The Breeding Bird Survey 2023 *incorporating the Waterways Breeding Bird Survey*

Population trends of the UK's breeding birds

THE 2023 BBS REPORT

THE BBS PARTNERSHIP

The BTO/JNCC/RSPB Breeding Bird Survey is a partnership jointly funded by the BTO, JNCC and RSPB, with fieldwork conducted by volunteers. The Breeding Bird Survey (BBS) now incorporates the Waterways Breeding Bird Survey (WBBS).

The members of the BBS Steering Committee in 2023 were James Pearce-Higgins (Chair), Dawn Balmer, Simon Gillings, Dario Massimino, David Noble (all BTO), Simon Wotton, Leah Kelly (both RSPB), Paul Woodcock and Solène Marion (both JNCC).

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BTO is a Registered Charity, Number 216652 (England & Wales), SC039193 (Scotland).

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RSPB is a Registered Charity, Number 207076 (England and Wales), SC037654 (Scotland).

THE BBS TEAM AT BTO

James Heywood is the BBS National Organiser and first point of contact for BBS or WBBS queries. James is responsible for the day-to-day running of these surveys, liaising with BTO Regional Organisers and volunteers, maintaining the databases, promoting the schemes, and producing the annual report. David White, Engagement & Surveys Officer for England, supports the National Organiser, primarily with the volunteer coordination of these surveys.

Dario Massimino, Senior Data Scientist in the Bioacoustics and Data Science Team, produced the bird and mammal population trends for 2023, assisted by Research Ecologist Caroline Brighton. David Noble is the Principal Ecologist for Monitoring, responsible for strategic developments in biodiversity monitoring. Dawn Balmer is Head of Surveys, which includes both BBS and WBBS among other surveys. Maria Knight, Secretary in the Science Department, works closely with James and David assisting with the running of the surveys. Simon Gillings oversees the BBS and WBBS research programmes, and James Pearce-Higgins is the Director of Science.

Contact the BBS National Organiser:

James Heywood, British Trust for Ornithology
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ONLINE RESOURCES

Further information, including population trend graphs, can be found at www.bto.org/bbs for BBS, and www.bto.org/wbbs for WBBS, and a full species-by-species discussion of these results, and those from other surveys, can be found on the BirdFacts website at: www.bto.org/birdfacts

This report can be downloaded from: www.bto.org/bbs-report

Post to @BBS_birds

ACKNOWLEDGEMENTS

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The founder sponsors of the 1998 WBBS pilot year were Thames Water, British Waterways, Severn Trent, Hyder (Welsh Water) and Anglian Water. Since then surveys have been funded by the Environment Agency, BTO, JNCC and RSPB, and sponsored by Severn Trent, Anglian Water and by Essex & Suffolk Water. The WBBS was adopted into the BBS Partnership in 2017.

The report was produced by James Heywood. The cover photo of a Redstart was kindly supplied by Edmund Fellowes/BTO images and the report was printed by Swallowtail Print, Norwich, using carbon-balanced paper from responsible sources.

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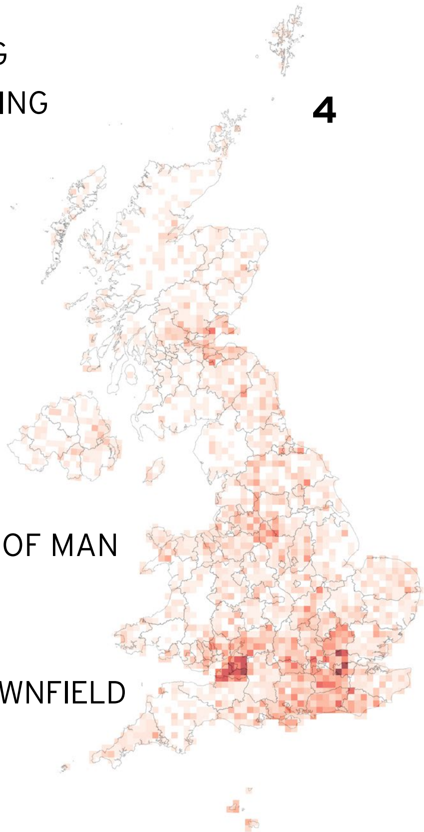
INSIDE ...

This is the 29th annual report of the BTO/JNCC/RSPB Breeding Bird Survey (BBS) and Waterways Breeding Bird Survey (WBBS), documenting the population trends of widespread UK breeding bird species during the periods 1994–2023 and 1998–2023 respectively. These are the main schemes for monitoring the population changes of the UK's widespread breeding birds, providing an important indicator of the health of the countryside. Trends are produced each year for 119 species based on BBS data, and for 28 waterway specialist species based on WBBS data. Population trends are published as Official Statistics and have been produced to the high professional standards set out in the Code of Practice for Official Statistics. The results are used widely to set priorities and to inform conservation action.



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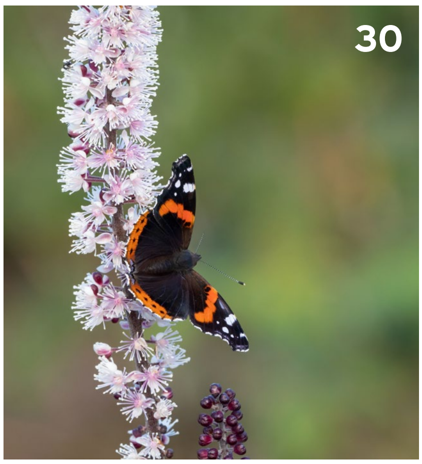

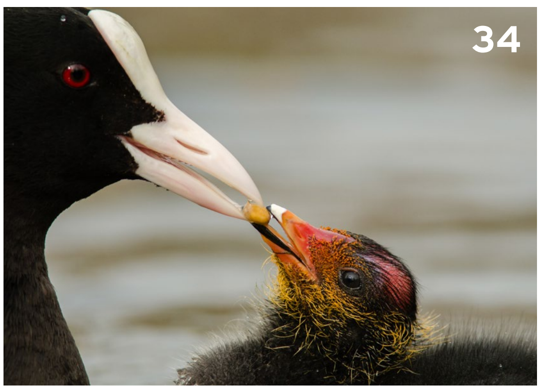

TURTLE DOVE: LIZ CUTTING/BTO; SOUND RECORDER: MIKE BRIGGS; RED ADMIRAL: EDMUND FELLOWES/BTO; COOT: RICHARD JACKSON/BTO

CITATION

Heywood, J.J.N., Massimino, D., Balmer, D.E., Kelly, L., Marion, S., Noble, D.G., Pearce-Higgins, J.W., White, D.M., Woodcock, P., Wotton, S. & Gillings, S. 2024. *The Breeding Bird Survey 2023*. BTO Research Report **765**. British Trust for Ornithology, Thetford. Published by the British Trust for Ornithology, the Joint Nature Conservation Committee and the Royal Society for the Protection of Birds, May 2024.

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30 Years of The Breeding Bird Survey

2023 marked the 30th year of fieldwork for BBS. Here, we look briefly at the survey's many achievements and celebrate some of its achievers – the volunteers.

James Heywood, BBS National Organiser, BTO

At approximately 7:05am on 4 April 1994, the first bird – probably a Skylark – was recorded on the then brand new Breeding Bird Survey in the Vale of Belvoir in Leicestershire. Thirty years on, nearly 9,000 skilled and dedicated volunteers have submitted nearly eight million records of 300 species of bird from 176,100 visits, amounting to over 300,000 hours of recording.

ACHIEVEMENTS

BBS volunteers are routinely thrown challenges – a barbed wire fence erected here, a fallen tree there. For some, the challenges are routine – a five-mile slog climbing hundreds of metres in challenging upland terrain, just to arrive at the square. Twice, the challenges have been felt by the scheme as a whole – in 2001 and 2020, a very large proportion of the volunteer base were grounded by Foot and Mouth and COVID-19 respectively. The 2020 BBS report in particular gave us the opportunity to reflect on the achievements of the scheme over its then 27 years of operation (Harris *et al.* 2021). It makes for impressive reading, distilling the vital outputs of BBS, ranging from regular Official Government Statistics (including the BBS trends that can be read in this report, and Wild Bird Indicators), contributions to the Pan-European Common Bird Monitoring Scheme (PECBMS) and periodic use in setting conservation priorities, in the form of the regular Birds of Conservation Concern assessments. On top of this are frequent and impactful contributions to research, particularly those that relate directly to land use policies. BBS is routinely used to assess the effectiveness of agricultural policies that are designed to benefit wildlife, and more recently have been put to work assessing the benefits of areas designated for wildlife. Other areas where BBS data have been used to shed further light on include the impacts of climate and the role of disease in the declines of some of our most common birds.

ACHIEVERS

If that article and the above summary are a celebration of the achievements of BBS, then it is right that we celebrate the people who have made these achievements possible – those nearly 9,000 volunteers. It is simply not possible to mention all of the individual contributions of those who have given much to the scheme, but overleaf, we highlight a small number whose contributions, be it in the field or as a Regional Organiser (RO), stand out. Just over 100 volunteers have surveyed BBS in all of its 30 years, 86 of whom have surveyed the same square (sometimes more). Fifteen volunteers have racked up a staggering 180 or more visits – the equivalent of three squares a year for 30 years. For some, their effort represents an average of over 10 visits per year!

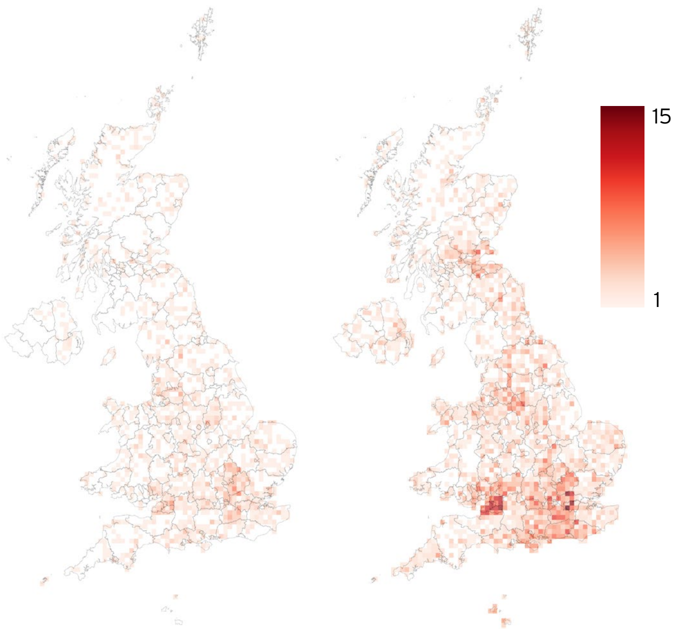
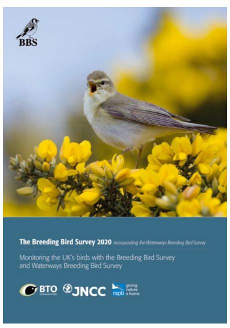


Figure 1: The growth of BBS coverage from 1994 (left) to 2023 (right), measured as BBS squares covered per hectad (10 x 10 km). The unevenness of coverage is partly due to the sampling design, with more squares available in areas of higher population density, but also the limited availability of surveyors in remote places. A weighting is applied during analysis to account for this.



◀ A four-page article by BTO Director of Science, James Pearce-Higgins, for the 2020 report provides an excellent summary of the many achievements made using BBS data. Since that summary, many more important outputs have arisen from BBS data (p13), including more work on determining the effectiveness of our protected area network.

Alastair McIlwain
RO – Co. Down.
Years as RO: 30
BBS Squares: 1
Visits: 13

Alastair is the only Regional Organiser in Northern Ireland to have fulfilled the role for the full 30 years. This is one of the hardest parts of the UK to maintain coverage, for reasons of both human and physical geography. To have stuck at it for that long under challenging circumstances is a terrific achievement.

Hugh Insley
RO – Inverness East & West
Years as RO: 30
BBS Squares: 3
Visits: 29

Awarded the BTO Bernard Tucker Medal in 2010, Hugh has been a Regional Organiser in Inverness for the duration of BBS. Benefiting in more recent years from Upland Rovers, Hugh has successfully motivated volunteers in some of the most challenging terrain the UK has to offer.

Every one of the nearly 9,000 BBS volunteers is worthy of praise. Members of the Regional Network, without whom the survey simply could not exist at the scale it does, are a special group. This page celebrates five of its members – representing each of the four countries of the UK – who for one reason or another are among the most dedicated. For every one of these, are countless others who have devoted much time to the BBS cause – thank you!

Over 7,000 different squares have been surveyed in the 30 years of BBS. Darker shades of blue represent the most sampled squares, with 178 being surveyed uninterrupted for the full 30 years.

Muriel Cadwallender
RO – Northumberland.
Years as RO: 30
BBS Squares: 5
Visits: 97 over 30 years

Muriel is a stalwart for BBS in the north-east and, along with husband Tom, who is the Regional Representative, is part of a formidable partnership for the study of ornithology and natural history in the county. Among the five squares is one in the Northumberland National Park where Curlew, Snipe and Lapwing are still regularly occurring, so this will be one that has contributed much to our understanding of the pressures facing wading birds.

Steve Davies
RO – Birmingham & Worcs.
Years as RO: 18
BBS Squares: 33
Visits: 257 over 19 years

Steve has operated all over east Wales and the West Midlands, where he is also RO in two regions. Many of the 33 squares have been surveyed for one or two years, Steve undertaking the often challenging task of setting up sites and contacting landowners, and then handing these on to volunteers. Steve also has four long-term sites of his own and, above all, just enjoys getting up early in the morning.

Andrew King
RO – Brecknock
Years as RO: 10
BBS Squares: 15
Visits: 204 over 30 years

Ninth on the all-time list of visits completed, Andrew has surveyed almost exclusively in south Wales, where he is RO for Brecknock. More recently, he has ventured further afield to record as part of Upland Rovers. One of his squares, on the River Usk, is one of the few to regularly record Goosander.

Coverage and sightings in 2023

As well as a round up of 2023, we provide some additional insights on sightings and coverage over the last 30 years.

For this thirtieth year of fieldwork, UK coverage was very similar to that in the previous two years – welcome confirmation that the scheme hasn't been adversely affected by the enforced break in 2020. However, as in every year, there have been some gains and some losses in different parts of the country.

COVERAGE OVERVIEW

Coverage in Scotland remains near the all-time highs from 2021 and 2022. Coverage in England remains stable, although there was a decrease in the number of squares covered in the north and west of the country, with an increase in the south and east (see p26). In Wales, there was a decline in coverage following what was hoped to be a sign of recovery in 2022. Coverage has been steadily declining in Wales since 2017 (Table 1) and the number of squares in 2023 represents a 13% decrease from that seen in the peak year of 2015. Improving coverage in Wales will be one of the major focuses in the coming years, not least due to the increasingly important role that Wales plays in supporting some the UK's rarer woodland species (see p22). The number of squares covered in Northern Ireland was very similar to that from the previous year. 2024 sees the start of a new cycle of funding in Northern Ireland; not only will a subset of squares in the more challenging west of the country benefit from professional coverage, but these professionals will be tasked with training and mentoring new volunteers to provide more longer-term coverage across Northern Ireland.

SIGHTINGS

Even though the BBS is designed to monitor the more common and widespread species, there are always a handful of rare species that are recorded and provoke interest. Some of these species are genuine rarities, such as a **Woodchat Shrike** in Yorkshire and a **Lapland Bunting** on the Isle of Tiree. Other still relatively rare species, such as **Crane** – recorded on seven squares in East Anglia and Oxfordshire – and **Cattle Egret** – also recorded on seven squares, in Sussex, Essex and the south-west – may be seen sufficiently often in the coming years to warrant BBS trends of their own.

Some 7,015 different squares have been covered in total since 1994, with 178 covered in each of the 30 years. Many species, of course, are observed in nearly every square in every year – the total counts on all visits from the most frequently encountered species number in the millions; **Woodpigeon** (3.1m), **Blackbird** (1.5m) and **Starling** (1.4m) are the three most frequently counted. Some 16 species, however, have been seen on just a single occasion, including a **Capercaillie** in the Highlands in 1997, and a **Wryneck** in Hampshire in 2004. Whilst BBS counts for the 119 species listed in Table 2 and online are used for population trends, sightings of rarer species are used by the Rare Breeding Bird Panel to help monitor our rarest breeding species (https://rbbp.org.uk).

Table 1: The number of BBS squares with data received to date and the number of volunteers participating by year.

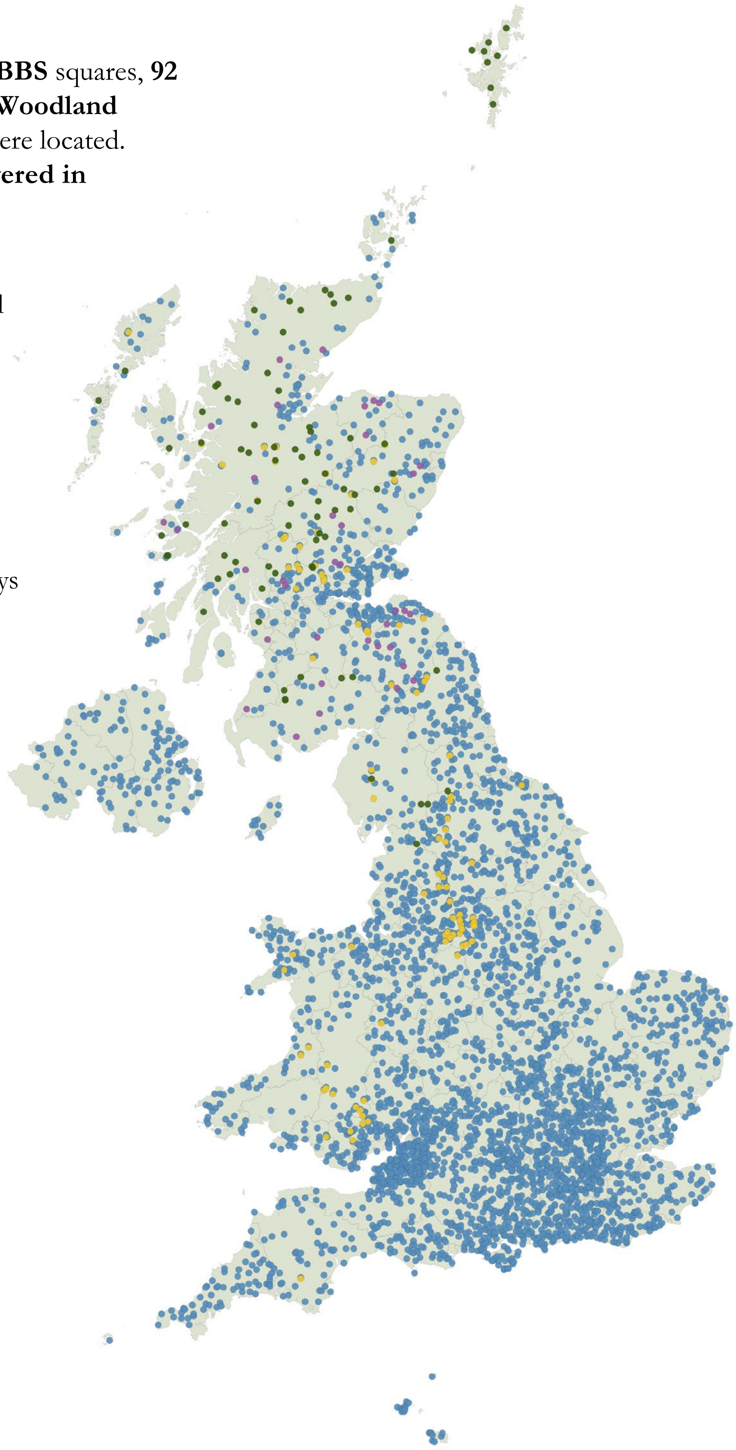
	England	Scotland	Wales	Northern Ireland	Channel Islands	Isle of Man	UK total	No. of volunteers
1994	1,172	245	122	25	1	4	1,569	*838*
1995	1,321	283	121	17	1	4	1,747	*1,014*
1996	1,420	308	116	65	7	4	1,920	*1,198*
1997	1,657	313	138	75	6	6	2,195	*1,523*
1998	1,712	309	192	85	7	6	2,311	*830*
1999	1,791	275	223	95	7	5	2,396	*1,917*
2000	1,749	246	213	83	7	3	2,301	*1,858*
2001*	532	78	22	0	7	0	639	*542*
2002	1,652	231	215	97	7	3	2,205	*1,778*
2003	1,738	255	214	109	7	4	2,327	*1,872*
2004	1,884	273	253	102	11	6	2,529	*2,022*
2005	2,180	305	271	120	13	3	2,892	*2,332*
2006	2,569	336	272	107	19	5	3,308	*2,661*
2007	2,822	486	269	129	16	4	3,726	*2,959*
2008	2,556	404	242	121	15	1	3,339	*2,639*
2009	2,569	396	235	116	17	0	3,333	*2,570*
2010	2,566	331	246	115	16	0	3,274	*2,553*
2011	2,538	358	223	110	15	0	3,244	*2,489*
2012	2,671	383	275	117	21	4	3,471	*2,628*
2013	2,729	471	332	127	26	0	3,685	*2,775*
2014	2,734	482	340	120	27	0	3,703	*2,734*
2015	2,832	476	343	78	23	3	3,755	*2,793*
2016	2,875	490	334	127	24	2	3,852	*2,797*
2017	2,948	523	340	131	28	3	3,973	*2,836*
2018	2,992	581	332	119	20	4	4,048	*2,835*
2019	2,940	608	325	119	21	8	4,021	*2,775*
2020†	1,762	157	61	28	17	9	2,034	*1,453*
2021	2,840	628	301	152	19	10	3,950	*2,713*
2022	2,835	633	315	125	16	10	3,934	*2,747*
2023	2,850	624	300	128	19	10	3,931	*2,751*

** 2001: foot-and-mouth disease, † 2020: COVID-19*

COVERAGE MAP

This coverage map illustrates where the **3,719 'core'** **BBS** squares, **92 'add-on'** **Upland Adjacent** squares, **36** **Scottish Woodland (SWBBS)** squares and **84** **Upland Rovers** squares were located. Combined, these make up the **3,931 BBS squares covered in 2023**.

