

Index of Abundance for Scottish Terrestrial Breeding Birds, 1994 to 2015

An Official Statistics Publication for Scotland

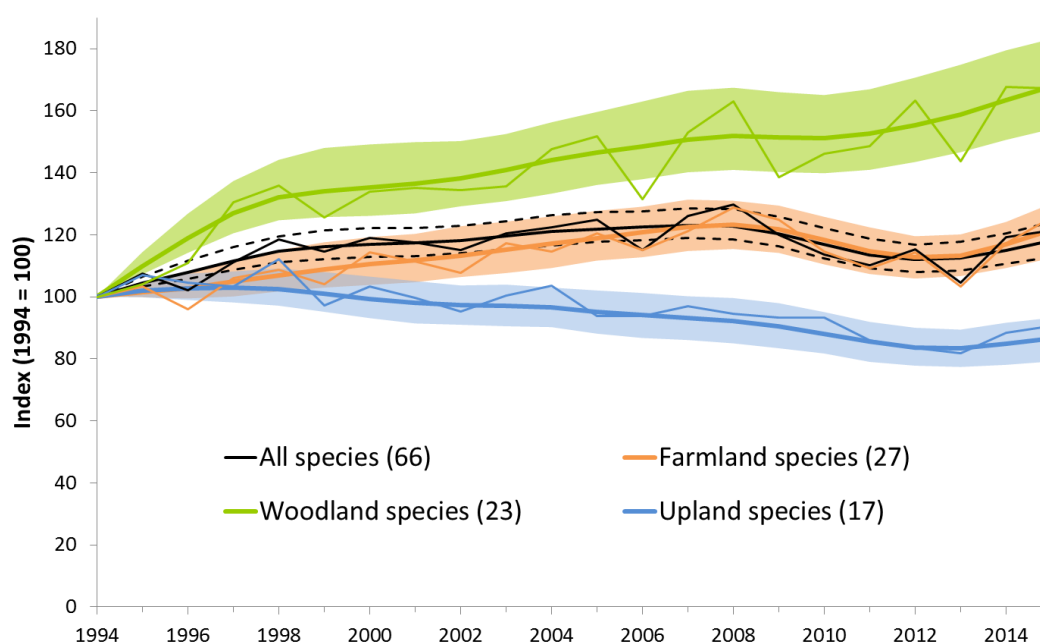
Scotland's terrestrial breeding birds include those commonly associated with woodland, farmland and upland habitats. Some are found in one particular habitat, for example treecreepers are typical woodland birds. Others use a wider range of habitats, such as wrens which can be found in woodland, farmland and uplands. Birds can respond relatively quickly to variation in habitat extent and condition through changes in breeding success, survival or dispersal. Since most are relatively easy to identify and count, and many are widespread and abundant, they are used as indicators of environmental change.

Evidence

In Scotland, terrestrial breeding birds are monitored primarily through the Breeding Bird Survey (BBS). Volunteers visit randomly located 1km survey squares twice in the breeding season (April to July). The squares are representative of farmland, woodland and upland habitats. Ten of the 66 species reported here are assessed using targeted surveys, as they are either too scarce for reliable abundance estimation by the BBS or are better monitored by specialised surveys. A further 46 terrestrial species regularly breed in Scotland but insufficient data are available to include in these indicators as they are too scarce to be monitored by the BBS effectively, and are not covered by species-specific surveys. Among the species excluded are several woodland, farmland and upland specialists of current conservation concern (Eaton *et al.*, 2015) such as wood warbler and spotted flycatcher.

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Thick and thin lines are smoothed and unsmoothed trends, respectively. Dashed lines (for all species trend) and shaded areas (for habitat specific trends) illustrate 95% confidence intervals.



