative of good habitat condition on bog and wet heath in the UK, using modelled abundance data from the National Plant Monitoring Scheme. Plant populations form the environment in which most other species exist, as well as providing numerous ecosystem services. Drivers of change are well-understood for many UK habitats.

7b. Abundance of wetlands plant species

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

Between 2015 and 2019, average indicator plant abundance for the bog and wet heath habitat type included within this UK indicator shows an initial decline of 34% in 2016 followed by a steady rise to 83% of the baseline in 2019.

Figure 7.3: Abundance of plant species in one broad UK wetlands habitat, 2015 to 2019



Notes:

1. The line graph shows the unsmoothed trends (dashed line); the variation around the lines shown (the shaded area) is the standard deviation of 1,000 simulated trend indices calculated according to the method of Soldaat *et al.* (2017).
2. Abundance is measured by the percentage area covered by a species within a plot.

3. The figures in brackets indicate the number of species or species aggregates included in the composite index for that particular habitat type.

Source: Botanical Society of Britain and Ireland, Joint Nature Conservation Committee, National Plant Monitoring Scheme, Plantlife, UK Centre for Ecology & Hydrology.

The National Plant Monitoring Scheme (NPMS) was designed to monitor UK habitats of conservation importance. This is achieved through the establishment of small plots in areas of habitats targeted by the scheme. The abundances of plant species, measured as the percentage area covered by a species within a plot, are recorded each year. Surveyors record from different lists of indicator species depending on their level of experience and the habitat within which a plot is located. Both the placement of plots, and the selection of one-kilometre national grid squares within which the plots are located, are subject to statistical methodologies designed to minimise bias (Pescott *et al.*, 2019a).

The design of the NPMS included the definition of a set of 11 broad habitat types, within which 28 finer habitat types are nested. These fine-scale habitats are linked to existing classifications such as the British National Vegetation Classification. Surveyors can choose, based on their knowledge of a habitat, whether to record a plot at the broader or finer level. The current indicator summarises species' percentage cover (abundance) data at the broad habitat level. This is done using a model that is able to account for both the range of percentage covers that a species may exhibit in a habitat when present, and the fact that species may often be absent from any given plot (Pescott *et al.*, 2019b). Such data are often described as "zero-inflated". This model is applied across years for each species/habitat combination, and the indicators presented here for each broad habitat are the result of combining the resulting species/habitat time trends across the relevant set of NPMS habitat indicator species. The broad wetland habitat measure presented in this indicator is a subset of those for which the largest numbers of NPMS plots currently exist. See the [technical background document](#) for more detail.

As this is an experimental statistic it has not been assessed.

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.

Plants are a large part of the fundamental fabric of which habitats are made and directly indicate changes to environmental conditions and habitat management. Plants provide essential habitats and food for wildlife, and essential ecosystem services for humans, such as reduced erosion, nutrient cycling, oxygen production, and climate regulation.

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 variation within the indicator, particularly between species of different water and wetland habitats. In particular, birds of wet grassland have shown substantial declines, with widespread declines in breeding waders and the yellow wagtail having declined by 96% in riverine habitats, whilst birds of slow and standing water, such as mallard and tufted duck, have on average increased (see Figure 7.3).

Table 7.1: Bird species included in the breeding wetland bird indicator

Birds of fast flowing water (4 species)

Common sandpiper (*Actitis hypoleucos*); Dipper (*Cinclus cinclus*); Goosander (*Mergus merganser*); Grey wagtail (*Motacilla cinerea*)

Birds of slow and standing water (6 species)

Coot (*Fulica atra*); Great-crested grebe (*Podiceps cristatus*); Little grebe (*Tachybaptus ruficollis*); Mallard (*Anas platyrhynchos*); Moorhen (*Gallinula chloropus*); Tufted duck (*Aythya fuligula*)

Birds of wet grassland (8 species)

Curlew (*Numenius arquata*); Lapwing (*Vanellus vanellus*); Little egret (*Egretta garzetta*); Mute swan (*Cygnus olor*); Redshank (*Tringa totanus*); Snipe (*Gallinago gallinago*); Teal (*Anas crecca*); Yellow wagtail (*Motacilla flava*)