Squares from the Upland BBS and SWBBS-Adjacent schemes, covered between 2006 and 2013 by professional fieldworkers, are not shown on this map nor in Table 1 as they are not part of the BBS square set outside of these professionally surveyed years. Data from these squares in the years covered are included in the data analysis and trend calculations for the years they were surveyed. Ongoing, professional coverage of squares in Northern Ireland is included in the map and table. Please see pages 14 and 15 for more information on these surveys and square types.



▲ Observed on only two squares in 1994, Cetti's Warbler was recorded on 150 BBS squares in 2023. Even accounting for changes in sampling effort, that is a rapid increase, shown by a near nine-fold increase in England (Table 3, p19).

CETTI'S WARBLER: LIZ CUTTING/BTO

The lengths people go to

For most BBS volunteers, undertaking their survey and entering their data are enough. Some will write to their Regional Organiser to provide an update on their progress. However, a smaller number of volunteers will go to extreme lengths to prove their commitment. One such case in 2023 came from a volunteer who will be known to many readers – Andy Musgrove, former Head of Monitoring at BTO – who ensured that he was doing his early visit at just the moment the 'Google StreetView car' was driving past. Here is Andy in action as the vehicle drove past him just at the end of the last sector.

The importance of BBS

How does BBS help inform conservation priorities in the UK? A perspective from the UK Statutory Nature Conservation Bodies.

Paul Woodcock, Senior Evidence Specialist, JNCC

It's 30 years since the Breeding Bird Survey began – a great milestone! Since its inception, the BBS has been jointly funded and developed by BTO, RSPB, and the Joint Nature Conservation Committee (JNCC). So now is a good time to reflect on the value of BBS to JNCC as well as to the Nature Conservation Bodies in each of the UK countries (Natural England, Natural Resources Wales, NatureScot, Northern Ireland Environment Agency).

JNCC is a public body that provides evidence and advice on nature conservation to the UK government and devolved administrations, as well as co-ordinating activities that need a UK-level response or are more efficiently carried out collectively. The BBS fits into this co-ordination well. By using consistent methods across the UK, it gives species trends for all four countries and the UK as a whole. It's also more efficient to co-ordinate one survey, rather than replicating the infrastructure and administration separately in each country.

NATURE RECOVERY

In 2021, JNCC and the conservation agencies of the four UK countries published Nature Positive 2030 (jncc.gov.uk/our-role/the-uk/nature-positive-2030). This sets out an ambition that species and ecosystems in the UK are beginning to recover by 2030 and proposes how to achieve that, so is a cornerstone of UK conservation policy for the rest of the decade. To underpin the commitment, clear evidence was needed that nature has been declining. That might seem obvious, but it's only obvious because skilled volunteers in surveys like the BBS have collected trusted data consistently across the UK for several decades, so there is scientific certainty about how bird species populations are changing (complemented by similar long-term surveys on other taxa).

The reports published as part of Nature Positive 2030 emphasise that long-term citizen science datasets are vital for showing whether nature is starting to recover. There is also a wider context for this. Under the new Global Biodiversity Framework, the UK and every other signatory nation will report progress on 23 internationally agreed biodiversity targets. For the UK, that happens through the UK Biodiversity Indicators, which BBS data will again be important for.

Box 1: Country Agency Perspective

BBS is valuable to the UK countries individually, often for similar reasons. Below, ornithologists from each of the four country Statutory Nature Conservation Bodies give a joint perspective:

The BBS is a cornerstone of the evidence base on birds in each country. It provides vital early warning of declines in some of our widespread species, and indicates which species are faring better. This helps shape the direction of bird conservation. For example, we use it to help determine bird conservation priorities based on assessments such as the Birds of Conservation Concern (BoCC), which we use to identify species in rapid decline that need urgent conservation action. When combined with other datasets that give information on changes in productivity and survival (e.g. from ringing and nest recording), BBS data can also provide initial insights into causes of species declines and help show whether widespread nature recovery mechanisms such as agri-environment schemes are working. UK and country-level indicators (produced by combining the individual BBS species trends) are key to giving a clear overall picture about the severity of changes and progress in reversing these declines. We also really value that volunteers are willing to contribute their time and expertise to help maintain and grow the BBS.

Phil Grice, Pat Lindley, Simon Cohen & Ronan Owens

THE FUTURE

The biggest challenge and the biggest opportunity will be continuing to anticipate and adapt to new evidence needs. For example, we are now seeing more interest and demand for species data over smaller areas (e.g. to help test the success of nature recovery projects like rewilding). This may make the regional BBS trends increasingly important to put results from such projects in context. Similarly, new agricultural and woodland policies are being developed and implemented across the UK. BBS data are already helping plan these, and will help understand what is working and what isn't.

For JNCC, the BBS and similar surveys are a key part of the evidence that provides the impetus for conservation, informs policies, measures what effect these policies have, and then contributes to how the UK reports progress globally. It can only do all that because the UK has so many skilled volunteers willing to contribute and a partnership between BTO, JNCC and RSPB. This is why BBS is valuable for JNCC and will continue to be as ambitions on nature recovery are put into practice.

Turtle Dove conservation

The Turtle Dove population has declined steeply, sharing the fate of several formerly widespread species, which have been continually disappearing from European farmland. However, thanks in part to the data from the BBS, we can track the species trends for the Western Flyway to evaluate the effect of conservation.

Eva Šilarová & **Alena Klvaňová**, Pan-European Common Bird Monitoring Scheme (PECBMS), Czech Society for Ornithology

THE WESTERN FLYWAY

Turtle Doves breed across most of Europe and migrate on a broad front to sub-Saharan Africa to overwinter. According to data from EURING (the coordinating body for European bird ringing schemes), the birds use four flyways (Marx *et al.* 2016). Breeding numbers show an overall decline, especially in Western Europe and including the UK. In 2015, the species was added to the IUCN Red List as Vulnerable. In response, RSPB led the production of an International Single Species Action Plan for Turtle Dove (Fisher *et al.* 2018). This identified three main threats to the species, present in different combinations in different flyways: habitat loss (primarily due to agricultural intensification), unsustainable levels of hunting, and illegal killing, the latter of little importance for the Western Flyway. These threats were present despite Turtle Doves being listed in Annex II of the Birds Directive and Annex II of the Convention on Migratory Species, and the action plan aimed to address all of them. PECBMS was tasked with computing flyway-specific trends, but the data were also used to create models predicting the population's future development under various conditions. The current dataset covers two flyways – Western and Central-Eastern. In the case of the Western Flyway these calculations are possible in large part thanks to the UK BBS, which has the longest tradition in Europe and generates high-quality data.

SCALE OF POPULATION MANAGEMENT

Flyways play an important role as management units in the context of an adaptive harvest management mechanism. The ban on Turtle Dove hunting in the Western European Flyway came into force in 2021. To take the best environmental measures, it is necessary to analyse their impact on the most recent and accurate data as possible.

THE IMPORTANCE OF BBS DATA

The BBS Partnership has striven to deliver UK data, including from the 2023 breeding season, to the project. To enable this, a new Official Statistic had to be created and was published in December 2023, six months earlier than the typical May/June date. UK Turtle Dove data could then be used in a way that maximised their impact and delivered up-to-date information for the Action Plan. We at PECBMS greatly appreciated this step, which was very important to deliver the Western Flyway trend. In the future, and thanks to this mechanism, the hope is that there can be an earlier delivery of other UK species data, from which we will be able to compute flyway-specific species trends for other threatened migratory species of conservation concern.

SUCCESS IN THE WESTERN FLYWAY

Within the Western Flyway, it seems that the hunting restrictions have already positively affected Turtle Doves. Breeding pair estimates have slightly increased in the last three years (Figure 2), and the 2023 estimate is the highest in the last 10 years. The most up-to-date data from the UK help to monitor the recent situation in the Western Flyway and model the species' future. This way, the huge efforts of UK fieldworkers, alongside projects such as the RSPB-led Operation Turtle Dove partnership will hopefully contribute to this species' recovery.

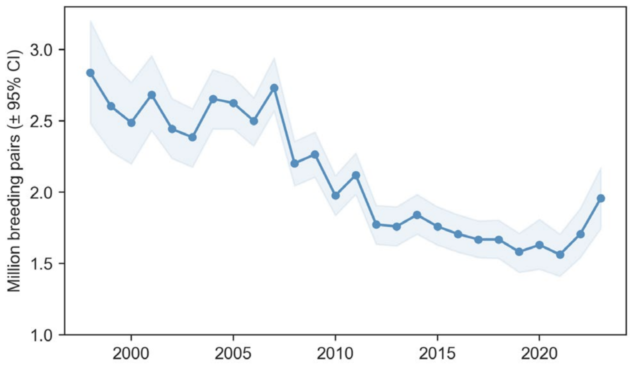


Figure 2: Estimated numbers of Turtle Dove breeding pairs in the Western Flyway for the period 1998–2023 (millions of pairs, ±95% confidence intervals).

FIND OUT MORE...

Carboneras, C., et al., 2024. *Turtle Dove Adaptive Harvest Management mechanism - March 2024 Technical update (western flyway)*. Report to the EU Task Force on the Recovery of Birds. Brussels https://pecbms.info/td_2024_w_flyway

Operation Turtle Dove 2024. https://www.operationturtledove.org Accessed 21/03/24

Passive acoustic monitoring

The BBS has stood the test of time over the last 30 years. But what will the next three decades look like? It seems inevitable that the burgeoning field of bioacoustics will become a widespread part of the bird monitoring toolkit. The question is, how?

Mark Wilson, Acting Head of Science, BTO Scotland; **Adham Ashton-Butt**, Senior Research Ecologist, BTO & **Simon Gillings**, Head of Data Science & Bioacoustics, BTO

The BBS is the bedrock of the bird monitoring landscape in the UK and the consistency, robustness and simplicity make the data it produces a joy for ecologists to work with. However, for some species and/or places, we simply have to admit that the BBS cannot, on its own, deliver all the data we need to monitor bird populations. Here, we describe some ongoing work exploring the potential for acoustic monitoring – used in conjunction with the BBS – to increase our spatial, temporal and taxonomic coverage of surveys that contribute to our common bird monitoring.

SOUND IN SCOTLAND

Scotland is a sensible context in which to think about alternative approaches to traditional monitoring, with large areas of remote upland landscapes hosting many species that are poorly covered by existing survey schemes. In the 2023 breeding season, BBS volunteers in Scotland were invited to deploy a sound recorder on their squares. The initial invitation was limited to combinations of surveyors and squares for which BBS data had been returned for at least two of the previous three years. Participants were asked to deploy recorders on their early visits and to collect them on their late visit. We are aiming to answer two main questions:

- Can acoustic surveys improve on the data coming from traditional BBS surveys, by extending the monitoring period and detection of shy, cryptic or nocturnal species?
- Could acoustic surveys extend the spatial coverage achieved by the BBS, particularly in remote areas where the prospect of high levels of BBS coverage is not feasible?

The response was overwhelming – within three days, we had twice as many offers of help as we had recorders to deploy! From more than 60 BBS squares where surveyors were willing to deploy recorders, we selected 30 covering a wide range of habitats and regions. Each

▲ A typical sound recorder deployment.

recorder was set to record for one minute out of every 15 throughout the duration of its deployment. Twenty-eight of the 30 recorders returned useful data (including one that fell into a bog pool!) amounting to 2,077 hours (more than 300 GB) of sound files!

DATA – LOTS OF IT

Audio data present many challenges, one being sheer volume – it would take a very long time for someone to manually listen to and identify all the bird calls in these recordings! Instead, we ran these data through an automated classifier (Cornell University's BirdNET-Analyzer; see Box 1, Figure 3) to detect birds, identify them to species, and assign confidence scores to these identifications (reflecting the probability that they are correct). This resulted in more than 800,000 putative detections of 199 species! However, not all of the detections made by the classifier are correct; and not all bird calls on the recordings were detected. We therefore checked the classifier outputs for two important types of error:

1. **False-positives.** These arise when a classifier incorrectly identifies that calls of a species are present in a recording when they are not. If a high proportion of detections for a particular species are correct, a classifier is said to have high levels of *precision* for that species.
2. **False-negatives**. These occur when calls of a species present on a recording are not detected, or

SOUND RECORDER DEPLOYMENT: MIKE BRIGGS

Box 1: Machine learning & automated classifiers

Passive acoustic monitoring generates more data than a human expert can reasonably be expected to listen to. Computational approaches using machine learning (a kind of artificial intelligence – AI) make this problem manageable. There are many different types of machine learning, some of which are well-suited to audio data. The BirdNET-Analyzer classifier we used to analyse our recordings employs a 'Deep Neural Network' (DNN) which has been trained on labelled spectrograms (visual representations of recorded sounds).

Once trained, classifiers can be applied to field data to automatically find bird calls, identify the species most likely to have made them, and assign confidence scores to each identification reflecting the probability that it is correct. Much like humans, classifiers are not perfect, and are liable to make mistakes especially when applied to calls of species that aren't well represented in the labelled recordings the classifiers have been trained on.

However, these models can be continually improved as training datasets are supplemented with new recordings – they learn! BTO is actively developing a suite of bird classifiers for use in the UK, which are being made available via BTO's Acoustic Pipeline – for more information about how to use these or contribute to their development, see: www.bto.org/pipeline

are (incorrectly!) assigned to a different species. If a high proportion of the calls of a species within a set of recordings are detected and correctly identified by a classifier, it is said to have high levels of *recall* for that species.

INTERPRETING CLASSIFICATIONS

As mentioned above, each detection is accompanied by a confidence score. If detections with high confidence scores are more likely to be correct than those with low confidence, we can use these scores to filter out detections that are likely to be incorrect, leaving us with a more robust dataset. However, it is important to understand differences between species in BirdNET

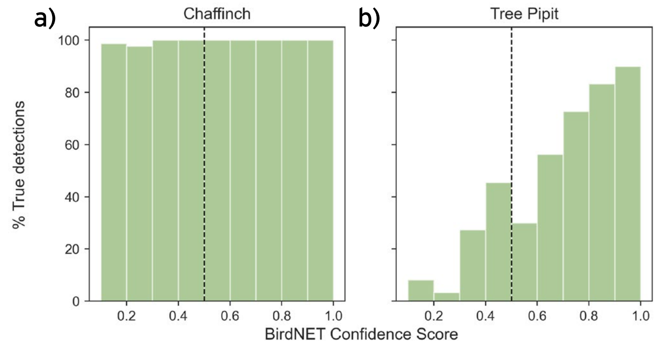


Figure 4: BirdNET-Analyzer precision for Chaffinch (a) and Tree Pipit (b). An arbitrary threshold of 50% detection would result in 82% of correct Chaffinch identifications being unnecessarily rejected. However, the same threshold would likely be too low for robust analysis of Tree Pipit identifications, as it would result in 36% of retained Tree Pipit identifications being incorrect.

performance. For example, BirdNET recall (the proportion of calls detected and identified) is higher for **Tree Pipit** than for **Chaffinch**, but precision (the percentage of BirdNET identifications that are correct) is much higher for Chaffinch than for Tree Pipit (Figure 4). This means that an optimal threshold for filtering BirdNET identifications, balancing the risks of false positives and false negatives, is likely to be considerably higher for Tree Pipit than for Chaffinch.

GREENSHANK – AN EXEMPLAR

Leaving aside the above considerations of classification accuracy and confidence thresholds, interesting patterns are already evident from the acoustic data collected during this project. To illustrate this, we can take a closer look at the data from a BBS square on a peat bog on Lewis in the Western Isles. This is one of a small number of squares where **Greenshank** have been recorded on BBS transects in recent years. In 2023, out of a total of 3,931 BBS squares surveyed in the UK, only around 100 were within the breeding range of Greenshank, with the BBS recording this species in only a fifth of these.

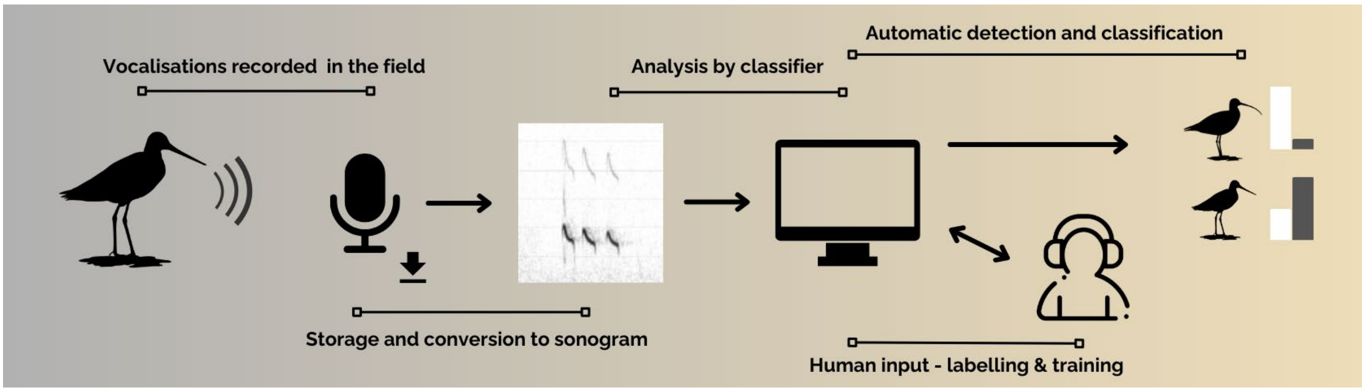


Figure 3: A schematic of data collection for passive acoustic monitoring using automated classification. Sampling by expert human observers of subsets of these outputs is important for confidence, but also for continued training of the classifier.

Figure 5 shows the timings of Greenshank detections on this square. Not only do Greenshank vocalisation rates peak during times when BBS surveyors are unlikely to be present, but there is clear seasonal variation in call rates (most likely due to periods when birds are incubating). This temporal variation in calling activity could result in birds not being picked up on BBS visits. This is a square where the BBS generally does record Greenshank, but on how many squares are Greenshank missed due to surveys happening at times when birds aren't calling much? This kind of situation could make acoustic surveys a more effective means of detecting and monitoring abundance of some species. However, others (particularly those that are commonly picked up by eye) may be detected less reliably by audio recorders than by human surveyors.

As well as answering questions on whether birds are present, and how vocally active they are, audio data could also tell us a lot about what birds are doing. A Curlew call classifier produced by BTO and collaborators at the University of Durham can identify different types of Curlew vocalisation, such as display calls, alarm calls, and even calls used by adults to alert their young. We hope that it will prove possible to use the outputs of this classifier not just to indicate patterns of abundance, but to provide evidence of breeding, and potentially even information on breeding success – something that many Curlew conservation projects urgently need.

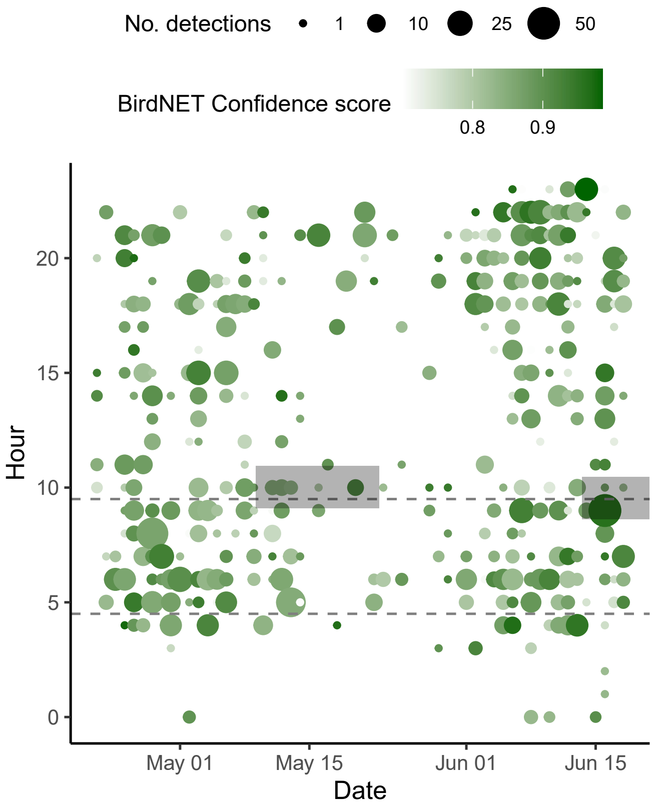


Figure 5: Greenshank detections with >70% confidence score on a BBS square on the Isle of Lewis in 2023. The frequency of Greenshank detections varies by the time of day and across the season. The timings of a typical BBS visit (dashed lines) and the timings typical of this square (grey rectangles) do not necessarily lend themselves to detecting this species.

CREDITS

We offer our thanks to The Sound Approach, and Ken and Linda Smith for funding this work, to the 30 volunteers who assisted with data collection, and the many more who kindly offered their assistance.

SUMMARY

Acoustic surveys offer several advantages over traditional survey methods, enabling continuous sampling over long periods of time, potentially yielding more information on patterns of seasonal movements and daily activity, and improving survey coverage of many species that are poorly catered for by traditional methods. They also lend themselves to participation by a wide range of people, including those with little or no bird identification skills or previous survey experience. In some areas where there are few skilled bird surveyors who are willing and able to carry out surveys, being able to draw on more people to help with deployment and collection of acoustic recorders could make a big difference. There is also a clear opportunity to extend the audio/AI approach and incorporate it within the BBS itself. Mobile apps (e.g., Merlin Bird ID, also from Cornell University) are gaining popularity and work well in some circumstances. For the moment, and whilst there are still some issues with accuracy, we are asking BBS and other survey volunteers not to use these apps for survey work (see BTO's statement: www.bto.org/survey-auto-id). This is, however, very likely to change in the future.