Assessment

Since the start of the time series in 1994 to the most recent estimate in 2015:

- 40 of the 66 bird species increased in abundance and 25 declined; the all-species (smoothed) index increased steadily up to the mid-2000s, subsequently fluctuating between 12% and 23% above the 1994 index value. It is currently 18% higher than in 1994.
- The smoothed woodland bird index increased significantly by 68% overall;
- The smoothed farmland bird index increased steadily up to the late-2000s, subsequently fluctuating between 13% and 23% above the 1994 index value. It is currently 22% higher than in 1994;
- The smoothed upland bird index decreased significantly by 14% overall;
- The unsmoothed data show that, between 2014 and 2015, the farmland bird index increased by 7%. Changes in the upland, woodland and all-species indices during this period were not significantly different from zero.

All species change (2014 – 2015)	No significant change
All species change (1994 – 2015)	Increased



Commentary

Since 1994 the smoothed all-species index steadily increased to a maximum in 2007, with inter-annual change becoming more variable after this time. In 2015 it stood at 18% above the baseline, and 4% below the 2007 figure. Between 2014 and 2015, only the farmland bird indicator changed significantly, increasing by 7%.

In this commentary, the term 'long-term' refers to the period from 1994 to 2015, while 'short-term' refers to changes between 2014 and 2015. Longer-term changes since the 1970s, analogous to those reported for the UK (e.g. DEFRA, 2015; Harris *et al.*, 2016) are not available for Scotland due to low monitoring coverage prior to the start of the BBS. The main drivers of population change are not always clear, but where it is available, information that can help to explain the changes shown here is provided. Bird populations in Scotland are (as elsewhere) affected by conditions in all parts of their range, in the non-breeding as well as the breeding season. For example, a summer migrant to Scotland may be affected by the conditions in Scotland, along its migration route, or on its wintering grounds. Long-term and short-term changes for individual species are assessed using unsmoothed trends. Due to the variability in the individual species trends, populations are considered to have increased or decreased only when the change is at least 5%. Individual species trends are shown in Table 1.

Woodland Birds

Overall, bird species associated with woodland have increased more than those in the other groups, over the long-term.

Despite the increasing trend of this group in the long-term, woodland indicator species changed little between 2014 and 2015. The largest short-term increases were for bullfinch, siskin and chiffchaff, while the largest short-term declines were for tree pipit, coal tit and buzzard. The population increase for bullfinch, following a similar increase over the previous two years, takes it to its highest levels since the start of the indicator. The continuing good fortunes of chiffchaff, along with those of blackcap, may be related to improved climatic conditions during the winter and, at least in the case of blackcap, the provision of food at bird tables, which have led to changes in their migratory behaviour (Plummer *et al.*, 2015). Populations of willow warbler and tree pipit, notwithstanding the short-term decline of the latter species, exhibit markedly more positive trends in the northern part of their UK range than the south. Although climate change effects seem likely to play a role, local-scale habitat changes could also be important (Morrison *et al.*, 2010). Woodland creation, felling and stocking of managed forests and reductions in numbers of large herbivores in upland north-west Britain are suggested to have resulted in increased shrubland and increasing abundances of bird species associated with this habitat (Calladine *et al.*, 2015). As well as benefitting birds during the breeding season, shrubland could benefit several species (including bullfinch) that make use of young conifer plantations during the winter (Calladine *et al.*, 2013).

Coal tit is now at its lowest population levels since the start of the indicator, having declined by 13% since 2014. Goldcrest, another small conifer specialist, also declined between 2014 and 2015. Both of these species increased during the very cold winters between 2009 and 2011, when populations of most other small resident birds declined. This suggests that the ways in which conifer specialists respond to other climate variation may be different from most other passerines, though exactly how or why is not clear.

Farmland Birds

There have been long-term increases in several farmland indicator species, the biggest of which are for goldfinch, great tit, magpie, corncrake and whitethroat. Goldfinch numbers have increased substantially since 1994; an increase attributed partly to changes in their use of alternative food sources, such as more regular feeding in gardens (BTO, 2016), resulting in an improved annual survival (Baillie *et al.*, 2014). The great tit trend for farmland is even more positive than in woodland, with which this species is more strongly associated. The increase in magpie abundance in Scotland since the early 1990s is



accompanied by an expansion of its range in southern Scotland, and is probably due to reduced control by humans (Balmer *et al.*, 2013).