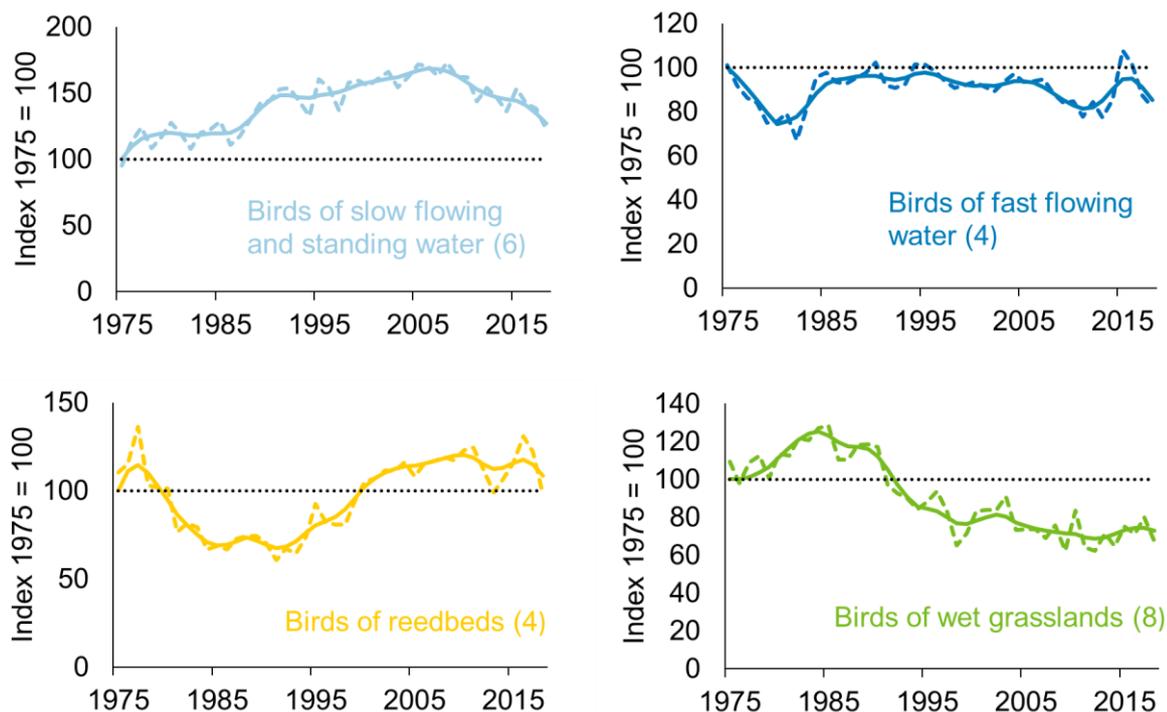
Birds of reedbeds (4 species)

Cetti's warbler (*Cettia cetti*); Reed bunting (*Emberiza schoeniclus*); Reed warbler (*Acrocephalus scirpaceus*); Sedge warbler (*Acrocephalus schoenobaenus*)

Other wetland birds (4 species)

Grey heron (*Ardea cinerea*); Kingfisher (*Alcedo atthis*); Oystercatcher (*Haematopus ostralegus*); Sand martin (*Riparia riparia*)

Figure 7.3: Breeding wetland birds across 4 wetland habitats in England, 1975 to 2018



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 94% and the wader index has increased 53% between 1975/76 and 2016/17. However, both peaked in the late 1990s and between 2011/12 and 2016/17 the smoothed index for waders increased by 1% whereas the index for wildfowl declined by 13%.

Amongst wildfowl, in the long term, numbers of scaup, European white-fronted goose, pochard, eider and Bewick’s swan have all declined by 82%, 57%, 54%, 48% and 45% respectively, compared to their baseline levels in 1975/76. There were considerable increases in the long term, since 1975/76, for numbers of whooper swan (21-fold) gadwall (15-fold) British/Irish greylag goose (13-fold) Svarlbard light-bellied brent goose (9-fold) and pink-footed goose (5-fold). In the short term, between 2011/12 and 2016/17, the majority of species in the wildfowl indicator declined, most notably numbers of Bewick’s swan (49%) Svarlbard light-bellied brent goose (38%) and eider (35%).

Amongst waders, in the long term, numbers of ringed plover and dunlin have shown steep declines of 51% and 48% respectively, compared to their baseline levels in 1975/76. There have been considerable increases in the long term, since 1975/76 for numbers of avocet (7-fold) black-tailed godwit (8-fold) and golden plover (4-fold). Numbers of curlew have declined by 18% in the short

term between 2011/12 and 2016/17, whereas the indices for golden plover and black-tailed godwit increased, by 32% and 25% 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. Changes since the 1990s is 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 the wintering ranges of some species, such as ringed plovers, shifting away from the UK.

Table 7.2: Bird species included in the wintering waterbird indicator

Wildfowl (22 species)

Bewick's swan (*Cygnus columbianus*); British/Irish greylag goose (*Anser anser anser*); Dark-bellied brent goose (*Branta bernicla bernicla*); Eider (*Somateria mollissima*); European white-fronted goose (*Anser albifrons albifrons*); Gadwall (*Anas strepera*); Goldeneye (*Bucephala clangula*); Goosander (*Mergus merganser*); Mallard (*Anas platyrhynchos*); Mute swan (*Cygnus olor*); Pink-footed goose (*Anser brachyrhynchus*); Pintail (*Anas acuta*); Pochard (*Aythya ferina*); Red-breasted merganser (*Mergus serrator*); Scaup (*Aythya marila*); Shelduck (*Tadorna tadorna*); Shoveler (*Anas clypeata*); Svalbard light-bellied brent goose (*Branta bernicla hrota*); Teal (*Anas crecca*); Tufted duck (*Aythya fuligula*); Whooper swan (*Cygnus cygnus*); Wigeon (*Anas penelope*)