In either context (static or mobile) the suitability of acoustic surveys for inexperienced surveyors could help BTO to make our work more inclusive and accessible to a wide diversity of people. Additionally, BTO supporters with good bird identification skills who are unable to carry out traditional surveys in remote areas may still be able to contribute to acoustic monitoring at BTO by helping with our efforts to identify and verify calls.

FIND OUT MORE...

BTO 2024. BTO Acoustic Pipeline: Accurate species identification and data management for acoustic monitoring in conservation, management and site assessment, Available at: www.bto.org/pipeline

Kahl, S., Wood, C.M., Eibl, M. & Klinck, H. 2021. BirdNET: A deep learning solution for avian diversity monitoring. *Ecological Informatics* **61**. 101236 doi.org/10.1016/j.ecoinf.2021.101236

Published Papers 2023/24

Barton, M.G., Henderson, I., Border, J.A. & Siriwardena, G.M. 2023. A review of the impacts of air pollution on terrestrial birds. *Science of the Total Environment* **873**: 162136. doi.org/10.1016/j.scitotenv.2023.162136

Brighton, C.H., Massimino, D., Boersch-Supan, P., Barnes, A.E., Martay, B., Bowler, D.E., Hoskins, H.M.J. & Pearce-Higgins, J.W. 2024. Protected areas in good condition have a positive effect on bird population trends. *Biological Conservation* **292:** 110553. doi.org/10.1016/j.biocon.2024.110553

Evans, L. C., Burgess, M. D., Potts, S. G., Kunin, W. E. & Oliver, T. H. 2024. Population links between an insectivorous bird and moths disentangled through national-scale monitoring data. *Ecology Letters* **27**: e14362. doi.org/10.1111/ele.14362

Havinga, I., Marcos, D., Bogaart, P., Massimino, D., Hein, L. & Tuia, D. 2023. Social media and deep learning reveal specific cultural preferences for biodiversity. *People and Nature* **5**: 981–998. doi.org/10.1002/pan3.10466

Rigal, S. & 50 co-authors. 2023. Farmland practices are driving bird population decline across Europe. *Proceedings of the National Academy of Sciences* **120**: e2216573120. https://www.pnas.org/doi/pdf/10.1073/pnas.2216573120

Sharps, E., Hawkes, R.W., Bladon, A.J., Buckingham, D.L., Border, J., Morris, A.J., Grice, P.J. & Peach W.J. 2023. Reversing declines in farmland birds: How much agri-environment provision is needed at farm and landscape scales? *Journal of Applied Ecology* **60**: 568–580. doi.org/10.1111/1365-2664.14338

Stanbury, A.J., Balmer, D.E., Eaton, M.A., Grice, P.V., Khan, N.Z., Orchard, M.J. & Wotton, S.R. 2023. The status of the UK breeding European Turtle Dove *Streptopelia turtur* population in 2021. *Bird Study* **70**: 183–194. doi.org/10.1080/00063657.2023.2256511

Stanbury, A.J., Hawkes, R.W., Teuten, E.L, Tománková, I. & Douglas D.J.T. 2023. Habitat and other environmental correlates of the decline of breeding Whinchats *Saxicola rubetra* in the UK since the mid-1990s. *Bird Study* **70**: 227–242. doi.org/10.1080/00063657.2023.2264560

Tirozzi, P., Massimino, D. & Bani, L. 2024. Avian responses to climate extremes: insights into abundance curves and species sensitivity using the UK Breeding Bird Survey. *Oecologia* **204**: 241-255 doi.org/10.1007/s00442-023-05504-9

FURTHER READING

BTO 2024. *BirdTrends 2024: trends in numbers, breeding success and survival for UK breeding birds.* www.bto.org/birdtrends

Fisher, I., Ashpole, J., Scallan, D., Proud, T. & Carboneras, C. 2018. International Single Species Action Plan for the conservation of the European Turtle-dove *Streptopelia turtur* (2018 to 2028). *European Commission Publications Office.* https://data.europa.eu/doi/10.2779/743376

Johnstone, I.G., Hughes, J., Balmer, D.E, *et al.* 2022. Birds of Conservation Concern Wales 4: the population status of birds in Wales. *Milvus the Journal of the Welsh Ornithological Society* **2**: 1–34. Available at: https://tinyurl.com/BoCCW4

Marx, M., Korner-Nievergelt, F. & Quillfeldt, P. 2016. Analysis of ring recoveries of European Turtle doves *Streptopelia turtur* – Flyways, migration timing and origin areas of hunted birds. *Acta Ornithologica* **51:** 55–70. https://doi.org/10.3161/00016454AO2016.51.1.005

PECBMS. 2023. *Trends of common birds in Europe, 2023 update***.** Pan-European Common Bird Monitoring Scheme https://pecbms.info/trends-of-common-birds-in-europe-2023-update

Stanbury, A., Eaton, M., Aebischer, N., Balmer, D., Brown, A., Douse, A., Lindley, P., McCulloch, N., Noble, D. & Win I. 2021. The status of our bird populations: the fifth Birds of Conservation Concern in the United Kingdom, Channel Islands and Isle of Man and second IUCN Red List assessment of extinction risk for Great Britain. *British Birds* **114**: 723–747. www.britishbirds.co.uk/sites/default/files/BB_Dec21-BoCC5-IUCN2.pdf

Background and methods

The BBS was launched in 1994 to provide more representative habitat and geographical coverage than the main survey running at the time, the Common Birds Census (CBC). The CBC ended in 2000, and the overlap period between 1994 and 2000 allowed BTO to develop methods for calculating long-term trends (from the 1960s to the present) using data from both schemes. The BBS National Organiser, based at BTO HQ, is responsible for the overall running of the scheme, and is the main point of contact for the network of volunteer Regional Organisers (ROs). ROs are responsible for finding new volunteers and allocating squares to observers in their region. At the end of the season they validate submissions made online, and collect paper submissions for inputting.

The BBS is a line-transect survey based on randomly located 1-km squares. Squares are chosen through stratified random sampling, with more squares in areas with more potential volunteers. The difference in sampling densities is taken into account when calculating trends. BBS volunteers make two early-morning visits to their square during the April–June survey period, recording all adult birds encountered while walking two 1-km transects across their square. Each 1-km transect is divided into five 200-m sections for ease of recording. Birds are recorded in three distance categories, or as 'in flight', in order to assess detectability and work out species density. To assess further the detectability of species the option of recording how birds were first detected (by song, call or visually) was introduced in 2014. Observers also record the habitat along the transects, and record any mammals seen during the survey. Surveying a BBS square involves around six hours of fieldwork per year, and the aim is for each volunteer to survey the same square (or squares) every year.

As BBS squares are selected randomly, they can turn up within any kind of habitat. Some squares can never be surveyed, and these truly 'uncoverable' sites are removed from the system. However, squares that are temporarily inaccessible, or which are not taken up due to their remote location, are retained in order to maintain the integrity of the sampling design.

The BBS provides reliable population trends for a large proportion of our breeding species. Trends can also be produced for specific countries, regions or habitats. For these analyses, we take the higher count from the two visits for each species, summed over all four distance categories and 10 transect sections. Only squares that have been surveyed in at least two years are included in the analyses. Population changes are estimated using a log-linear model with Poisson error terms. Counts are modelled as a function of year and site effects, weighted to account for differences in sampling densities across the UK.

Since 2009, data from additional randomly selected 1-km squares surveyed as part of the Scottish Woodland BBS and the Upland BBS have been included in the BBS sample. These squares were surveyed using the same methodology as standard BBS squares, and results were incorporated into the trends, accounting for additional sampling effort. Since 2010, the option of adding an Upland Adjacent square to an existing 'Eligible Upland' BBS square has been encouraged, with the aim of increasing coverage in upland areas. These data are treated separately during the analyses.

The 'Upland Rovers' initiative was introduced in 2017, with the aim of further increasing coverage in remote areas. Carefully selected squares are available to be surveyed just once by 'roving' volunteers. These are 'core' BBS squares with poor to no previous coverage, upland in habitat type and remote as identified by a combination of distance from road and local human population.

Work has been carried out to assess the reliability of BBS trends, to ensure that reported trends are based on reliable data and sufficient sample sizes. This work has resulted in the following exclusions and caveats:

- We do not report population trends for six species of gull (Black-headed, Mediterranean, Common, Great Black-backed, Herring and Lesser Black-backed), as a large proportion of the records are of non-breeding, wintering or migratory individuals.
- Trends for rare breeding species with substantial wintering populations (e.g. Fieldfare) are excluded.
- Trends for Common Tern, Cormorant, Grey Heron and Little Egret are reported with the caveat that counts may contain a high proportion of birds away from breeding sites.
- Trends for Barn Owl and Tawny Owl are reported with the caveat that the BBS monitors nocturnal species poorly.
- Counts for six wader species (Oystercatcher, Lapwing, Golden Plover, Curlew, Snipe and Redshank) are corrected to exclude counts from non-breeding flocks, and observations of Golden Plover in habitat unsuitable for breeding are also excluded.

As for reports since 2021, we use the standard methods and omit all data from 2001 and 2020 to prevent the coverage biases in those years from affecting the trends we produce (see Harris *et al.* 2021, 2022). Although we omit the underlying data, we can estimate trend values for 2001 and 2020 by interpolating the smoothed trend line over the remaining years.

Interpreting the results

Pages 16–29 contain the annual bird and mammal population trend statistics for the Breeding Bird Survey (BBS), and pages 34–35 cover the Waterways Breeding Bird Survey (WBBS) results. Some guidance on reading and interpreting these tables and graphs is provided here.

THRESHOLDS FOR TRENDS

To ensure robust results, we produce trends only for species with sufficient data. To judge this, we look at the average number of squares on which a species has been recorded per year during the trend period. For UK BBS trends, we consider species above a reporting threshold of 40 squares. For countries within the UK, English Regions and UK WBBS trends, the threshold is an average of 30 squares during the trend period. The one-year change for 2022–23 is shown where the sample size reaches the reporting threshold for one of the longer trend periods. Therefore, if there is a 10-year or 'all-time' (27-year) trend, a one-year change is presented.

BBS 'ADD-ON' SQUARES

'Add-on' squares surveyed during the lifetime of the BBS, using BBS methodologies, have been included in these trends. These include Upland BBS, Upland Adjacent and Scottish Woodland squares. Upland BBS and Scottish Woodland squares were originally surveyed by professional fieldworkers: Scottish Woodland squares are now surveyed by volunteers. Upland Adjacent squares are also covered by volunteers during visits to survey their core BBS square: these were introduced as an option to increase coverage in remote upland areas.

TRENDS AND TABLES EXPLAINED

Species	Min. sample	1-year (22-23)	10-year (12-22)	27-year (95-22)	LCL	UCL
Stonechat	199	-2	197 *	243 *	168	345
Wheatear	372	-17 *	-32 *	-32 *	-42	-21

- Trends for species in brackets are reported with caveats (explanation on Pages 14, 29 and 34).
- For bird trends, **Red-listed** and **Amber-listed** species from *Birds of Conservation Concern 5* (BoCC5) are shown in the relevant colour. The exception to this is in the Wales Population trends, where the *Birds of Conservation Concern 4 Wales* (BoCC4 Wales) assessments are used.
- The sample size refers to the mean number of squares per year on which the species was recorded during BBS or WBBS. The figure shown in the tables, 'Min. Sample', is the smaller of these sample size figures for the 10-year and all-time trends, per species, per region.
- Trends are presented as the percentage change over three periods: one-year, 10-year and all-time.
- The short-term change covers the most recent years of the survey, i.e. for BBS and WBBS: 2022 to 2023.
- The long-term changes for both BBS and WBBS, cover the lifetime of the survey (BBS birds: 1994–2023, BBS mammals: 1995–2023, WBBS: 1998–2023). The 10-year trends cover 2012–22 for both surveys. All-time and 10-year periods have been smoothed, and the end years truncated.
- Trends with statistically significant changes are marked with an asterisk (*), where the 95% confidence limits of the change do not overlap zero.
- LCL and UCL are the lower and upper 95% confidence limits for the longest BBS bird trend: 1995–2022, BBS mammal trend: 1996–2022 and WBBS bird trend 1999–2022.

INTERPRETING GRAPHS

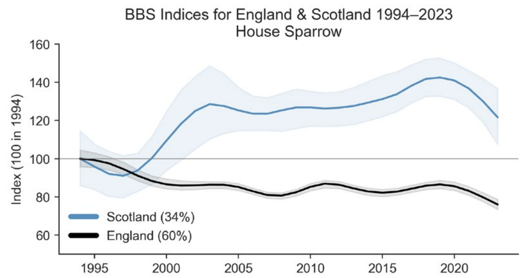
All BBS and WBBS graphs are displayed in the same way throughout the report. Beware, however, that the index and time period axes do vary in scale.

Single region BBS and WBBS index graphs show:

- smoothed trend – dark line
- confidence interval (85%) – pale shading
- annual index values – dots

In addition to these, we produce plots of multiple countries or regions for the same species on the same graph. This is used to illustrate where trends differ among geographical areas, either in their direction, or in the timing of particular changes. Care should be taken interpreting these; higher or lower indices for one region compared to another do not necessarily mean higher or lower abundance or prevalence.

In the example below, House Sparrow have increased since 1995 in Scotland and decreased in England. However, occupancy (number of squares observed as a percentage of the number surveyed) is still higher in England (60%) compared with Scotland (34%). For comparisons of countries and some regions, occupancy rates from 2023 are presented in the figure legend for reference. For clarity, annual index values are not shown in multi-region plots.



ONLINE RESOURCES

BBS BIRD TREND GRAPHS ONLINE: www.bto.org/bbs-graphs
BBS BIRD TREND TABLES ONLINE: www.bto.org/bbs-tables
BBS MAMMAL TRENDS ONLINE: www.bto.org/bbs-mammals
WBBS RESULTS ONLINE: www.bto.org/wbbs-results

United Kingdom: population trends

The first BBS report covering the 1994 and 1995 seasons reported population changes for 98 species. In this report, following the 30th year of fieldwork, we are now able to report on a further 21 species. Trends are published here, and throughout this report, at all time (27 years) and 10-year periods, with five-years also included online. The one-year change from 2022 to 2023 is also presented.

STATISTICALLY SIGNIFICANT RESULTS

Period	No. species	Greatest change in UK trends	
Long-term (95–22) increases	35	Red Kite	2,232%
Long-term (95–22) decreases	42	Turtle Dove	-97%
Short-term (22–23) increases	20	Firecrest	84%
Short-term (22–23) decreases	9	Kingfisher	-38%

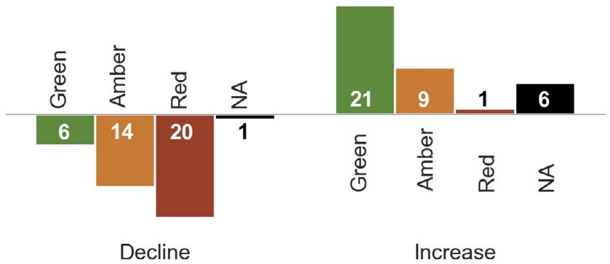


Figure 6: The number of birds with significant long-term declines and increases by BoCC5 assessment status (NA=Not assessed).

TRENDS OVER 30 YEARS

Both the colonisation by new species and growth in coverage and sample sizes have resulted in BBS monitoring more species over the course of the scheme. Some species, however, including **Turtle Dove** (p9) and **Willow Tit**, are now so rare that BBS cannot monitor them effectively. **Mediterranean Gull** would also qualify for a five-year trend but, as with other gulls, we don't publish these (p14). Nevertheless, the increase in observations of this species highlights their burgeoning breeding population, especially in the southern England.

AERIAL INSECTIVORES

Across the UK and in individual countries, there are widespread declines among our aerial insectivores, particularly **Swift**, **Swallow** and **House Martin**. All are reliant on swarming insects to feed and all typically nest in close association with humans. In the case of Swift, the declines go back to the beginning of the BBS, with declines across all three reported time points of 66%, 44% and 24%. For Swallow, a 35% increase between 1995 and 2010 has been followed by a decline of 43% since 2012. This pattern is true in all four countries of the UK. House Martin too, following initial increase or stability in the early part of the scheme, have now declined across Great Britain, with a 10-year decline of 40%. Only in Northern Ireland is this seen to differ (p24). Whilst weather was a stronger correlate of Swift demographic changes than aphid biomass (Finch *et al.* 2023), in Swallows, there is evidence that insect biomass is associated with chick survival (Martay *et al.* 2023).

These declines are not just limited to swifts, martins and swallows. The flycatchers too, are in decline. **Spotted Flycatcher** has declined by 73% in England since 1994, and over a more recent time period in Scotland (see p20). **Pied Flycatcher** has declined by 59% in the UK, with a significant proportion of the population found in Welsh woodlands (p22).

PERSISTENT DECLINES

Along with aerial insectivores, several other groups have experienced sustained long-term declines, many of which have been highlighted in previous BBS reports. Farmland species such as Turtle Dove, **Lapwing** and **Yellowhammer** all show declines on the 27-, 10- and five-year trends. One species that has seen sustained declines in recent years, **Greenfinch**, is showing some signs that the decline is, at the very least, slowing (Figure 7).

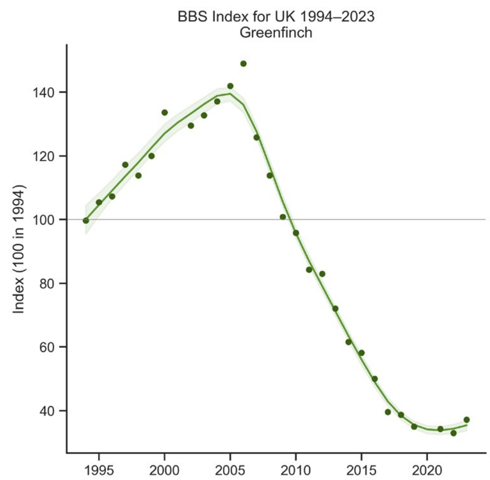


Figure 7: Are Greenfinch declines at an end following 15 years of decline as a result of disease?

FIND OUT MORE...

Finch, T., Bell, J.R., Robinson, R.A. & Peach, W.J. 2023. Demography of Common Swifts (*Apus apus*) breeding in the UK associated with local weather but not aphid biomass. *Ibis* **165**: 420–435. doi.org/10.1111/ibi.13156

Martay, B., Leech, D.I., Shortall, C.R., Bell., JR., Thackeray, S.J., Hemming, D.L. & Pearce-Higgins, J.W. 2023. Aerial insect biomass, but not phenological mismatch, is associated with chick survival of an insectivorous bird. *Ibis* **165:** 790–807. doi.org/10.1111/ibi.13190

Table 2: UK population trends during 2022–23, 2012–22 and 1995–2022.