Waders (15 species)

Avocet (*Recurvirostra avosetta*); Bar-tailed godwit (*Limosa lapponica*); Black-tailed godwit (*Limosa limosa*); Curlew (*Numenius arquata*); Dunlin (*Calidris alpina*); Golden plover (*Pluvialis apricaria*); Grey plover (*Pluvialis squatarola*); Knot (*Calidris canutus*); Lapwing (*Vanellus vanellus*); Oystercatcher (*Haematopus ostralegus*); Purple sandpiper (*Calidris maritima*); Redshank (*Tringa totanus*); Ringed plover (*Charadrius hiaticula*); Sanderling (*Calidris alba*); Turnstone (*Arenaria interpres*)

Other wintering waterbirds (4 species)

Coot (*Fulica atra*); Cormorant (*Phalacrocorax carbo*); Great crested grebe (*Podiceps cristatus*); Little grebe (*Tachybaptus ruficollis*)

Wetland plants

The creation of the NPMS allowed for the creation of annual trends in the abundance of plants in habitats of conservation importance. Following 5 years of development, the scheme was launched by a partnership consisting of the Botanical Society of Britain and Ireland (BSBI), the Joint Nature Conservation Committee (JNCC), Plantlife, and the UK Centre for Ecology & Hydrology (UKCEH) in 2015. This indicator uses a subset of the species selected by the NPMS as indicative of good condition in those habitat types considered to be of most importance for the conservation of UK biodiversity – see the [technical background document](#) for a full list of species included. These species are monitored in small sample plots (between 25 and 100 m² in area) according to a methodology that was designed to minimise biases in data collection. Results for the UK bog and wet heath habitats are presented here in the wetland plant species abundance indicator.

Since 2018, UKCEH, with input from all partners, have been developing a method of using NPMS data to indicate annual changes in habitat condition. The method is based on a hierarchical model, formulated in a Bayesian framework, that integrates information on a species' abundance and occupancy; the occupancy estimates also take advantage of the fact that most plots are surveyed twice a year, allowing adjustments for false negatives (i.e. species that are overlooked during surveys). Simulation tests and applications to real data indicate that the method is robust and produces ecologically sensible metrics.

The one-kilometre squares of the NPMS were selected according to a weighted-random algorithm designed to introduce a known bias towards semi-natural habitats. However, within this design, a sampling bias exists in that, in common with other UK structured monitoring schemes based on volunteer participation, squares located within lowland areas are more likely to be sampled. Further work will focus on additional adjustment for bias (Pescott *et al.*, 2019b).

Web links for further information

Wildfowl and Wetlands Trust: [National water bird estimates](#)

Botanical Society of Britain & Ireland: [Home page](#)

British Trust for Ornithology: [Potential volunteering for surveys](#)

British Trust for Ornithology: [Waterways Breeding Bird Survey](#)

British Trust for Ornithology: [Wetland Bird Survey](#)

British Trust for Ornithology & Royal Society for the Protection of Birds: [Technical Background Document](#)

Countryside Survey: [Home page](#)

Defra: [Populations of wild birds](#)

Defra and UK Centre for Ecology & Hydrology: [Technical background document - plants](#)

Joint Nature Conservation Committee: [Home page](#)

National Plant Monitoring Scheme: [Home page](#)

Plantlife: [Home page](#)

UK Centre for Ecology & Hydrology: [Home page](#)

Wildfowl and Wetlands Trust: [Waterbird monitoring](#)

References

Pescott, O. L., Walker, K. J., Harris, F., New, H., Cheffings, C. M., Newton, N., Jitlal, M., Redhead, J., Smart, S. M. and Roy, D. B. (2019a). The design, launch and assessment of a new volunteer-based plant monitoring scheme for the United Kingdom. *PLoS ONE* 14(4): e0215891.

<https://doi.org/10.1371/journal.pone.0215891>

Pescott, O. L., Powney, G. P. and Walker, K. J. (2019b). *Developing a Bayesian species occupancy/abundance indicator for the UK National Plant Monitoring Scheme*. Wallingford, NERC/Centre for Ecology & Hydrology and BSBI, 29pp. [DOI:10.13140/RG.2.2.23795.48161](https://doi.org/10.13140/RG.2.2.23795.48161)

Soldaat, L. L., Pannekoek J., Verweij, R. J. T., Van Turnhout, C. A. M. and Van Strien, A. J. (2017). A Monte Carlo method to account for sampling error in multi-species indicators. *Ecological Indicators* 81: 340–347 [DOI:10.1016/j.ecolind.2017.05.033](https://doi.org/10.1016/j.ecolind.2017.05.033)

Last updated: October 2020

Latest data available:

7a. Populations of wetlands species: breeding wetland birds – 2018; wintering waterbirds – 2017/18

7b. Abundance of wetlands plant species – 2019