Species	Min. sample	1-year (22-23)	10-year (12-22)	27-year (95-22)	LCL	UCL
Canada Goose	579	-4	36 *	128 *	65	240
Greylag Goose	314	-12	14	211 *	45	628
Mute Swan	279	-15	3	27	-6	80
Egyptian Goose	37	-30	57 *	1,835 *	677	>9,999
Shelduck	158	-13	-11	-16	-57	28
Mandarin Duck	41	8	80 *	604 *	271	1,397
Gadwall	52	16	81 *	223 *	87	503
Mallard	1,458	0	-8 *	6	-5	19
Teal	52	71 *	83 *	–	–	–
Tufted Duck	165	-13	-20 *	6	-24	46
Goosander	47	-32	-12	-18	-45	41
Red Grouse	159	14	-22 *	-17	-31	1
Grey Partridge	203	-8	-19 *	-63 *	-69	-56
Pheasant	2,076	-11 *	-4	24 *	15	34
Indian Peafowl	46	-10	-35	–	–	–
Red-legged Partridge	611	-35 *	-6	6	-5	18
Swift	1,028	-15	-44 *	-66 *	-70	-61
Cuckoo	669	10	22 *	-35 *	-42	-26
Feral Pigeon	754	3	8	-13	-24	1
Stock Dove	962	-3	41 *	46 *	32	65
Woodpigeon	2,831	6 *	-5 *	33 *	26	41
Turtle Dove	28	-11	-78 *	-97 *	-99	-96
Collared Dove	1,471	1	-27 *	-17 *	-24	-9
Moorhen	670	-11 *	-13 *	-25 *	-33	-16
Coot	286	-15 *	-30 *	-14	-31	10
Little Grebe	76	-17	1	12	-18	57
Great Crested Grebe	76	11	-16 *	-11	-39	17
Oystercatcher	392	-2	-3	-21 *	-31	-11
Lapwing	663	-5	-13 *	-51 *	-58	-43
Golden Plover	69	24	3	-10	-36	23
Curlew	531	-4	-8	-50 *	-56	-43
Snipe	184	4	15	22	-1	49
Common Sandpiper	78	6	-9	-25 *	-44	-4
Redshank	88	19	-6	-49 *	-66	-24
(Common Tern)	68	-6	1	0	-55	88
(Cormorant)	276	3	7	27	-3	79
(Grey Heron)	699	-5	-4	-14 *	-24	-1
(Little Egret)	70	-7	70 *	2,347 *	736	>9,999
Sparrowhawk	355	9	-19 *	-23 *	-33	-12
Marsh Harrier	50	14	-5	–	–	–
Red Kite	255	9	139 *	2,232 *	1,280	4,511
Buzzard	1,296	-6 *	1	80 *	64	99
(Barn Owl)	55	68 *	-9	208 *	108	351
Little Owl	65	-33	-44 *	-74 *	-79	-65
(Tawny Owl)	96	-29	-25 *	-42 *	-54	-26
Kingfisher	57	-38 *	17	-17	-44	40
Gt Spotted Woodpecker	1,279	-1	-4	132 *	114	149
Green Woodpecker	884	0	-28 *	-3	-11	6
Kestrel	683	22 *	-13 *	-40 *	-47	-33
Hobby	46	-1	-2	-5	-34	47
Peregrine	56	2	-25 *	-43 *	-61	-13
Ring-necked Parakeet	105	27 *	93 *	2,154 *	834	>9,999
Jay	890	2	-4	19 *	8	33
Magpie	2,136	0	0	-1	-6	4
Jackdaw	2,043	0	8 *	63 *	48	79
Rook	1,448	-2	-4	-23 *	-31	-15
Carrion Crow	2,692	2	1	18 *	11	27
Hooded Crow	151	12	6	14	-13	49
Raven	412	24	21	39	-7	127
Coal Tit	955	14 *	-12 *	0	-11	13
Marsh Tit	149	-23	-25 *	-45 *	-57	-27
Willow Tit	27	117	-52 *	-90 *	-94	-86
Blue Tit	2,622	6 *	-8 *	-2	-6	1
Great Tit	2,507	1	-13 *	25 *	20	32
Skylark	1,919	6 *	15 *	-11 *	-17	-6
Sand Martin	151	44 *	-4	18	-41	125
Swallow	2,163	22 *	-43 *	-24 *	-29	-19
House Martin	970	4	-40 *	-44 *	-51	-36
Cetti's Warbler	44	10	343 *	934 *	486	7,189
Long-tailed Tit	1,116	10	-4	15 *	6	26
Wood Warbler	45	1	-51 *	-81 *	-90	-71
Willow Warbler	1,462	-3	-9 *	-9 *	-18	-1
Chiffchaff	1,889	8 *	32 *	162 *	144	183
Sedge Warbler	319	23 *	-19 *	-13	-28	4
Reed Warbler	149	6	14	42 *	13	83
Grasshopper Warbler	91	16	-9	5	-24	44
Blackcap	1,958	-9 *	23 *	190 *	173	206
Garden Warbler	470	18	-17 *	-29 *	-38	-17
Lesser Whitethroat	307	-2	-7	-10	-24	5
Whitethroat	1,546	-1	-15 *	19 *	11	30
Firecrest	37	84 *	157 *	–	–	–
Goldcrest	922	10	5	1	-12	18
Wren	2,793	2	28 *	29 *	24	34
Nuthatch	632	15 *	8 *	104 *	81	125
Treecreeper	406	20 *	-6	1	-13	18
Starling	1,841	0	-8 *	-54 *	-58	-51
Song Thrush	2,294	-2	22 *	30 *	22	36
Mistle Thrush	1,209	10 *	-7 *	-36 *	-42	-29
Blackbird	2,803	1	-4 *	17 *	13	21
Ring Ouzel	46	25	4	–	–	–
Spotted Flycatcher	168	47 *	-37 *	-68 *	-74	-62
Robin	2,701	2	14 *	25 *	21	30
Nightingale	34	11	-5	-42 *	-63	-5
Pied Flycatcher	39	-22	–	-59 *	-75	-33
Redstart	198	7	-22 *	6	-11	24
Whinchat	78	-12	-12	-60 *	-71	-47
Stonechat	199	-2	197 *	243 *	168	345
Wheatear	372	-17 *	-32 *	-32 *	-42	-21
Dipper	67	3	-32 *	-50 *	-64	-28
Tree Sparrow	206	-11	-26 *	62 *	19	120
House Sparrow	1,803	-2	-4	-7	-13	1
Dunnock	2,347	-4	-9 *	10 *	4	15
Yellow Wagtail	169	-16	-5	-46 *	-57	-34
Grey Wagtail	242	-27 *	20 *	-12	-27	5
Pied Wagtail	1,382	-2	-10 *	-20 *	-28	-14
Meadow Pipit	883	2	4	-13 *	-20	-6
Tree Pipit	155	3	-20	-14	-33	12
Chaffinch	2,775	-1	-39 *	-32 *	-35	-29
Bullfinch	705	7	-17 *	-11 *	-18	-1
Greenfinch	1,774	13 *	-57 *	-67 *	-70	-65
Linnet	1,328	9	1	-23 *	-31	-16
Lesser Redpoll	186	-7	-20 *	13	-17	47
Common Crossbill	64	56 *	-50 *	-10	-38	42
Goldfinch	2,029	1	19 *	151 *	134	171
Siskin	232	20 *	-20 *	35 *	8	75
Corn Bunting	151	-11	39 *	-16	-40	13
Yellowhammer	1,259	-4	-19 *	-31 *	-36	-25
Reed Bunting	565	5	8	28 *	14	46

INTERPRETING THE RESULTS: see Page 15

TREND TABLES ONLINE: www.bto.org/bbs-tables

England: population trends

Trends for 114 species are published overleaf, an increase of two now that both Firecrest and Teal qualify for 10-year trends. Two additional species have five-year trends, including Woodlark as a newcomer in 2023, giving 116 species overall.

STATISTICALLY SIGNIFICANT RESULTS

Period	No. species	Greatest change in English trends	
Long-term (95–22) increases	33	Red Kite	22,811%
Long-term (95–22) decreases	41	Turtle Dove	-97%
Short-term (22–23) increases	13	Firecrest	90%
Short-term (22–23) decreases	22	Kingfisher	-56%

NEW TRENDS

The number of trends published for England increases again, with the addition of a five-year trend for Woodlark, which shows a 45% increase from 2017 to 2022. The overwhelming majority of Woodlark BBS records are in the southern half of England where the heaths of the New Forest, Dorset and the Thames Basin support much of the population. Meanwhile, 10-year trends – both increasing – are now available for Teal (166%) and Firecrest (140%).

WOODLANDS

The Wild Bird Indicator update, published in November 2023, highlighted the short-term (five-year) declines in many of our woodland birds. The species used in the indicator are ecologically diverse, their grouping into specialists and generalists reflecting this. For many species, these declines are purely seen in the short-term, with five- and 10- year declines seen in widespread generalists like Great Tit, Dunnock and Blackbird which otherwise have either a positive or stable long-term trends. All three of these well known species have declined in England between 2017 and 2022, whilst trends in other UK countries are variable: over the last 10 years Blackbirds are stable in Scotland and up by 12% in Wales, compared with Great Tit (10-year declines in Wales and Northern Ireland, stable in Scotland) and Dunnock (19% 10-year decline in Scotland, stable in Wales).

Other species, particularly 'specialists' like Marsh Tit and Nightingale have shown persistent long term declines of 45% and 40% respectively, although Nightingale have seen a 35% increase in the last five years in England. Like Marsh Tit, Tree Pipit has also experienced steady declines across all three time periods, with a 10-year decline of 24% also evident in Wales. Tree Pipits in Scotland are faring better, with a 73% increase since 1995. Woodland birds in the UK are under pressure from a range of threats, including ever increasing populations of deer (p28), as well as potentially through competitive interactions with other species, these potentially mediated by human behaviour (Broughton *et al.* 2022).

AVIAN INFLUENZA

One of the strengths of the BBS is being able to present a view over the medium- to long-term. Year-to-year changes can be harder to interpret as other, non-biological factors, can play a part. Nevertheless, the BBS can still sometimes detect changes over this short time period. Whilst not significant, there was a substantial decrease in the **Common Tern** index between 2022 and 2023 in England. This species is usually reported with the caveat that many records are away from breeding areas, but it seems quite likely that the huge impact of Highly Pathogenic Avian Influenza (HPAI) is, partly, reflected in the one-year change. **Mute Swan**, too, has seen the third successive decline in the unsmoothed index. What is more certain will be the increasingly important role of the BBS and other surveys in detecting the longer-term impacts of HPAI. In the short-term, a focus on reporting cases is key to better understanding the acute impacts of the disease. For guidance on how to report dead wild birds, please visit: www.bto.org/report-ai

FARMLAND

Whilst the overall decline in woodland birds is more recent, farmland birds have been declining for much longer. In many cases, these declines continue, with the species listed on p16 ('Persistent Declines'), along with **Kestrel**, all showing 27-, 10- and five-year declines in England. In some cases, the declines in England are relatively recent (e.g., **Tree Sparrow**, Figure 8 and p20), or have slowed following steeper declines in the period 1995–2010 (e.g., **Starling** and **Grey Partridge**). Of the specialist farmland species, only **Skylark**, **Corn Bunting** and **Stock Dove**, show positive recent trends.

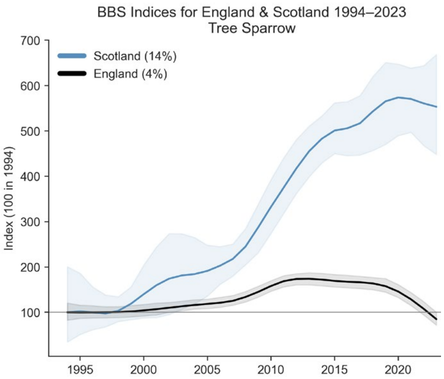


Figure 8: Whilst increasing in Scotland, Tree Sparrow has experienced significant recent decline in England.

FIND OUT MORE...

Broughton, R.K., Shutt J.D. & Lees., A.C. 2022. Rethinking bird feeding: are we putting extra pressure on some struggling woodland birds? *British Birds* **115**: 2–6. https://britishbirds.co.uk/content/rethinking-bird-feeding

Defra 2023. Wild bird populations in the UK. Annual trends in wild bird populations in the UK. Available at https://www.gov.uk/government/statistics/wild-bird-populations-in-the-uk.

Table 3: Trends in England during 2022–23, 2012–22 and 1995–2022.

Species	Min. sample	1-year (22-23)	10-year (12-22)	27-year (95-22)	LCL	UCL
Canada Goose	525	-17	32 *	92 *	26	170
Greylag Goose	254	-25 *	22 *	331 *	160	690
Mute Swan	237	-15	12	26	-6	100
Egyptian Goose	37	-29 *	56 *	1,823 *	546	>9,999
Shelduck	127	-17	-5	13	-38	50
Mandarin Duck	39	9	74 *	622 *	262	1,567
Gadwall	49	29 *	70 *	199 *	90	483
Mallard	1,210	-5	-11 *	10	0	20
Teal	30	32	166 *	–	–	–
Tufted Duck	142	-5	-26 *	-6	-34	34
Red Grouse	88	-1	-13	0	-31	36
Grey Partridge	177	-14	-21 *	-61 *	-69	-53
Pheasant	1,732	-13 *	-2	28 *	17	36
Indian Peafowl	43	-3	-35	–	–	–
Red-legged Partridge	588	-36 *	-6	2	-10	16
Swift	883	-14	-46 *	-67 *	-72	-61
Cuckoo	428	-5	-14 *	-72 *	-75	-68
Feral Pigeon	609	4	16 *	-15 *	-25	-4
Stock Dove	886	-3	46 *	47 *	28	66
Woodpigeon	2,246	5 *	-6 *	36 *	28	44
Turtle Dove	27	-11	-78 *	-97 *	-98	-96
Collared Dove	1,269	-6 *	-32 *	-23 *	-29	-17
Moorhen	618	-10 *	-16 *	-28 *	-35	-19
Coot	258	-16 *	-25 *	-11	-28	14
Little Grebe	59	-20	4	2	-38	55
Great Crested Grebe	68	2	-14	-22	-42	12
Oystercatcher	221	8	2	55 *	25	101
Lapwing	558	-12 *	-17 *	-39 *	-47	-30
Golden Plover	27	37	-25	–	–	–
Curlew	344	-4	-1	-32 *	-42	-21
Snipe	96	-20	34 *	14	-15	57
Common Sandpiper	33	-18	-6	-34 *	-57	-5
Redshank	62	2	-22	-46 *	-64	-13
(Common Tern)	62	-50	8	41	-30	116
(Cormorant)	231	7	16	32 *	5	67
(Grey Heron)	570	-12 *	-3	-20 *	-33	-9
(Little Egret)	64	-11	66 *	2,149 *	701	>9,999
Sparrowhawk	292	8	-21 *	-30 *	-39	-18
Marsh Harrier	43	14	-6	–	–	–
Red Kite	203	-1	170 *	22,811 *	>999	>9,999
Buzzard	919	-9 *	10 *	202 *	151	256
(Barn Owl)	52	55 *	-6	221 *	106	468
Little Owl	63	-32	-43 *	-73 *	-79	-66
(Tawny Owl)	83	-16	-22 *	-34 *	-47	-12
Kingfisher	51	-56 *	-12	-28	-50	2
Gt Spotted Woodpecker	1,098	-7	-9 *	96 *	84	114
Green Woodpecker	829	-1	-30 *	4	-5	12
Kestrel	605	19 *	-10 *	-26 *	-33	-19
Hobby	44	-2	-7	-6	-37	42
Peregrine	35	-41	-18	18	-32	120
Ring-necked Parakeet	105	27 *	93 *	2,153 *	869	>9,999
Jay	759	-5	-11 *	0	-8	8
Magpie	1,778	-2	3	1	-4	7
Jackdaw	1,645	-2	15 *	80 *	68	96
Rook	1,157	-5	-2	-14 *	-24	-2
Carrion Crow	2,199	4	2	26 *	16	36
Raven	206	12	11	29	-38	319

Species	Min. sample	1-year (22-23)	10-year (12-22)	27-year (95-22)	LCL	UCL
Coal Tit	638	18 *	-9 *	12	-1	29
Marsh Tit	137	-1	-27 *	-49 *	-59	-38
Willow Tit	23	114	-52 *	-90 *	-94	-84
Blue Tit	2,117	5 *	-8 *	-3	-7	1
Great Tit	2,017	1	-13 *	18 *	13	24
Skylark	1,520	3	11 *	-13 *	-18	-7
Sand Martin	90	21	4	-1	-33	47
Swallow	1,647	16 *	-50 *	-33 *	-38	-27
House Martin	738	-4	-46 *	-58 *	-64	-52
Cetti's Warbler	41	7	352 *	766 *	323	8,138
Long-tailed Tit	982	0	-11 *	4	-6	13
Willow Warbler	936	-7 *	-22 *	-48 *	-54	-42
Chiffchaff	1,569	8 *	29 *	156 *	142	173
Sedge Warbler	199	22 *	-16 *	-21	-38	2
Reed Warbler	140	6	14	40 *	12	76
Grasshopper Warbler	41	8	-3	-25	-50	30
Blackcap	1,643	-12 *	19 *	149 *	132	165
Garden Warbler	379	15	-19 *	-39 *	-48	-28
Lesser Whitethroat	294	-3	-6	-9	-20	8
Whitethroat	1,320	-4	-15 *	15 *	8	25
Firecrest	35	90 *	140 *	–	–	–
Goldcrest	664	7	4	23 *	2	38
Wren	2,167	-2	24 *	24 *	18	29
Nuthatch	540	7	8 *	110 *	86	140
Treecreeper	303	11	-8	-6	-19	11
Starling	1,484	-7	-10 *	-63 *	-66	-60
Song Thrush	1,782	-4 *	13 *	23 *	16	30
Mistle Thrush	938	0	-17 *	-50 *	-54	-45
Blackbird	2,219	-1	-8 *	9 *	5	13
Ring Ouzel	26	-26	14	–	–	–
Spotted Flycatcher	106	47 *	-33 *	-73 *	-79	-66
Robin	2,124	1	15 *	31 *	26	36
Nightingale	34	12	-5	-40 *	-65	-1
Redstart	110	-4	-12	-2	-28	27
Whinchat	29	-37 *	-43 *	-65 *	-81	-44
Stonechat	82	4	230 *	270 *	152	474
Wheatear	200	5	-40 *	-25 *	-47	-1
Dipper	32	18	-38 *	-60 *	-80	-10
Tree Sparrow	154	-25 *	-38 *	8	-20	46
House Sparrow	1,452	-4 *	-8 *	-20 *	-25	-13
Dunnock	1,900	-6 *	-10 *	4	-3	10
Yellow Wagtail	165	-17 *	-4	-45 *	-56	-31
Grey Wagtail	163	-22	16	2	-19	23
Pied Wagtail	1,034	-7	-3	-18 *	-24	-12
Meadow Pipit	451	3	-13 *	-22 *	-33	-11
Tree Pipit	69	-10	-42 *	-69 *	-80	-52
Chaffinch	2,145	-5 *	-47 *	-42 *	-44	-39
Bullfinch	537	-6	-28 *	-25 *	-32	-16
Greenfinch	1,504	8 *	-55 *	-65 *	-67	-62
Linnet	1,070	10	-3	-27 *	-34	-20
Lesser Redpoll	68	-4	-37 *	-28	-60	16
Crossbill	33	30	-61 *	–	–	–
Goldfinch	1,662	-2	16 *	140 *	124	160
Siskin	89	18	1	74	-14	292
Corn Bunting	143	-9	35 *	-14	-37	17
Yellowhammer	1,089	-10 *	-18 *	-37 *	-42	-32
Reed Bunting	422	0	0	32 *	13	51

TREND GRAPHS ONLINE: www.bto.org/bbs-graphs **TREND TABLES ONLINE:** www.bto.org/bbs-tables

INTERPRETING THE RESULTS: see Page 15

Scotland: population trends

The 2023 report sees the introduction of four new trends, giving a total of 75 species for which at least a five-year trend can be calculated. A number of species, particularly of woodland and scrub, are showing differing trends in Scotland compared to further south in the UK.

STATISTICALLY SIGNIFICANT RESULTS

Period	No. species	Greatest change in Scottish trends	
Long-term (95–22) increases	23	Chiffchaff	1,088%
Long-term (95–22) decreases	16	Greenfinch	-71%
Short-term (22–23) increases	10	Kestrel	73%
Short-term (22–23) decreases	3	Grey Wagtail	-42%

NEW TRENDS

Grasshopper Warbler and **Red Kite** are new additions to the list of species for which trends can be produced in Scotland, with five-year trends now added. In addition, 10-year trends are now available for **Sparrowhawk**, **Mute Swan** and **Whinchat**. These all follow shortly after their recent introduction with five-year trends. In the case of Whinchat, the ability to produce new trends is almost certainly a direct result of increase in coverage from Upland Rovers. Whinchat in Scotland has shown relatively little change in the last decade, but has declined by 65% in England. Recent research, led by RSPB and using BBS data, has also highlighted that declines were greatest in areas with more woodland, and least in areas with the highest coverage of unenclosed semi-natural grassland (Stanbury *et al.* 2023).

NORTH/SOUTH DIVIDE

Population trends of several species differ between Scotland and England. **Willow Warbler** has featured recently in these pages in this regard with climate change directly implicated. **Tree Sparrow** and **House Sparrow** are similar, though the reasons for this aren't yet known. House Sparrow in Scotland has increased by 36% in the last 27 years (p15, albeit with some signs of very recent decline), doubled in Wales and increased by half in Northern Ireland, compared with a 20% decline in England. Whilst BBS occupancy is much lower, Tree Sparrow in Scotland has increased to five and half times the 1995 population, whilst in England there have been 38% and 35% declines in the last 10 and five years, with several reports of complete colony collapse in monitored strongholds. Other species showing increases in Scotland, but declines in England include **Bullfinch**, **Cuckoo**, **Garden Warbler** (five-year), **Long-tailed Tit, Tree Pipit** and Willow Warbler. A species showing the opposite pattern is **Oystercatcher**, which along with **Lapwing** (63%), **Curlew** (60%) and **Common Sandpiper** (25%) is declining in Scotland. Only Oystercatcher is showing an increase in England, with other waders showing persistent declines there too.

SCOTTISH INDICATORS

January 2024 saw the publication of The Scottish Terrestrial Breeding Bird Indicators 1994–2022 (NatureScot, 2024), based largely on BBS data. Of the different indicators, the woodland bird index increased significantly by 56% since 1994, with a recent period of stability since 2016. Many of the changes can be linked to changes in weather – there was a positive correlation between the all-species indicator and and the mean annual temperature in Scotland. The woodland indicator was positively correlated with seasonal levels of rainfall, which may benefit woodland birds by increasing the availability of invertebrates. Comparisons with the woodland indicator in other countries are difficult due to differences in the species composition of the indicator. Many woodland species in Scotland are doing very well. **Blackcap** (679%) and **Chiffchaff** (1,089%) and **Jay** (445%) have rapidly growing populations, alongside **Great Spotted Woodpecker** and Tree Pipit. Some woodland species, however, aren't faring as well in Scotland. The decline in numbers of Spotted Flycatcher (51% over the last decade, revealed by a new 10-year trend in Scotland) is similar to that reported for the species in England.

SPOTTED FLYCATCHER: EDMUND FELLOWES/BTO

FIND OUT MORE...

NatureScot 2024. Scottish Terrestrial Breeding Birds 1994–2022. NatureScot Available at: https://www.nature.scot/doc/official-statistics-scottish-terrestrial-breeding-birds-1994-2022

Stanbury, A.J. et al. 2023. Habitat and other environmental correlates of the decline of breeding Whinchats *Saxicola rubetra* in the UK since the mid-1990s. *Bird Study* **70**: 227–242. doi.org/10.1080/00063657.2023.2264560

Table 4: Trends in Scotland during 2022–23, 2012–22 and 1995–2022.

Species	Min. sample	1-year (22-23)	10-year (12-22)	27-year (95-22)	LCL	UCL
Greylag Goose	43	4	2	126	-24	758
Mute Swan	31	7	-22	– –	–	–
Mallard	127	12	-8	-20 *	-34	-3
Red Grouse	65	26	-24 *	-25 *	-39	-6
Pheasant	173	-1	-14 *	2	-14	27
Swift	58	-32	-9	-60 *	-72	-45
Cuckoo	99	17	48 *	62 *	29	107
Feral Pigeon	79	7	-17	-6	-39	37
Stock Dove	34	16	-12	– –	–	–
Woodpigeon	259	7	-8	4	-13	27
Collared Dove	64	36 *	0	11	-40	92
Oystercatcher	148	-7	-8	-37 *	-51	-22
Lapwing	86	9	-9	-63 *	-73	-50
Golden Plover	44	22	17	-10	-35	27
Curlew	134	1	-13	-60 *	-69	-50
Snipe	72	14	12	25	-1	63
Common Sandpiper	40	8	-8	-25 *	-43	-5
(Grey Heron)	60	16	0	4	-28	55
Sparrowhawk	30	0	-14	–	–	–
Buzzard	177	4	-12	11	-6	40
Gt Spotted Woodpecker	76	18	9	440 *	274	645
Kestrel	37	73 *	-18	-67 *	-78	-52
Jay	32	9	20	445 *	248	848
Magpie	72	-9	36 *	82 *	41	140
Jackdaw	151	5	11	48 *	15	110
Rook	129	13	3	-36 *	-54	-16
Carrion Crow	242	10	-5	-3	-20	18
Hooded Crow	58	28	-10	-31 *	-55	-1
Raven	70	57	53	52 *	0	127
Coal Tit	163	9	-8	-3	-17	21
Blue Tit	205	3	-3	6	-5	23
Great Tit	198	2	-9	47 *	22	80
Skylark	253	9 *	26 *	-4	-16	9
Sand Martin	42	54 *	0	52	-32	485
Swallow	217	16 *	-33 *	-2	-21	16
House Martin	85	8	-29 *	39	-9	116
Long-tailed Tit	43	42	71 *	127 *	54	247
Willow Warbler	261	-9 *	3	32 *	17	50
Chiffchaff	97	19 *	127 *	1,089 *	654	1,779
Sedge Warbler	66	21	-19	13	-23	67
Blackcap	100	-10	57 *	679 *	463	1,049
Garden Warbler	36	2	-14	–	–	–
Whitethroat	107	9	-4	121 *	49	185
Goldcrest	109	10	-6	-1	-25	36
Wren	283	12 *	40 *	58 *	35	81
Treecreeper	46	40	2	6	-22	52
Starling	175	8	-1	-28 *	-46	-13
Song Thrush	224	-3	39 *	37 *	18	57
Mistle Thrush	94	30 *	15	10	-23	61
Blackbird	246	1	0	31 *	12	51
Spotted Flycatcher	32	41	-51 *	–	–	–
Robin	245	0	1	13	-1	31
Whinchat	27	-6	14	-64 *	-76	-41
Stonechat	52	-9	203 *	192 *	113	378
Wheatear	97	-23 *	-27 *	-34 *	-48	-17
Tree Sparrow	39	12	34	450 *	145	1,249
House Sparrow	127	-9	3	36 *	3	80
Dunnock	174	8	-19 *	27 *	7	51
Grey Wagtail	36	-42 *	4	-29	-50	7
Pied Wagtail	160	6	-22 *	-32 *	-44	-19
Meadow Pipit	259	3	12 *	-12 *	-22	-2
Tree Pipit	45	4	-8	73 *	19	155
Chaffinch	294	3	-24 *	-10	-20	1
Bullfinch	58	18	6	45 *	10	107
Greenfinch	107	46 *	-57 *	-71 *	-79	-60
Linnet	107	16	31 *	0	-26	29
Lesser Redpoll	63	-16	0	32	-17	110
Crossbill	32	67	-44 *	–	–	–
Goldfinch	137	10	34 *	238 *	160	350
Siskin	95	25	-30 *	15	-12	52
Yellowhammer	131	13	-20 *	9	-8	31
Reed Bunting	79	4	40 *	58 *	23	108

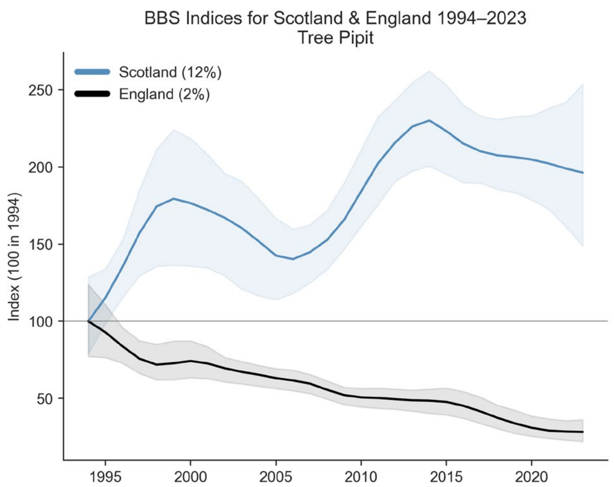


Figure 9: Tree Pipit is one of a number of species, like Willow Warbler, showing an increase in Scotland, but a decline in England.

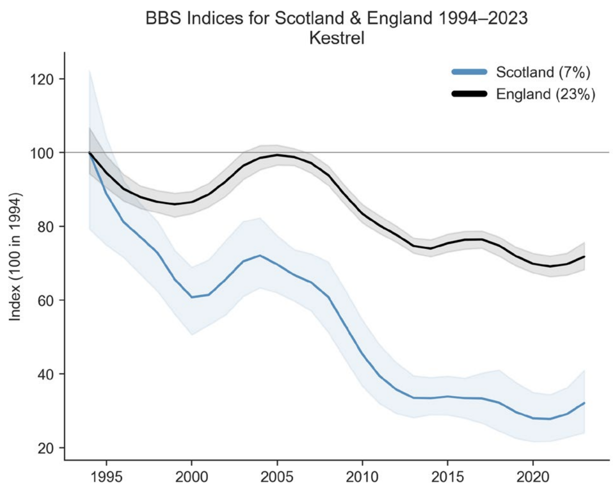


Figure 10: Kestrel, by contrast, is in decline in both Scotland and England. Rodenticide use has been implicated in its declines across the UK.

TREND GRAPHS ONLINE: www.bto.org/bbs-graphs TREND TABLES ONLINE: www.bto.org/bbs-tables

Wales: population trends

The provision of new all-time trends for species are relatively rare, especially for established breeding species. In 2023, we are able to report the all-time trends for Grey Wagtail in Wales for the first time. The total number of species reported for Wales remains at 60.

STATISTICALLY SIGNIFICANT RESULTS

Period	No. species	Greatest change in Welsh trends*	
Long-term (95–22) increases	18	Canada Goose	596%
Long-term (95–22) decreases	17	Greenfinch	-79%
Short-term (22–23) increases	5	Yellowhammer	105%
Short-term (22–23) decreases	4	Pheasant	-19%

* Species are colour coded by the BoCC4 Wales assessment.

GOING WITH THE FLOW

Despite the average sample size for **Grey Wagtail** increasing to such a degree that a new all-time trend can be produced, the trend is a relatively stable one. Often, new all-time trends arise for colonising species (for example, **Little Egret** and **Ring-necked Parakeet** in England), but this does not appear to be the case here. Grey Wagtail is one of four species to contribute to the "Birds of Fast Flowing Water" sub-indicator for Wetlands. Both BBS data in the three countries of Great Britain and WBBS data for the UK, show a similar pattern – some increases in the late 1990s, with a sharp decline between 2007 and 2011, followed by recovery to similar levels to the start of the monitoring period.

Dipper, another species contributing to this riparian indicator, does not have a sufficient sample size in Wales for trends, yet a significant proportion of the UK's population is supported by Welsh rivers, especially in the south of the country. The UK trend for Dipper shows a decline of 50% since 1995. Like Grey Wagtail, a decline was seen in the late 2000s, with a brief recovery, followed by a subsequent five-year decline of 30%. With increasing concerns over water quality, species like Grey Wagtail and the data generated from WBBS (p34) and riparian transects on BBS squares will become ever more important.

CURLEW CRISIS

Curlew is showing some of the biggest declines of any UK breeding species, with the UK population having nearly halved since 1995. Given that the UK supports around a quarter of the total global breeding population, this decline has potentially far-reaching consequences. The largest of these declines is seen in Wales, with a decline of over three-quarters since 1995, compared to still concerning declines of 60% in Scotland and 32% in England (Figure 11).

The mean average sample size for Curlew in Wales has always been relatively low. However, with declines as they are, Curlew, like other species in the UK such as Willow Tit and Turtle Dove, may become too rare for BBS to monitor effectively in Wales. Another species for which that is now true is **Yellowhammer**. Although published in Table 5, the average sample size for Yellowhammer in Wales has now dropped below the official reporting threshold, a consequence of the 76% decline seen in Wales since 1995.

WELSH WOODLANDS

Along with some riparian species, Wales also supports significant populations of the UK's more threatened woodland birds, particularly the Red-listed **Wood Warbler** and Amber-listed **Pied Flycatcher**. In both cases, sample sizes are insufficient to produce trends for Wales. The sample sizes for both species across the UK are relatively small, with Pied Flycatcher too now falling below the official reporting threshold for the UK with most of the BBS squares on which they occur being in Wales. The trends for both of these long-distance migrants are similar (Figure 12), with long-term declines of 81% (Wood Warbler) and 59% (Pied Flycatcher). Like other species that contribute to the specialist woodland indicator, five-year declines are evident, though there is less certainty surrounding this period for Pied Flycatcher (Figure 12b).

Another woodland specialist that also has a significant Welsh population is **Redstart**. Redstart was recently moved to Green in the recent BoCC4 Wales assessment, but remains at Amber in the UK assessment. Its population, both in England and Wales has fluctuated since 1994. In Wales, and at the UK level, 10-year declines are reported (30% and 20% respectively). However, there is some sign of a recovery, with 2023 results seeing the third successive increase in the unsmoothed index.

MORE SQUARES, MORE TRENDS

What is clear is the importance of Wales in supporting significant proportions of the populations of some the UK's more threatened woodland and riparian species. However, sample sizes are often not sufficient to calculate robust trends for Wales alone. As BBS looks to its next 30 years, improving BBS coverage in Wales will be a major focus – alongside the potential for the development of WBBS (p33) – so that more robust measures of change can be made for these species in Wales.

GREY WAGTAIL: EDMUND FELLOWES/BTO

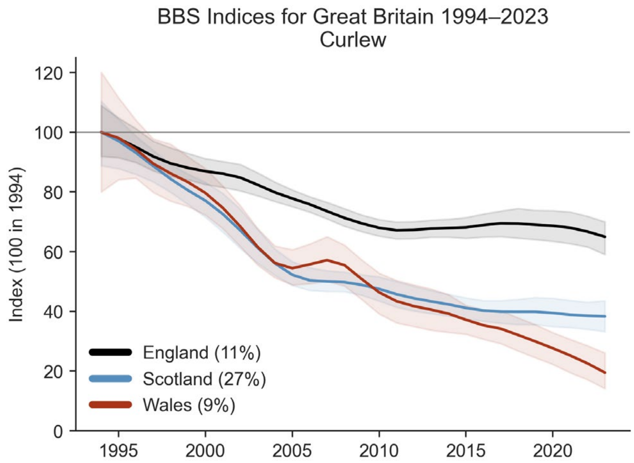


Figure 11: Curlew populations are declining across Britain, but the rate of this is greatest in Wales.

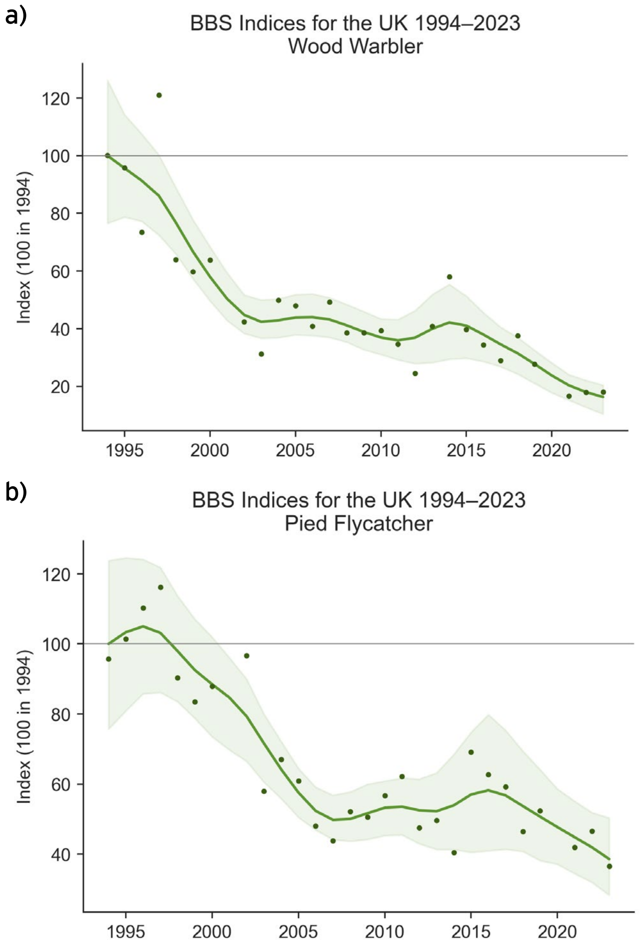


Figure 12: UK population trends of (a) Wood Warbler and (b) Pied Flycatcher, both species with significant populations in Wales, but with insufficient samples sizes for Welsh trends.

FIND OUT MORE...

Burgess, M., Castello, J., Davis, T. & Hewson, C. 2022. Loop-migration and non-breeding locations of British breeding Wood Warblers *Phylloscopus sibilatrix*. *Bird Study* **69**: 1–2.
doi: 10.1080/00063657.2022.2138825

Table 5: Trends in Wales during 2022–23, 2012–22 and 1995–2022.

Species†	Min. sample	1-year (22-23)	10-year (12-22)	27-year (95-22)	LCL	UCL
Canada Goose	37	50	81 *	596 *	255	1,519
Mallard	77	11	18	-1	-48	68
Pheasant	110	-19 *	-1	22	-16	77
Swift	64	-16	-59 *	-76 *	-84	-63
Cuckoo	67	-3	45 *	3	-28	36
Feral Pigeon	40	-28	0	29	-5	117
Stock Dove	38	-7	2	85 *	9	217
Woodpigeon	216	6	4	36 *	7	67
Collared Dove	84	8	-1	25	-14	88
Curlew	31	-31	-46 *	-77 *	-86	-65
(Grey Heron)	46	15	23	0	-47	79
Red Kite	38	28	86 *	522 *	250	1,131
Buzzard	159	-19 *	-19 *	-17 *	-32	-1
Gt Spotted Woodpecker	102	4	13 *	231 *	154	312
Green Woodpecker	47	15	-8	-34 *	-49	-14
Jay	86	38	5	41	-1	105
Magpie	181	9	-4	-21 *	-34	-8
Jackdaw	158	5	-15	8	-33	91
Rook	81	3	-45 *	-59 *	-73	-39
Carrion Crow	232	-16 *	-4	7	-9	25
Raven	108	-13	-11	14	-17	97
Coal Tit	85	26 *	-18	-30 *	-49	-4
Blue Tit	202	9	-19 *	-6	-18	6
Great Tit	194	-11	-21 *	19 *	2	40
Skylark	115	30	-13	-21	-37	1
Swallow	192	23 *	-44 *	-23 *	-36	-10
House Martin	91	34	-54 *	-48 *	-63	-26
Long-tailed Tit	70	51 *	-20	5	-22	36
Willow Warbler	175	-1	-19 *	-21 *	-35	-2
Chiffchaff	170	3	9	92 *	57	132
Blackcap	154	2	11 *	183 *	127	269
Garden Warbler	62	28	-18	-27	-53	15
Whitethroat	96	8	-25 *	-28 *	-44	-5
Goldcrest	94	11	5	-44 *	-61	-11
Wren	227	-5	29 *	26 *	11	40
Nuthatch	84	33	-5	44 *	12	90
Treecreeper	45	15	4	7	-23	52
Starling	84	-13	18	-66 *	-78	-49
Song Thrush	190	5	29 *	39 *	20	59
Mistle Thrush	114	-2	17 *	7	-16	38
Blackbird	226	5	12 *	54 *	45	69
Robin	220	10 *	29 *	11 *	1	24
Redstart	72	25	-30 *	0	-19	22
Stonechat	51	2	159 *	360 *	223	710
Wheatear	60	-28	-25 *	-32 *	-50	-4
House Sparrow	146	1	11	103 *	65	146
Dunnock	180	-7	6	35 *	10	61
Grey Wagtail	30	-7	24	-23	-54	21
Pied Wagtail	133	-3	2	-2	-22	24
Meadow Pipit	102	-7	-16	-17	-37	3
Tree Pipit	37	17	-24 *	-28	-55	8
Chaffinch	222	-12 *	-43 *	-45 *	-53	-38
Bullfinch	72	24	-2	-4	-27	28
Greenfinch	98	21	-72 *	-79 *	-86	-72
Linnet	104	-11	8	-19	-41	18
Lesser Redpoll	38	-15	-21	–	–	–
Goldfinch	157	-6	17 *	107 *	62	161
Siskin	37	-9	36	139 *	48	366
Yellowhammer	29	105 *	–	-76 *	-86	-64
Reed Bunting	32	23	3	35	-25	140

† Species are colour coded by BoCC4 Wales assessment.

Northern Ireland: population trends

As for 2022, 38 species trends are reported for Northern Ireland, with 38 species reported. One hundred and twenty eight squares were covered in 2023, 92 by volunteers. Increasing coverage, particularly in the geographically challenging west, will be a major focus for the future.

STATISTICALLY SIGNIFICANT RESULTS

Period	No. species	Greatest change in Northern Irish trends*	
Long-term (95–22) increases	17	Blackcap	1,795%
Long-term (95–22) decreases	2	Greenfinch	-81%
Short-term (22–23) increases	12	Lesser Redpoll	161%
Short-term (22–23) decreases	0	–	–

WOODLAND BIRDS

Northern Ireland recorded some of the highest densities of **Coal Tit** in the UK during *Bird Atlas 2007–11*. The overall trend since 1995 is one of no change, but, like many of the UK's woodland birds, and as highlighted by the Wild Bird Indicators, this is a species experiencing more recent declines, with a decrease of 30% seen in the last 10 years. Another indicator species, labelled as a generalist and found in many more habitats than just woodland, **Dunnock,** is faring better in Northern Ireland compared with England and Scotland, where both countries have 10-year declines of 10% and 19% respectively. The overall pattern in Northern Ireland is much more like Wales – with an overall increase since the start of the BBS and stability in the last 10 years. Compared with the five-year declines seen across Great Britain, **Buzzard** in Northern Ireland is the only population to show some more recent stability. The trajectory for Buzzard is similar to England, with big increases between 1995 and 2015 (>10,000%), but either decreasing (England) or stabilising (Northern Ireland). In Wales, the population has shown a steady decline. Disentangling regional population changes in Buzzard and other scavengers such as **Red Kite**, including the interactions between themselves, their food sources and HPAI will be a major challenge in years to come.

AROUND THE HOUSES

Elsewhere, declines in **House Martin** and **House Sparrow** in the UK and the countries of Great Britain are highlighted. In Northern Ireland, both are faring comparatively well, with House Sparrow increasing by nearly 50% since 1995 and House Martin showing no significant change since 1995 and over 10- and five-year time periods, albeit with some fluctuations (Figure 13). **Swallow**, meanwhile, like in other UK countries, has declined by 21% in the last 10 years (Figure 14). With high profile algal blooms observed in Lough Neagh in 2023, and lakes being a major food source for aerial insect feeders such as swallows and martins, it remains to be seen whether such events will have any acute and/or longer lasting impacts on bird life.

COAL TIT: EDMUND FELLOWES/BTO

Table 6: Trends in Northern Ireland during 2022–23, 2012–22 and 1995–2022.

Species	Min. sample	1-year (22-23)	10-year (12-22)	27-year (95-22)	LCL	UCL
Mallard	31	33	3	213 *	0	421
Pheasant	46	-2	-13	99 *	14	320
Woodpigeon	92	24 *	16 *	126 *	77	191
Collared Dove	41	18	-10	63 *	1	286
Buzzard	38	18	7	1,169 *	499	3,000
Magpie	89	8	-22 *	-9	-31	22
Jackdaw	84	6	-15 *	56 *	18	117
Rook	78	-13	-3	-13	-36	27
Hooded Crow	89	0	17 *	182 *	112	285
Coal Tit	68	8	-30 *	19	-21	69
Blue Tit	84	33 *	3	3	-25	33
Great Tit	81	11	-12 *	126 *	78	192
Skylark	26	4	36	-35 *	-62	-13
Swallow	89	66 *	-21 *	-20	-40	16
House Martin	50	9	-14	74	-6	196
Willow Warbler	86	31 *	-16 *	48 *	17	81
Chiffchaff	40	-14	-10	17	-13	60
Sedge Warbler	29	105 *	-39 *	–	–	–
Blackcap	51	2	40 *	1,795 *	1,280	3,861
Goldcrest	50	23	49 *	57 *	5	119
Wren	99	15 *	33 *	59 *	16	101
Starling	85	13	-10	16	-19	64
Song Thrush	85	16 *	47 *	80 *	39	147
Mistle Thrush	61	39	-14	-27	-69	35
Blackbird	93	10 *	24 *	58 *	27	101
Robin	95	10	18 *	21	-2	40
House Sparrow	63	30 *	8	49 *	3	159
Dunnock	77	8	4	60 *	4	122
Pied Wagtail	52	1	-11	25	-11	105
Meadow Pipit	65	12	28 *	8	-21	50
Chaffinch	97	8	-23 *	14	-13	32
Bullfinch	37	25	-15	-3	-38	46
Greenfinch	32	48	-74 *	-81 *	-88	-65
Linnet	38	69	-35 *	-26	-53	12
Lesser Redpoll	27	161 *	-50 *	-20	-61	104
Goldfinch	60	43 *	18	565 *	323	1,340
Reed Bunting	32	60 *	-14	-36	-58	23

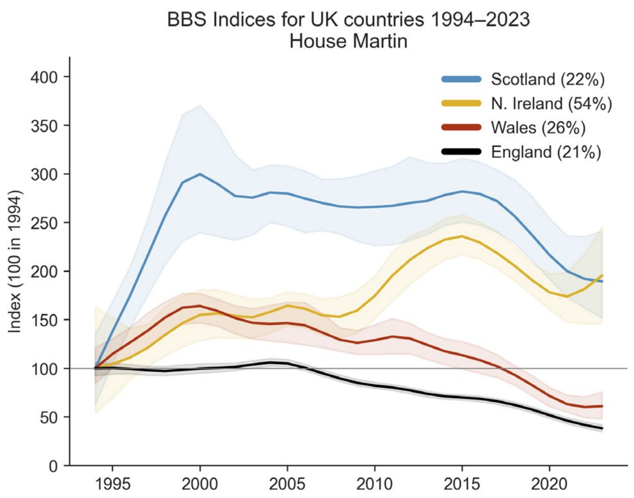


Figure 13: Northern Ireland is the only country for which House Martin do not show at least 10-year (Scotland) or all-time declines (Wales and England).

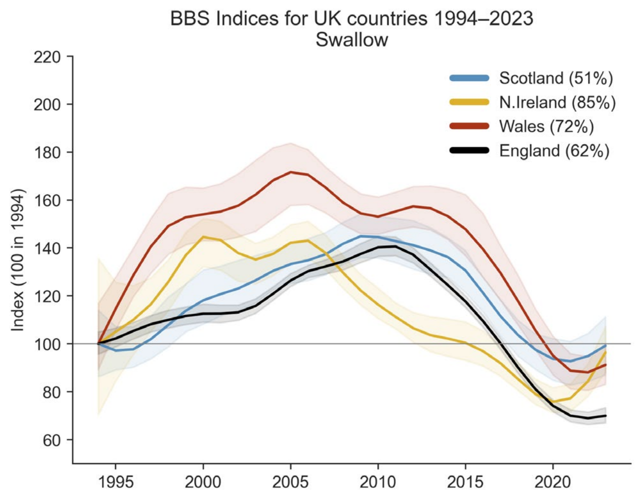


Figure 14: By contrast to House Martin, Swallow is experiencing declines in all four countries of the UK.

Channel Islands

Nineteen squares were surveyed on the Channel Islands in 2023. These data, and those from the Isle of Man, feed into the trends for the UK.

Firecrest occupancy on Guernsey and Jersey on BBS squares has been increasing markedly in the last five years and has played its part in the ability of the relatively new five-year UK trend for this species, particularly on Guernsey. Occupancy on Guernsey went from around 7% (one square in around 15) between 2015 and 2018 to nearly 50% of squares (five out of 11) in 2023.

A **Zitting Cisticola** was recorded on Alderney in 2023, the first time for this species on this island and only the second record for BBS. Zitting Cisticola is reported in the Rare Breeding Birds Panel (Eaton *et al.* 2023), with breeding occurring at a site in Alderney in 2020.

Fifteen volunteers contributed records from 85 species. Over the course of the 30 years of BBS, 153 species have been recorded in the Channel Islands from 46 different volunteers.

FIRECREST: CHRIS KNIGHTS/BTO

Isle of Man

Coverage remains at 10 squares, with a dedicated group of volunteers sustaining this record coverage level for the third successive year.

Nine volunteers once again surveyed the 10 sites on the Isle of Man, with 14 people having taken part overall. Seventy-seven species were recorded in 2023, with 106 recorded in total over the history of BBS. In 2023, **Shag** was the fourth most numerous bird counted during BBS with 76 individuals counted on three squares, behind **Herring Gull**, **Jackdaw** and **Rook**. A single individual of the BoCC IoM (Morris & Sharpe 2021) Amber-listed **Wheatear** was recorded on just a single square in 2023.

In 2023, there was a repeat record of **Red Grouse**, the second year that this upland species has been recorded on the island on a BBS square. The same pattern is true of **Great Spotted Woodpecker**. Meanwhile, **Razorbill** makes its first appearance since 1998 and **Guillemot** only the fourth. Having been observed for the last four years, **Hen Harrier** was not seen in 2023. **Stonechat**, meanwhile, was recorded at their highest relative densities on BBS squares on the island, with the overall pattern of counts mimicking trends from England and the UK.

FIND OUT MORE...

Eaton., M.A. & The RBBP 2023. Rare Breeding Birds in the UK in 2021. *British Birds* **116:** 609–684.

Morris, N.G. & Sharpe, C.M. 2021. Birds of Conservation Concern in the Isle of Man (BoCCIoM) 2021. Manx Birdlife.
Available at: http://manxbirdlife.im/bocciom

English regions: population trends

A number of new trends are available for English Regions, partly as a result of the wonderful growth in coverage. Seven new species/region/trend combinations are available, with the majority being online. Grey Wagtail, as in Wales, is now available as an all-time trend in the south-east of England.

NEW TRENDS

The sustained increases in **Stonechat** in the UK are now seen at the regional scale, with increases of 146% and 96% seen in the south-west and the south-east of England respectively over the last 10 years. The growth of the **Firecrest** population is almost entirely in the south-east of England. The new 10-year trend in England is matched with a new 10-year trend in this region, with an increase of 275%.

THE CAPITAL EFFECT

In the 2022 report, we highlighted the major short-term declines in **Blackbird** in London and the association with Usutu virus. This short-term decline was also on the back of a longer-term decline in the region. Blackbird is not the only species to show declines in London, but not elsewhere. **Song Thrush** has declined by 45% in London since 1995, but is either stable or increasing in other regions. **House Sparrow** is declining in other regions beyond London, but experienced some of the most drastic declines in London during the first 10 years of the survey, declining by 71% between 1994 and 2000. This was alongside a 30% decline in the south-east. Since then, House Sparrow in London has seen an increase of a third in the last decade and 27% in the last five years. In other regions, the declines have been slower and/or more recent. **Jay** is declining in London and the south-east of England, but is increasing (East of England) or stable elsewhere.

By contrast, some species are faring relatively better in London compared with other regions. London is the only region of England where **Moorhen** is increasing; in all other parts of England it is either declining or no change is seen (see p34). **Great Tit** too has doubled in the capital since 1995 and isn't showing the medium-term (10-year) declines seen in almost all other regions of England. Another familiar tit species, **Blue Tit**, has shown an 18% decline in London over the last decade, a decline seen in many other parts of the country, with the East of England and East Midlands the only two areas showing a long-term increase. Both Blue Tit and Great Tit have seen a decline in both England and Wales in the last 10 years, but not in Scotland, where Great Tit has seen a 47% long-term increase.

A species well familiar to many London residents is **Ring-necked Parakeet**, which continues to increase. This increase has expanded to the East of England where a new five-year trend is available, with most BBS records coming from squares in Hertfordshire.

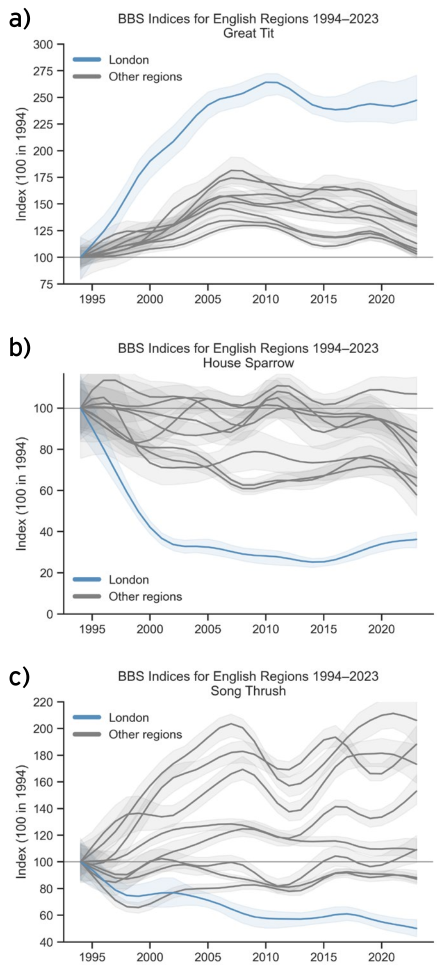


Figure 15: Species trends vary regionally, with (a) Great Tit showing an increase in London, compared with (b) House Sparrow and (c) Song Thrush.

Table 7: Counties in each region, coverage in 2023, trends produced and statistically significant changes.

Region		Counties	Number of squares covered in 2023	No. of trends	Significant increases	Significant declines
1	North West	Cheshire, Cumbria, Lancashire, Greater Manchester, Merseyside	199	58	17	21
2	North East	Cleveland, County Durham, Northumberland	144	40	10	11
3	Yorkshire & Humber	East Yorkshire, North Lincolnshire, North Yorkshire, South Yorkshire, West Yorkshire	257	56	21	14
4	East Midlands	Derbyshire, Northamptonshire, Leicestershire & Rutland, Lincolnshire, Nottinghamshire	287	58	21	18
5	East of England	Bedfordshire, Cambridgeshire, Essex, Hertfordshire, Norfolk, Suffolk	372	70	21	26
6	West Midlands	Birmingham, Herefordshire, Shropshire, Staffordshire, Warwickshire, Worcestershire	184	55	20	15
7	South East	Berkshire, Buckinghamshire, Hampshire, Isle of Wight, Kent, Oxfordshire, Surrey, Sussex	751	71	16	33
8	South West	Avon, Cornwall, Devon, Dorset, Gloucestershire, Somerset, Wiltshire	555	63	14	21
9	London	Greater London	101	27	11	10

Table 8: Trends in English regions during 1995–2022.

Species	North West		North East		Yorkshire & Humber		East Midlands		East of England		West Midlands		South East		South West		London	
	95-22	Sample	95-22	Sample	95-22	Sample	95-22	Sample	95-22	Sample	95-22	Sample	95-22	Sample	95-22	Sample	95-22	Sample
Canada Goose	**129 ***	74	**–**	–	**202 ***	36	**42**	47	**29**	61	**48 ***	73	**45 ***	137	**227**	59	**–**	–
Greylag Goose	**–**	–	**–**	–	**974 ***	49	**586 ***	38	**176 ***	55	**–**	–	**125**	48	**–**	–	**–**	–
Mute Swan	**–**	–	**–**	–	**–**	–	**–**	–	**250 ***	43	**–**	–	**-41**	59	**10**	40	**–**	–
Shelduck	**–**	–	**–**	–	**–**	–	**–**	–	**10**	37	**–**	–	**–**	–	**–**	–	**–**	–
Mallard	**8**	157	**87 ***	39	**26**	113	**-1**	114	**0**	197	**31 ***	120	**6**	257	**16**	170	**-31**	43
Tufted Duck	**–**	–	**–**	–	**–**	–	**–**	–	**–**	–	**–**	–	**-4**	31	**–**	–	**–**	–
Red Grouse	**–**	–	**–**	–	**-5**	51	**–**	–	**–**	–	**–**	–	**–**	–	**–**	–	**–**	–
Grey Partridge	**-67 ***	23	**–**	–	**-57 ***	30	**-44 ***	32	**-61 ***	42	**–**	–	**-77 ***	28	**–**	–	**–**	–
Pheasant	**113 ***	144	**33 ***	79	**58 ***	163	**22 ***	168	**-18 ***	287	**85 ***	146	**12**	425	**50 ***	309	**–**	–
Red-legged Partridge	**–**	–	**–**	–	**8**	57	**-42 ***	77	**-30 ***	182	**56**	36	**97 ***	133	**159 ***	67	**–**	–
Swift	**-76 ***	99	**-79 ***	33	**-57 ***	85	**-62 ***	80	**-52 ***	146	**-67 ***	70	**-75 ***	170	**-73 ***	145	**-66 ***	57
Cuckoo	**-51 ***	31	**–**	–	**-69 ***	44	**-75 ***	46	**-67 ***	100	**-80 ***	48	**-77 ***	154	**-82 ***	70	**–**	–
Feral Pigeon	**-27**	75	**–**	–	**-39 ***	66	**-16**	52	**3**	78	**-24**	43	**22**	120	**-23**	72	**-10**	75
Stock Dove	**24**	60	**–**	–	**124 ***	62	**7**	86	**35 ***	156	**96 ***	91	**73 ***	241	**34 ***	148	**–**	–
Woodpigeon	**77 ***	217	**43 ***	94	**111 ***	189	**33 ***	209	**21 ***	337	**24 ***	187	**15**	536	**50 ***	391	**42 ***	84
Turtle Dove	**–**	–	**–**	–	**–**	–	**–**	–	**-97 ***	50	**–**	–	**-98 ***	35	**–**	–	**–**	–
Collared Dove	**-13**	131	**-36**	36	**-46 ***	87	**-22 ***	114	**13**	211	**-45 ***	115	**-27 ***	312	**-23 ***	209	**-29 ***	52
Moorhen	**-26**	68	**–**	–	**-5**	41	**-37 ***	60	**-41 ***	123	**-19**	59	**-36 ***	148	**-31 ***	74	**–**	–
Coot	**-35**	30	**–**	–	**–**	–	**6**	30	**-29**	38	**47**	30	**-14**	68	**–**	–	**–**	–
Oystercatcher	**6**	61	**32**	32	**287 ***	55	**–**	–	**43 ***	36	**–**	–	**–**	–	**–**	–	**–**	–
Lapwing	**-28 ***	112	**-21**	51	**-10**	113	**-68 ***	59	**-50 ***	71	**-51 ***	36	**-73 ***	95	**-82 ***	24	**–**	–
Curlew	**-46 ***	86	**-31 ***	53	**4**	118	**–**	–	**–**	–	**-72 ***	24	**–**	–	**–**	–	**–**	–
Snipe	**–**	–	**–**	–	**55**	40	**–**	–	**–**	–	**–**	–	**–**	–	**–**	–	**–**	–
(Cormorant)	**–**	–	**–**	–	**–**	–	**–**	–	**2**	50	**–**	–	**45**	57	**4**	36	**–**	–
(Grey Heron)	**-40 ***	75	**–**	–	**56**	38	**-17**	53	**-38 ***	82	**8**	57	**-26**	133	**-33 ***	88	**–**	–
Sparrowhawk	**-51 ***	31	**–**	–	**–**	–	**–**	–	**-27 ***	45	**–**	–	**-39 ***	66	**-21**	50	**–**	–
Red Kite	**–**	–	**–**	–	**–**	–	**–**	–	**86,891***	38	**–**	–	**16,028***	108	**–**	–	**–**	–
Buzzard	**84 ***	81	**5,958 ***	36	**3,215 ***	55	**7,644 ***	76	**25,603***	97	**145 ***	106	**1,106 ***	214	**-5**	253	**–**	–
Gt Spotted Woodpecker	**89 ***	88	**82 ***	32	**76 ***	57	**177 ***	70	**80 ***	157	**100 ***	113	**74 ***	346	**136 ***	195	**80 ***	40
Green Woodpecker	**–**	–	**–**	–	**–**	–	**173 ***	54	**41 ***	172	**19**	64	**-14 ***	324	**-8**	143	**-10**	31
Kestrel	**-37 ***	67	**–**	–	**-12**	65	**6**	67	**-15**	112	**-39 ***	40	**-40 ***	137	**-44 ***	79	**–**	–
Ring-necked Parakeet	**–**	–	**–**	–	**–**	–	**–**	–	**–**	–	**–**	–	**581 ***	40	**–**	–	**32,911***	52
Jay	**21**	70	**–**	–	**–**	–	**34**	37	**30 ***	125	**-18**	64	**-18 ***	256	**2**	123	**-30 ***	41
Magpie	**-19 ***	183	**-13**	42	**-13**	111	**21 ***	161	**40 ***	256	**-6**	165	**7**	455	**-10**	322	**43 ***	83
Jackdaw	**85 ***	149	**15**	71	**76 ***	135	**112 ***	141	**174 ***	243	**113 ***	146	**81 ***	421	**35 ***	313	**–**	–
Rook	**-29**	87	**-39 ***	52	**-24**	119	**0**	106	**11**	185	**9**	88	**-15**	276	**-18**	241	**–**	–
Carrion Crow	**25 ***	225	**-8**	91	**40 ***	193	**48 ***	198	**106 ***	316	**17**	185	**16 ***	519	**6**	386	**53 ***	84
Raven	**–**	–	**–**	–	**–**	–	**–**	–	**–**	–	**132 ***	34	**–**	–	**-10**	93	**–**	–
Coal Tit	**65 ***	74	**5**	46	**55 ***	51	**10**	43	**-14**	69	**23**	52	**-12**	170	**10**	117	**–**	–
Marsh Tit	**–**	–	**–**	–	**–**	–	**–**	–	**–**	–	**–**	–	**-46 ***	53	**-18**	31	**–**	–
Blue Tit	**-22 ***	204	**-20 ***	73	**-4**	166	**25 ***	195	**28 ***	317	**-9**	185	**-6**	522	**-15 ***	373	**-2**	83
Great Tit	**12**	191	**44 ***	66	**22 ***	146	**41 ***	183	**9**	300	**9**	180	**8**	508	**31 ***	363	**118 ***	79
Skylark	**-18**	116	**-20 ***	79	**3**	160	**0**	169	**-20 ***	288	**-8**	119	**-14 ***	338	**-26 ***	241	**–**	–
Swallow	**-51 ***	191	**-36 ***	83	**-45 ***	167	**-17 ***	159	**-31 ***	228	**-37 ***	145	**-27 ***	337	**-15**	323	**–**	–
House Martin	**-49 ***	93	**-51 ***	31	**-43 ***	69	**-50 ***	59	**-64 ***	95	**-61 ***	78	**-71 ***	143	**-61 ***	155	**–**	–
Long-tailed Tit	**15**	87	**–**	–	**28**	58	**54 ***	89	**0**	161	**-2**	92	**-32 ***	269	**30 ***	170	**-14**	33
Willow Warbler	**-7**	144	**-27**	76	**-41 ***	124	**-46 ***	95	**-87 ***	104	**-56 ***	88	**-87 ***	146	**-65 ***	152	**–**	–
Chiffchaff	**474 ***	115	**475 ***	55	**454 ***	97	**566 ***	124	**197 ***	233	**232 ***	152	**79 ***	425	**44 ***	333	**213 ***	36
Sedge Warbler	**–**	–	**–**	–	**–**	–	**–**	–	**-14**	46	**–**	–	**-21**	35	**-12**	34	**–**	–
Reed Warbler	**–**	–	**–**	–	**–**	–	**–**	–	**20**	42	**–**	–	**-4**	36	**–**	–	**–**	–
Blackcap	**258 ***	124	**92 ***	51	**128 ***	106	**193 ***	142	**129 ***	261	**167 ***	147	**147 ***	442	**137 ***	319	**208 ***	51
Garden Warbler	**-62 ***	28	**–**	–	**–**	–	**-23**	35	**-31 ***	60	**-18**	45	**-41 ***	102	**-52 ***	64	**–**	–
Lesser Whitethroat	**–**	–	**–**	–	**–**	–	**-12**	38	**14**	82	**3**	30	**-30 ***	61	**-22**	43	**–**	–
Whitethroat	**-16 ***	88	**45 ***	47	**-2**	92	**36 ***	149	**12**	262	**25 ***	110	**37 ***	323	**-9**	228	**–**	–
Goldcrest	**77 ***	50	**1**	30	**–**	–	**63**	35	**44 ***	83	**114 ***	50	**10**	220	**-20**	146	**–**	–
Wren	**60 ***	216	**17**	88	**32 ***	192	**46 ***	200	**32 ***	313	**33 ***	182	**9 ***	515	**4**	383	**29 ***	79
Nuthatch	**248 ***	49	**–**	–	**–**	–	**–**	–	**186 ***	38	**146 ***	57	**68 ***	217	**81 ***	103	**–**	–
Treecreeper	**–**	–	**–**	–	**–**	–	**–**	–	**10**	32	**–**	–	**-12**	103	**-24**	56	**–**	–
Starling	**-66 ***	170	**-56 ***	65	**-65 ***	128	**-63 ***	137	**-42 ***	231	**-70 ***	125	**-67 ***	349	**-72 ***	200	**-71 ***	80
Song Thrush	**96 ***	168	**8**	72	**59 ***	131	**58 ***	153	**0**	252	**84 ***	160	**-7**	466	**10**	329	**-45 ***	51
Mistle Thrush	**-33 ***	115	**-23**	42	**-51 ***	85	**-45 ***	84	**-68 ***	128	**-29 ***	87	**-58 ***	233	**-49 ***	133	**-80 ***	31
Blackbird	**38 ***	215	**21**	83	**30 ***	184	**15 ***	207	**-6**	329	**17 ***	188	**-9 ***	536	**14 ***	392	**-62 ***	84
Spotted Flycatcher	**–**	–	**–**	–	**–**	–	**–**	–	**-87 ***	17	**–**	–	**-70 ***	28	**-66 ***	28	**–**	–
Robin	**46 ***	207	**18**	79	**55 ***	164	**42 ***	196	**40 ***	311	**51 ***	186	**17 ***	520	**13 ***	379	**88 ***	82
Wheatear	**-42**	49	**–**	–	**15**	49	**–**	–	**–**	–	**–**	–	**–**	–	**–**	–	**–**	–
Tree Sparrow	**15**	30	**–**	–	**53**	45	**-19**	31	**–**	–	**–**	–	**–**	–	**–**	–	**–**	–
House Sparrow	**-12**	159	**-38**	50	**-20**	108	**-22 ***	130	**-31 ***	198	**-11**	145	**-30 ***	331	**13**	262	**-60 ***	70
Dunnock	**5**	179	**11**	67	**-11**	142	**-2**	183	**7**	284	**33 ***	171	**-9 ***	463	**4**	348	**-5**	64
Yellow Wagtail	**–**	–	**–**	–	**–**	–	**-31**	39	**-44 ***	49	**–**	–	**–**	–	**–**	–	**–**	–
Grey Wagtail	**–**	–	**–**	–	**–**	–	**–**	–	**–**	–	**–**	–	**4**	30	**-28**	33	**–**	–
Pied Wagtail	**-32 ***	128	**-16**	53	**-25 ***	112	**-16**	101	**-7**	153	**-4**	88	**-22 ***	213	**-17 ***	163	**–**	–
Meadow Pipit	**-16**	87	**-17**	58	**-2**	108	**-48 ***	41	**-69 ***	40	**–**	–	**-51 ***	50	**-14**	51	**–**	–
Chaffinch	**-37 ***	212	**-15**	92	**-15 ***	189	**-22 ***	203	**-50 ***	324	**-60 ***	182	**-56 ***	509	**-46 ***	380	**-52 ***	54
Bullfinch	**14**	43	**–**	–	**87 ***	34	**23**	55	**-68 ***	63	**-26 ***	55	**-55 ***	141	**-29 ***	120	**–**	–
Greenfinch	**-56 ***	145	**-67 ***	44	**-60 ***	102	**-55 ***	137	**-58 ***	244	**-58 ***	135	**-78 ***	372	**-68 ***	270	**-64 ***	55
Linnet	**-31 ***	88	**-38 ***	52	**-27 ***	102	**-26 ***	125	**-7**	183	**-20**	77	**-41 ***	237	**-28 ***	197	**–**	–
Goldfinch	**171 ***	172	**166 ***	63	**123 ***	140	**159 ***	156	**114 ***	239	**223 ***	138	**119 ***	388	**119 ***	310	**408 ***	57
Corn Bunting	**–**	–	**–**	–	**–**	–	**–**	–	**-28 ***	39	**–**	–	**-36**	32	**–**	–	**–**	–
Yellowhammer	**-63 ***	50	**-49 ***	47	**-19**	94	**-21 ***	143	**-24 ***	224	**-68 ***	99	**-46 ***	256	**-45 ***	173	**–**	–
Reed Bunting	**10**	64	**–**	–	**106 ***	51	**98 ***	71	**19**	84	**–**	–	**-49 ***	62	**21**	36	**–**	–

Mammal monitoring and population trends

BBS mammal data are used to produce population trends for nine mammal species for the UK as a whole, countries and English regions.

Recording mammals is an optional part of BBS. Surveyors have the choice to record mammals during the BBS season, either on core visits, or during additional visits or via local knowledge. In 2023, mammal monitoring was conducted on 88% of BBS squares.

WHITE IN TOOTH AND CLAW

Forty-four species of mammal were recorded during 2023, either through visual counts, field signs, local knowledge or sightings of dead animals. **Lesser White-toothed Shrew** has been recorded via the 'local knowledge' code on the same Isles of Scilly square for the last eight years. How long will it be before its larger cousin, the **Greater White-toothed Shrew** is recorded in some form on a BBS square? Introduced into Ireland, and present on the Channel Islands, it was first discovered on the British mainland in Northumberland in 2022.

NEW TRENDS

Whilst the number of species for which mammal trends are possible to calculate is likely to remain fixed – only increases in the number and distribution of **Sika Deer, Chinese Water Deer** and **Red Squirrel** might change that – we can still produce trends for new time periods for existing species. Following the 2023 field season, we see the first 10-year trend for **Brown Hare** in Wales. Unlike in England – where a 54% increase has been seen in the last 10 years – Brown Hare in Wales are not showing the same rapid increase, though there are signs of a slower increase. Brown Hare in Scotland remain relatively stable, though 2022 and 2023 both see an increase in the unsmoothed index relative to past five years. **Mountain Hare**, meanwhile, continues to decline. If you would like to contribute to a better understanding of the distribution, abundance and pressures facing Mountain Hare, we would be delighted if you were to sign up to the Volunteer Mountain Hare Survey (Mammal Society 2023).

DEER

Deer were last featured in the 2016 BBS report. There, the use of BBS mammal data was highlighted in a Scottish Government review conducted by Scottish Natural Heritage (now NatureScot) on the effectiveness of Deer Management in Scotland. Red Deer and Roe Deer were the focus of the review and abundance change was modelled between 1995–99 and 2012–15. Since that review, population increases of all four of the deer species that are monitored by the BBS have accelerated (Figure 16, Table 10). Given that deer have been shown, using BBS data, to adversely effect woodland birds in lowland England (Newson *et al.* 2012), coupled with the five-year decline in the Woodland Indicator (Defra 2023), this additional increase in the UK deer population is of concern.

Table 9: All mammal species recorded in 2023.

Species	Squares recorded
Red-necked Wallaby	1
Rabbit	1,534
Brown Hare	1,082
Mountain/Irish Hare	69
European Beaver	3
Grey Squirrel	1,370
Red Squirrel	41
Bank Vole	16
Water Vole	8
Field Vole	39
Wood Mouse	17
House Mouse	1
Harvest Mouse	1
Brown Rat	46
Hedgehog	40
Common Shrew	22
Pygmy Shrew	5
Lesser White-toothed Shrew	1
Mole	393
Bats – var. sp.	10
Domestic Cat	299
Red Fox	412
Grey Seal	9
Common Seal	6
Badger	252
Pine Marten	15
Otter	30
Stoat	26
Weasel	19
Polecat	1
American Mink	1
Wild Boar	5
Reeves's Muntjac	340
Fallow Deer	159
Red Deer	153
Sika Deer	18
Chinese Water Deer	24
Roe Deer	971
Park Cattle	2
Feral Goat	7
Bottle-nosed Dolphin	1

'Squares recorded' include counts of live mammals, field signs, dead mammals and local knowledge.

FIND OUT MORE...

Fuller, R.J. et al. 2014. Effects of woodland structure on woodland bird populations: an assessment of the effects of changes in woodland structure on bird populations as a result of woodland management practices and deer browsing. Defra Project, WC0793, doi: 10.13140/RG.2.1.2410.6644

Newson, S.E. et al. 2011. Modelling large-scale relationships between increasing abundance of deer and changes in woodland bird populations in lowland England. *Journal of Applied Ecology* **49**: 278–286. doi.org/10.1111/j.1365-2664.2011.02077.x

Mammal Society 2023. *The Volunteer Mountain Hare Survey* https://www.mammal.org.uk/mountainhareproject [accessed 21/03/2023]

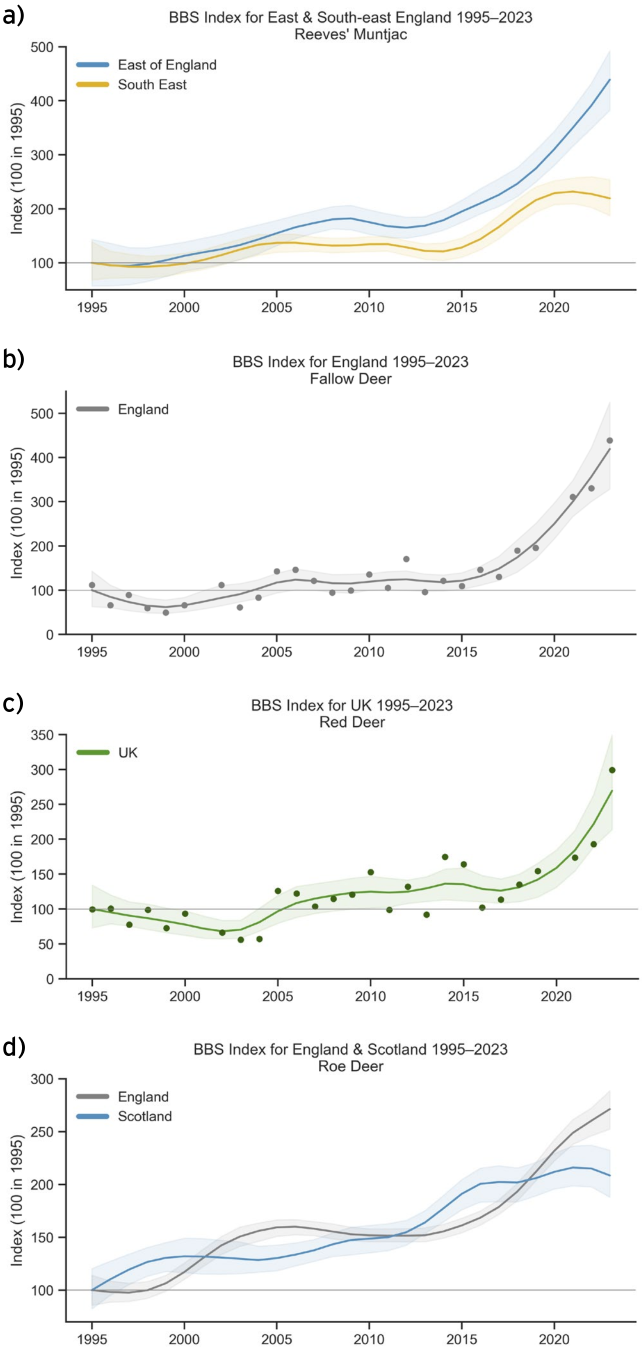


Figure 16: Deer population trends over varying parts of their ranges a) Muntjac in east and south-east England, b) Fallow Deer in England, c) Red Deer in the UK and d) Roe Deer in England and Scotland.

Table 10: Mammal trends in UK.

Species	Min. sample	1-year (22-23)	10-year (12-22)	26-year (96-22)	LCL	UCL
Rabbit	1,463	**-9**	**-33 ***	**-68 ***	-74	-62
Brown Hare	777	**9 ***	**44 ***	**38 ***	25	55
Mountain/Irish Hare	56	**-8**	**-32 ***	**-67 ***	-81	-41
Grey Squirrel	847	**48 ***	**45 ***	**35 ***	24	50
Red Fox	279	**9**	**-34 ***	**-49 ***	-57	-41
Reeves's Muntjac	128	**30 ***	**118 ***	**284 ***	183	446
(Fallow Deer)	71	**-10**	**171 ***	**245 ***	7	725
(Red Deer)	76	**55**	**78 ***	**133 ***	51	244
Roe Deer	511	**-1**	**56 ***	**129 ***	99	164

Table 11: Mammal trends in England.

Species	Min. sample	1-year (22-23)	10-year (12-22)	26-year (96-22)	LCL	UCL
Rabbit	1,201	**-10 ***	**-41 ***	**-61 ***	-67	-54
Brown Hare	659	**13 ***	**54 ***	**50 ***	35	69
Grey Squirrel	756	**43 ***	**45 ***	**34 ***	19	50
Red Fox	227	**-1**	**-28 ***	**-47 ***	-55	-38
Reeves's Muntjac	128	**29 ***	**118 ***	**281 ***	170	430
(Fallow Deer)	67	**33**	**187 ***	**321 ***	171	636
Roe Deer	394	**16 ***	**72 ***	**165 ***	125	214

Table 12: Mammal trends in Scotland.

Species	Min. sample	1-year (22-23)	10-year (12-22)	26-year (96-22)	LCL	UCL
Rabbit	113	**-23**	**-23**	**-86 ***	-92	-77
Brown Hare	89	**6**	**18**	**10**	-16	53
Grey Squirrel	30	**57 ***	**29**	**–**	–	–
(Red Deer)	53	**20**	**13**	**35**	-13	106
Roe Deer	113	**8**	**47 ***	**101 ***	56	172

Table 13: Mammal trends in Wales.

Species	Min. sample	1-year (22-23)	10-year (12-22)	26-year (96-22)	LCL	UCL
Rabbit	96	**15**	**-32**	**-37 ***	-59	-3
Brown Hare	31	**-5**	**14**	**–**	–	–
Grey Squirrel	62	**80 ***	**51 ***	**31 ***	1	73

Table 14: Mammal trends in Northern Ireland.

Species	Min. sample	1-year (22-23)	10-year (12-22)	26-year (96-22)	LCL	UCL
Rabbit	45	**20**	**14**	**-32**	-61	24
Mountain/Irish Hare	28	**62**	**-14**	**–**	–	–

NOTE: Trends are displayed in the same way as they are for the birds. Page 15 covers interpreting trends. Trends for **Red** and **Fallow Deer** are reported with caveats. These are herding species and trends should be interpreted with caution, the presence or absence of a herd on a given BBS visit could influence the overall trend.

Table 15: Mammal trends in English regions.

Species	North West		North East		Yorkshire & Humber		East Midlands		East of England		West Midlands		South East		South West		London	
	96-22	Sample	96-22	Sample	96-21	Sample	96-22	Sample	96-22	Sample	96-22	Sample	96-21	Sample	96-22	Sample	96-22	Sample
Rabbit	**-67 ***	102	**-67 ***	43	**-36**	124	**-72 ***	113	**-64 ***	208	**-70 ***	109	**-70 ***	302	**-38 ***	191	**–**	–
Brown Hare	**1**	62	**79 ***	34	**69 ***	82	**98 ***	98	**58 ***	153	**-18**	42	**9**	108	**65 ***	79	**–**	–
Grey Squirrel	**124 ***	62	**–**	–	**12**	40	**104 ***	52	**25**	110	**7**	78	**20 ***	231	**51 ***	121	**43 ***	53
Red Fox	**–**	–	**–**	–	**–**	–	**–**	–	**-11**	31	**–**	–	**-34 ***	65	**-57 ***	45	**–**	–
Reeves's Muntjac	**–**	–	**–**	–	**–**	–	**–**	–	**310 ***	59	**–**	–	**138 ***	40	**–**	–	**–**	–
Roe Deer	**–**	–	**–**	–	**334 ***	40	**–**	–	**319 ***	34	**–**	–	**132 ***	137	**67 ***	115	**–**	–

MAMMAL TREND GRAPHS ONLINE: www.bto.org/bbs-mammals

Brownfield sites: not such a 'brown field' after all

The co-location of both bird and butterfly data gathered on BBS squares provides a unique resource to researchers. Here, data on BBS/WCBS squares were used to understand the value of former development sites for biodiversity.

Callum Macgregor, Senior Research Ecologist, BTO Cymru

One of BTO's greatest strengths is the amazing datasets that have been produced through our surveys, and which continue to be added to every year by our brilliant volunteers. As well as the vital Official Statistics that the BBS and other schemes produce every year, they also represent a vast resource of field ornithology that BTO makes available to academics and researchers the world over, for use in addressing their own research questions.

THE BROWNFIELD DEBATE

Before I joined the science team at BTO Cymru, I was one such researcher at the University of Hull and wanted to look for evidence that brownfield sites (previously developed but since abandoned land) might be valuable for wildlife. There were lots of well-known examples of interesting species taking up residence in such locations – like the Willow Tit populations of Greater Manchester – but little work to understand whether such sites are more broadly useful, and to which species. Brownfield sites are a politically-charged issue, and policies favouring their redevelopment (into housing, back into industry, or for renewable energy), typically with the intention to spare agricultural land and the countryside, are in place in many countries including the UK.

Beginning in February 2020, I (with my supervisors' help) set to work identifying field study sites around Yorkshire and the north-east. But, just six weeks later, the first COVID-19 lockdown began. Instead, we turned to data that had already been collected. Being interested not solely in birds, but in biodiversity more generally, we sought data from three surveys – the BBS (for birds), the Wider Countryside Butterfly Survey (WCBS – for butterflies and other insects), and the National Plant Monitoring Scheme (NPMS – for plants). WCBS will be familiar to many BBS surveyors; whilst chiefly run by Butterfly Conservation (BC), BBS volunteers can survey their square for butterflies under WCBS and monitor the same location under both schemes. NPMS is administered separately but follows similar principles and methodology; all three schemes have sites which are randomly selected and therefore provide an unbiased sample. For this study, we used data from 708 BBS squares, 228 WCBS squares (of which 64 were the same squares surveyed in both schemes), and 99 NPMS squares.

Alongside these data, we obtained a map of ex-landfill sites in England from the Environment Agency's Historic Landfill Sites database. Closed landfill sites are a major type of brownfield site, and very relevant to our research questions, since they are often well-suited

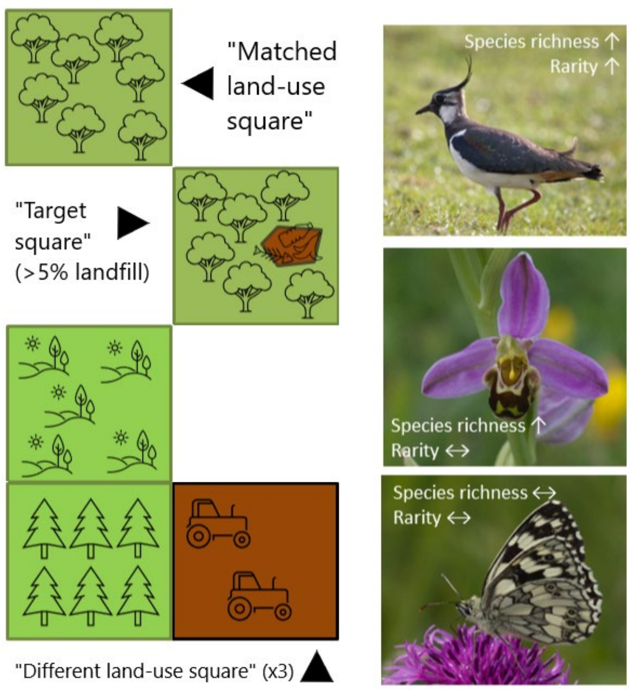


Figure 17: Squares were defined as 'target squares' if they contained more than 5% ex-landfill. 'Matched squares' were those nearby squares with comparable habitat but no landfill. Other squares in the landscape with different habitat were considered as un-matched.

LAPWING, BEE ORCHID & MARBLED WHITE: CALLUM MACGREGOR to repurposing, but can also be restored to species-rich grassland of similar richness to comparable natural habitat. We overlaid this map with the biodiversity datasets to identify surveyed squares that contained ex-landfill sites (covering 5–20% of the square in the majority of cases), and comparable nearby squares without ex-landfill (Figure 17). We compared these pairs of sites in terms of both species richness and an index of assemblage rarity for birds (BBS), butterflies, moths, dragonflies and damselflies (all WCBS) and plants (NPMS). We also tested whether these metrics varied with the area of a square covered by ex-landfill, and the time elapsed since landfill site closure.

RESULTS

Overall, our results indicated a positive effect of ex-landfill sites on landscape-scale biodiversity. Surveyed squares containing historical landfill sites tended to have higher species richness of birds, plants, dragonflies, damselflies and moths (but not butterflies!) than other nearby sites, and also supported a rarer assemblage of birds (Figure 18). Among squares containing ex-landfill, those with larger ex-landfill sites had more bird and dragonfly species. Species richness of birds, dragonflies, damselflies and moths declined as more time had passed since landfill site closure, whereas plant species richness increased over time.

However, these effects were small; for example, our analyses showed an average of 71 bird species in ex-landfill squares, compared to 63–66 species in neighbouring squares (depending on land use). This suggests that brownfield sites provide niches for a few extra species in a typical landscape, probably by increasing the diversity of available habitats.

Unlike the other groups, we didn't find any positive effect on butterflies. Butterfly distributions depend heavily on the foodplants eaten by their caterpillars. Wider countryside generalist species may find their caterpillar foodplants in most landscapes, and therefore find little additional benefit from ex-landfill sites (at least in terms of species richness). Habitat specialist species often depend on similarly specialist plant species, which may be less likely to colonise ex-landfills.

Viewed as a whole, our study suggests that redeveloping brownfield sites could have some unintended negative outcomes for biodiversity richness. It also demonstrates how BBS data can be re-used to tackle important, policy-relevant questions, especially when it is combined with other related and spatially matched datasets like WCBS. Thank you to all the volunteers from BBS, WCBS and NPMS who have contributed to this study.

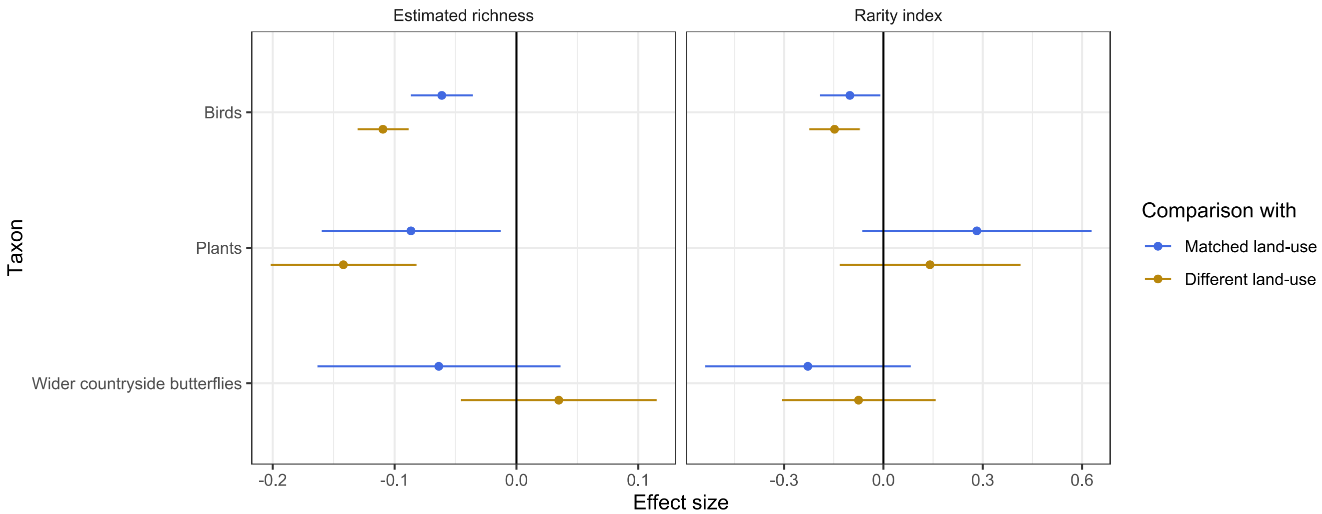


Figure 18: Presence of brownfield (historical landfill) sites in the landscape promotes species richness in multiple taxa. For each combination of response variable and taxon, target squares (with >5% landfill by area) were compared to matched and neighbouring squares (nearest neighbours with respectively the same (blue), and different (brown), modal land-use compared to the target square). Estimated species richness was significantly higher in target squares than matched and/or neighbouring squares for birds and plants, but not for wider countryside butterflies. Effect sizes (ES) are from Poisson- or binomial-family models with log link functions, such that comparison square metrics = target square metrics x eES (therefore, a negative ES indicates that metrics are lower in comparison squares than target squares, and vice versa).

FURTHER READING

Macgregor, C.J., Bunting, M.J., Deutz, P. Bourn, N.A.D., Roy, D.B. & Mayes W.M. 2022. Brownfield sites promote biodiversity at a landscape scale. *Science of the Total Environment* **804**: 150162 doi.org/10.1016/j.scitotenv.2021.150162

Wider Countryside Butterfly Survey

Breeding Bird Survey volunteers have the option to participate in the Wider Countryside Butterfly Survey on their squares each year, using the same transects, between May and August.

David White, Engagement & Surveys Officer, BTO

Established in 2009, WCBS generates important data on the abundance of wide-spread butterflies from under-recorded habitats such as plantation woodland, uplands and urban green spaces. Around 800 squares are covered each year across the scheme, with between 250 and 300 BBS squares and their volunteers contributing.

WCBS on BBS – 2023 FACTS

- Number of BBS squares covered: **283**
- Species counted: **43**
- Most numerous species: **Meadow Brown** (10,682 counted on 243 squares)
- Scarcest species: **Grizzled Skipper, Large Tortoiseshell**

THE UKBMS

The 2022 UK Butterfly Monitoring Scheme (UKBMS) Annual Report – to which data from the Wider Countryside Butterfly Survey contribute – has recently been published. UKBMS counts took place on a total of 235 days at a total of 3,196 locations in 2022. Also, a total of 40,745 recording visits were made to standard transects and WCBS squares, and a total of 2,036,621 butterflies were counted during these visits. You can read the report here: https://bit.ly/49DtNX2

WCBS IN 2023

Moving to 2023, Wider Countryside Butterfly Survey coverage was down in 2023 in comparison with previous years. This was not only the case on BBS squares, but also for volunteers taking part in the survey in general across the UK. The unpredictable weather in July and August was likely to be a contributing factor in this.

More encouragingly in relation to the weather, it was thought that the heat and droughts in the summer of 2022 would have had an adverse effect on butterfly numbers during 2023. However, this as yet doesn't seem to be the case.

WINNERS AND LOSERS IN 2023?

Two species in particular had a good year in 2023. This was especially the case with Red Admiral, with large numbers of this species being seen throughout the main survey period, resulting in a 45% increase in occupancy 2022–23. This species was especially prominent during a short heatwave that occurred in late June/early July. Holly Blue was also considerably more prominent than normal, occupying 57% of the core-visits squares across the scheme, and increase in occupancy of 40%. This was especially the case for the second brood of this species, that tends to be encountered in the late summer/ early autumn. Ringlet, by contrast, was the only wider countryside species not as widespread during the core period in 2023, compared with 2022.

TAKING PART

If you would like to find out more about WCBS, you can do so here: www.bto.org/butterflies. If any existing BBS volunteers would like to take part in WCBS on their BBS squares, they can indicate their preference to do so by clicking on the 'My Details and Settings' option on BBS online. Alternatively, they can email the BBS Team on: bbs@bto.org.

FIND OUT MORE...

Cooper, J.E.J., Plummer, K.E., Middlebrook, I. & Siriwardena, G.M. 2024. Using butterfly survey data to model habitat associations in urban developments. *Journal of Applied Ecology* **61**: 773–783 doi: 10.1111/1365-2664.14583

Middlebrook, I., Botham, M.S., Conway, R., Fox, R., Heywood J.J.N,. Noble, D.G., Peck, K., Salvati, J. & Roy, D.B. 2023 *United Kingdom Butterfly Monitoring Scheme report for 2022.* Butterfly Conservation, UK Centre for Ecology & Hydrology, British Trust for Ornithology & Joint Nature Conservation Committee.

RED ADMIRAL: NEIL CALBRAIDE/BTO

Waterways Breeding Bird Survey: news and coverage

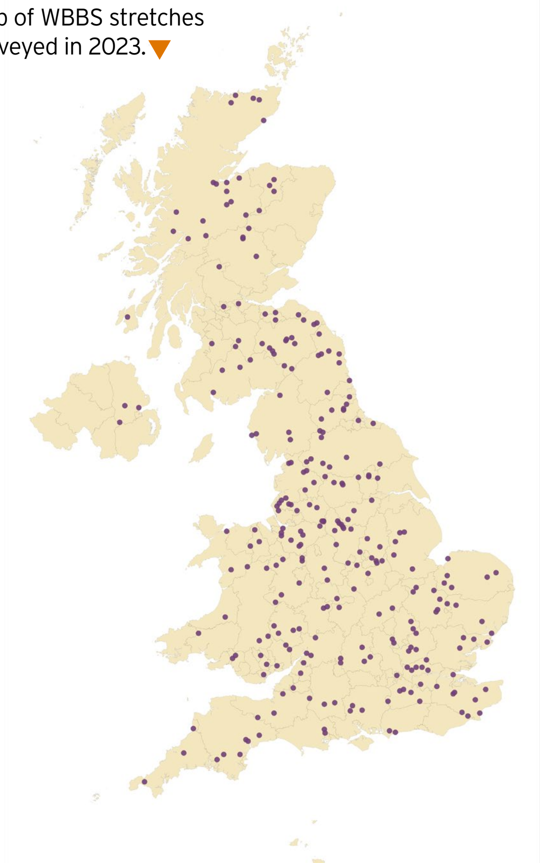
The Waterways Breeding Bird Survey forms part of the BTO/JNCC/RSPB Breeding Bird Survey partnership agreement and uses BBS-style transects along waterways – targeting the population monitoring of waterway specialists.

James Heywood, BBS National Organiser, BTO

2023 was a challenging year for the survey as coverage in Scotland, recently boosted by a surge in 2021 and 2022, returned to pre-2020 levels, resulting in a drop overall.

Past and present WBBS volunteers will hopefully have received a survey on their views of the scheme and how it might be developed in the future. The survey includes questions on the difficulties of and barriers to participation, as well as what form WBBS might take in years to come. The options that are being considered, if indeed they are needed at all, include the use of point counts rather than transects, limiting the number of species that surveyors are required to monitor and redesigning the way that sites are selected. If you have views on any aspect of the survey, we'd be delighted to hear from you.

Map of WBBS stretches surveyed in 2023.



Twenty different species were each seen on just a single stretch in 2023, including **Spoonbill** in Norfolk, **Common Scoter** in Cumbria, **Willow Tit** in County Durham and a **Short-eared Owl** in the marshes of coastal Essex.

Table 16: The number of WBBS stretches with data received to date and the total number of volunteers participating, by year.

	England	Scotland	Wales	Northern Ireland	UK total	No. of volunteers
1998	133	27	8	0	168	132
1999	133	36	14	3	186	170
2000	129	32	14	1	176	159
2001*	38	12	1	0	51	49
2002	151	49	26	2	228	203
2003	178	53	30	1	262	236
2004	191	59	37	0	287	258
2005	210	52	39	0	301	269
2006	202	57	32	4	295	257
2007	190	48	32	0	270	239
2008	200	48	27	1	276	241
2009	212	47	25	1	285	248
2010	204	43	23	1	271	238
2011	207	44	19	3	273	240
2012	204	57	21	3	285	244
2013	206	52	23	2	283	246
2014	203	53	26	2	284	248
2015	214	61	28	2	305	269
2016	215	57	30	2	304	266
2017	222	55	26	3	306	269
2018	219	49	24	2	294	261
2019	210	50	23	2	285	249
2020†	125	21	3	3	152	135
2021	190	63	23	3	279	243
2022	196	62	20	3	281	250
2023	195	54	19	3	271	241

**2001: foot-and-mouth disease , † 2020: COVID-19*

United Kingdom: WBBS population trends

The WBBS continues to produce population trends for 28 species associated with waterways where the reporting threshold of being recorded on an average of 30 stretches or more since the survey began in 1998 is met. Little Egret is the latest to have a 10-year trend.

STATISTICALLY SIGNIFICANT RESULTS

Period	No. species	Greatest change in UK WBBS trends	
Long-term (99–22) increases	1	Greylag Goose	136%
Long-term (99–22) declines	11	Lapwing	-67%
Short-term (22–23) increases	2	Sand Martin	53%
Short-term (22–23) declines	2	Grey Wagtail	-35%

The all-time, 10-year and one-year trends are displayed here and online. Further five-year trends are published online at: www.bto.org/wbbs-results. Of the 28 waterway specialists for which trends were possible, four species (reported in brackets) carry a caveat, explained on page 14.

RALLID RECESSION

The publication, in November 2023, of the latest Wild Bird Indicators, predominantly relies upon indices calculated from BBS. However, for the species that contribute to the Water and wetland bird species trends, data from the WBBS and its forerunner the Waterways Bird Survey (WBS), are used instead.

Whist the overall trend for this group has remained relatively stable since 1975, the last decade has shown a decline. This is particular true of the 'Birds of slow flowing and standing water' sub-habitat indicator, which increased from 1975 to 2005, but has been in decline ever since. Two species contributing to these declines, albeit over slightly different time frames, are **Coot** and **Moorhen**, both readily identifiable and familiar species.

The 23-year WBBS decline in Moorhen of 25% was driven by a relatively short phase of decline between around 2007 and 2012, since which time numbers have been relatively stable, though fluctuating widely, as shown in the significant one-year decline 2022–23 of 25% (Table 17, Figure 19b). One-year declines for Moorhen are also evident in the BBS. Coot meanwhile has undergone a steady decline since around 2010, with a 10-year decline of 42%, returning to a similar level in the early 1980s whilst still monitored by the WBS. Both species have previously benefited from the creation of new wetland habitats, especially following riparian gravel extraction in the 20th century.

Data from the BTO/RSPB/JNCC Wetland Bird Survey (WeBS) show a similar picture for both species, Coot having declined by around 50% (over a longer period since 2000) and Moorhen having too declined between 2008 and 2013. Breeding success has been seen to decrease in both species, with an increase in nest failure rates and coincident decline in the number of fledglings per breeding attempt, (BTO 2024). Predation, potentially by introduced American Mink, has been proposed as one possible factor. The recent announcement of the eradication of American Mink in East Anglia (Lea 2024), led by The Waterlife Recovery Trust, raises the possibility of nationwide eradication and with it the potential benefit to riparian wildlife.

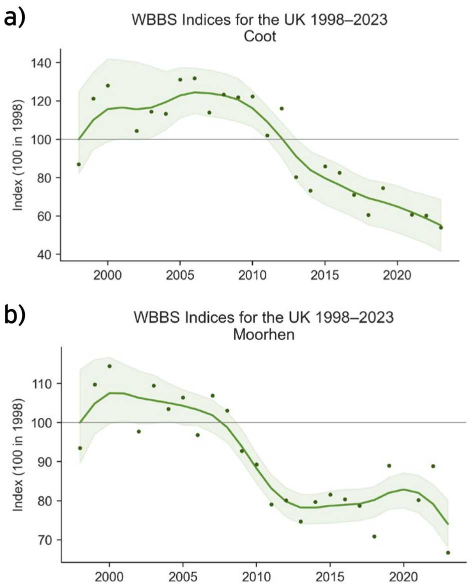


Figure 19: WBBS derived population trends of (a) Coot and (b) Moorhen.

MOORHEN: JOHN HARDING/BTO; COOT: RICHARD JACKSON/BTO

FIND OUT MORE...

BTO 2024. *BirdTrends 2024: trends in numbers, breeding success and survival for UK breeding birds.*www.bto.org/birdtrends

Lea, V. 2024. A mink-free Britain is now within reach. *British Wildlife* **35:** 313–317.

▲ **Little Egret** is the latest species to be added to the list of those monitored by WBBS, with a 10-year trend now available. Trends are consistent between the WBBS and the BBS for Little Egret and for its larger relative Grey Heron. Both surveys suggest that Little Egret is increasingly rapidly whereas Grey Heron is declining. Both species are, of course, monitored within the long running Heronries Census, the results of which can be found at: www.bto.org/heronries-results

Table 17: UK population trends during 2022–23, 2012–22 and 1999–2022.

Species	Min. sample	1-year (22-23)	10-year (12-22)	23-year (99-22)	LCL	UCL
Canada Goose	104	**-4**	**-16**	**80**	-13	222
Greylag Goose	61	**-22**	**38 ***	**136 ***	38	291
Mute Swan	114	**-3**	**-8**	**-14**	-36	11
Mandarin Duck	41	**49 ***	**84 ***	**–**	–	–
Mallard	240	**-7**	**-16 ***	**-10**	-22	3
Tufted Duck	43	**-1**	**-51 ***	**-63 ***	-81	-7
Goosander	57	**35**	**28**	**43**	-5	99
Moorhen	149	**-25 ***	**-1**	**-25 ***	-38	-9
Coot	68	**-10**	**-42 ***	**-47 ***	-69	-16
Oystercatcher	80	**-4**	**-24 ***	**-49 ***	-60	-33
Lapwing	67	**29**	**-29 ***	**-67 ***	-79	-51
Curlew	58	**26**	**-28 ***	**-66 ***	-77	-52
Common Sandpiper	69	**0**	**-16**	**-38 ***	-48	-27
(Common Tern)	31	**-19**	**-52 ***	**-60 ***	-75	-36
(Cormorant)	73	**-2**	**13**	**5**	-16	37
(Grey Heron)	178	**-4**	**1**	**-29 ***	-38	-20
(Little Egret)	32	**12**	**220 ***	**–**	–	–
Kingfisher	72	**-8**	**5**	**-10**	-32	16
Sand Martin	78	**53 ***	**36 ***	**50**	-9	124
Sedge Warbler	92	**6**	**-20 ***	**-51 ***	-61	-39
Reed Warbler	59	**-8**	**-3**	**-13**	-31	15
Whitethroat	133	**-8**	**-29 ***	**-7**	-23	11
Dipper	91	**-1**	**-9**	**-25**	-46	5
Grey Wagtail	132	**-35 ***	**20 ***	**-20**	-35	3
Pied Wagtail	155	**-13**	**-26 ***	**-48 ***	-58	-36
Reed Bunting	114	**16**	**-17 ***	**-14**	-26	4

Whilst many of the long-term WBBS trends tend towards decline, a sign of widespread pressures on our waterways, **Sand Martin** appear at least to be stable. WBBS data indicate a slight increase of 36% between 2012 and 2022, whereas the UK population trend from the BBS indicates no change between 1995 and 2022. Meanwhile, the closely related **Swallow** and **House Martin** are both faring poorly. Whilst not reported above, WBBS trends can be produced for these species. Both show 10-year declines between 36% and 52% in both schemes.

INTERPRETING THE RESULTS: see page 15

RESULTS ONLINE: www.bto.org/wbbs-results

SPECIAL THANKS

As is the case with the Breeding Bird Survey (see back cover), the Waterways Breeding Bird Survey also relies on the dedication and enthusiasm of Regional Organisers (RO) who manage the survey locally. Without these volunteers, it would not be possible to manage such large surveys and we are in debt to them all.

The back cover shows a complete list of the ROs who manage the Breeding Bird Survey locally; many of these ROs also co-ordinate the WBBS. For the list of those WBBS Regional Organisers who focus solely on managing WBBS (and are therefore not listed on the back page), please see the table opposite. If you would like to find out more about becoming a Regional Organiser and what is involved, please email: wbbs@bto.org

WBBS Regional Organisers in 2023:

ENGLAND	
Huntingdon & Peterborough	VACANT
Staffordshire (North, South, West)	VACANT
NORTHERN IRELAND	
Antrim & Belfast, Armagh, Down, Londonderry and Tyrone	Michael Stinson
WALES	
Montgomery	VACANT

We currently have vacancies for WBBS Regional Organisers in Anglesey, Bedfordshire, Cambridgeshire, Carmarthen, Devon, Essex (North-West & South), Huntingdon & Peterborough, Lincolnshire (South & West), Merseyside, Montgomery, Nottinghamshire, Radnorshire, Staffordshire (North, South & West), The Wirral and Yorkshire (Leeds & Wakefield, North-West & Richmond).

In addition to the ROs, we offer our sincere thanks to all the volunteers and landowners who enable these surveys to take place and have continued impact.

LITTLE EGRET: JOHN HARDING/BTO

SPECIAL THANKS: BBS REGIONAL ORGANISERS

We would like to thank all surveyors and ROs for making the BBS the success it is today. Space does not permit all observers to be acknowledged individually, but we would especially like to thank the ROs for their efforts.

BBS Regional Organisers in 2023:

ENGLAND	
Avon	Dave Stoddard
Bedfordshire	Judith Knight (now VACANT)
Berkshire	Sean Murphy
Birmingham & West Midlands	Steve Davies
Buckinghamshire	Phil Tizzard
Cambridgeshire	VACANT
Cheshire (Mid)	Paul Miller
Cheshire (North-East and South)	Hugh Pulsford
Cleveland	Michael Leakey
Cornwall	Michael Williams
Cumbria	Colin Gay
Derbyshire (North, South)	Simon Roddis
Devon	VACANT
Dorset	Pete Cadogan
Durham	David Sowerbutts
Essex (North-East)	Rod Bleach
Essex (North-West)	VACANT
Essex (South)	VACANT
Gloucestershire	Gordon Kirk
Hampshire	George Batho
Herefordshire	Chris Robinson
Hertfordshire	Martin Ketcher
Huntingdon & Peterborough	Mick Twinn
Isle of Wight	Teresa Tearle
Isles of Scilly	Will Wagstaff
Kent	Bob Knight
Lancashire (East)	Bernard Bracken (now VACANT)
Lancashire (North-West, South)	VACANT (now Mark & Heather Walsh)
Leicestershire & Rutland	Dave Wright
Lincolnshire (East)	Phil Espin
Lincolnshire (North)	Chris Gunn
Lincolnshire (South)	VACANT
Lincolnshire (West)	Mike Daly (now VACANT)
London (North)	Sabrina Schalz
London (South)	Richard Arnold
Manchester	Nick Hilton
Merseyside	VACANT
Norfolk (North-East)	Chris Hudson
Norfolk (North-West)	Jonathan Martin
Norfolk (South-East)	Rachel Warren
Norfolk (South-West)	Vince Matthews
Northamptonshire	Barrie Galpin
Northumberland	Muriel Cadwallender
Nottinghamshire	VACANT
Oxfordshire (North)	Frances Buckel
Oxfordshire (South)	John Melling
Shropshire	Jonathan Groom
Somerset	Eve Tigwell
Staffordshire (North, South, West)	Gerald Gittens
Suffolk	Mick Wright
Surrey	Penny Williams
Sussex	Helen Crabtree
The Wirral	Paul Miller
Warwickshire	Annette Jarratt-Knock
Wiltshire (North, South)	Polly Marino
Worcestershire	Steve Davies
Yorkshire (Bradford)	Mike Denton
Yorkshire (Central)	Mike Brown
Yorkshire (East, Hull)	Brian Walker
Yorkshire (Leeds & Wakefield)	VACANT
Yorkshire (North-East)	Nicholas Gibbons
Yorkshire (North-West)	VACANT
Yorkshire (Richmond)	VACANT
Yorkshire (South-East, South-West)	Grant Bigg
Yorkshire (York)	Rob Chapman
SCOTLAND	
Aberdeen	VACANT (now David Gregory)
Angus	VACANT (now Ron Lawie)
Argyll (Mull, Coll, Tiree & Morven)	Ewan Miles
Argyll (mainland & Gigha) & Bute	Nigel Scriven
Arran	James Cassels
Ayrshire	Dave McGarvie
Benbecula & The Uists	Yvonne Benting
Borders	Neil Stratton
Caithness	Donald Omand
Central	Neil Bielby
Dumfries	Andy Riches
Fife & Kinross	Paul Blackburn
Inverness (East & Speyside, West)	Hugh Insley
Islay, Jura & Colonsay	David Wood
Kincardine & Deeside	Claire Marsden
Kirkcudbright	Andrew Bielinski
Lanark, Renfrew & Dunbarton	Gordon Brady
Lewis & Harris	Craig Ferries
Lothian	Stephen Metcalfe
Moray & Nairn	Melvin Morrison
Orkney	VACANT (now Joseph Gilman)
Perthshire	Mike Bell
Rhum, Eigg, Canna & Muck	Bob Swann
Ross-shire	Simon Cohen
Shetland	Dave Okill (now VACANT)
Skye	Carol Hawley
Sutherland	Bob Swann
Wigtown	Andrew Bielinski
WALES	
Anglesey	Ian Hawkins
Brecknock	Andrew King
Caernarfon	Rhion Pritchard
Cardigan	Naomi Davis
Carmarthen	VACANT
Clwyd (East)	Anne Brenchley
Clwyd (West)	Mel ab Owain
Glamorgan (Mid, South)	Wayne Morris
Glamorgan (West)	Lyndon Jeffery
Gwent	Richard Clarke
Merioneth	Dave Anning
Montgomery	Margaret Town
Pembrokeshire	Annie Haycock
Radnorshire	VACANT
NORTHERN IRELAND	
Antrim & Belfast	Kevin Mawhinney
Armagh	Stephen Hewitt
Down	Alastair McIlwain
Fermanagh	Michael Stinson
Londonderry	Claire Hassan
Tyrone	Steven Fyffe
CHANNEL ISLANDS	
Channel Islands (excl. Jersey)	Chris Mourant
Jersey	Tony Paintin
ISLE OF MAN	
Isle of Man	David Kennett

We would be grateful for help organising the BBS in regions currently without a Regional Organiser (marked VACANT). If you live in one of these regions and would be interested in taking on the role, please let us know.

Many thanks are due to the following ROs who retired during the past year, having supported the BBS in their regions: Mike Daly, Craig Ferries, Barrie Galpin, Judith Knight, Wayne Morris, Carlton Parry, Sabrina Schalz and Dave Stoddart. Sadly, David Okill passed away in 2023 and we are grateful for all his assistance in Shetland.

We would like to thank and welcome Peter Bryant, Joseph Gilman, David Gregory, Daniel Jenkins-Jones, Ben Hillier, Ron Lawie, Emma Niederberger, Alan Sheffield, and Heather & Mark Walsh, who have taken over as ROs during the past year.

Finally, we would like to thank all the landowners who kindly allow volunteers to walk BBS and WBBS transects on their land.

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