The largest short-term gain of any farmland indicator species was for linnet, a seed-eating farmland specialist, a trend that is counter to that of some other granivorous species (see below). The previous three indicator values for this species, for 2012-2014, were its lowest for the whole indicator period, but the increase between 2014 and 2015 takes it back to 1994 levels. Both breeding performance and overwinter survival have been implicated in UK declines of this and other seed-eating species (e.g. Siriwardena *et al.*, 1998; Siriwardena *et al.*, 2000), but the cause of the short-term increase is not clear. The short-term change for linnet in England was also positive, though smaller than in Scotland, while in Wales there was little change (Harris *et al.*, 2016).

The long-term increase in corncrake numbers now appears to be slowing (Wotton *et al.*, 2015). The short-term drop in abundance is within the range of recent fluctuations, and may not be a signal of any longer term trend. Similarly, whitethroat shows a short-term decline in the context of a long-term increase. Populations of long-distance migrants that winter in the Sahel region of Africa (also including other species such as sedge warbler) are strongly influenced by winter rainfall there (Ockendon *et al.*, 2014). This is the most likely explanation for the long-term increase for these species, following severe droughts in this region several decades ago.

Six of the 27 farmland indicator species declined between 1994 and 2015, two of which (lapwing and oystercatcher) are waders. There is an increasing volume of literature (reviewed in Ainsworth *et al.*, 2016) to show that habitat, predation and the interaction between these factors are among the most important influences on the populations of these and other ground-nesting birds.

Kestrel numbers increased from 2014 levels, probably as a result of the high breeding success this species experienced (along with other small mammal predators), as a result of high vole numbers in that year (Challis *et al.*, 2015). Despite this short-term increase, kestrel has experienced a long-term decline in abundance greater than that of any other farmland indicator species. Studies elsewhere (e.g. Butet *et al.*, 2010) implicate agricultural intensification, and recent research on demographic factors suggests that in the UK, reductions in survival rate may be driving declines (Robinson *et al.*, 2014). Scottish populations of greenfinch, as elsewhere in the UK, have declined in response to the recent outbreak of trichomonosis that started in 2005 (Lawson *et al.*, 2012). The short-term increase for this species between 2014 and 2015, the first recorded in this indicator for 8 years, may mark a slow-down of this decline. The remaining two declining farmland indicator species are rook and skylark, both of which are strongly associated with arable farmland. Arable farmland specialists have suffered in recent decades from many aspects of agricultural intensification (Chamberlain *et al.*, 2000; Newton, 2004) including loss of field margins, a tendency towards autumn sowing of cereals, and increased use of fertilizers and pesticides.

Upland Birds

Cuckoo has the most positive long-term trend of species in this group, and is currently at its highest index value since 1994. The trend for cuckoo in the uplands shows greater change than in woodland, but the reasons for this are not clear. Douglas *et al.* (2010) largely ruled out the influence of host species on cuckoo trends, however differing population trends appear to be associated with different migration routes (Hewson *et al.*, 2016). The increased availability of scrub due to woodland expansion, summer food availability and differences in migration or wintering ecology between upland and woodland cuckoos could all contribute to differences in population trends. The raven population has doubled since 1994, possibly due to increased breeding success (Baillie *et al.*, 2014), but overall numbers in Scotland appear to have stabilised. Since 2003, raven population size has varied between 1.6 and 2 times its size when compared to 1994. Red grouse numbers have undergone a large increase for the second year in a row to bring them to their highest abundance in 16 years, but numbers are still within the margins of inter-annual variation for this species, and do not suggest a long-term change. Snipe is the only one of seven wader species in the terrestrial breeding bird indicator to be increasing; the other six all having declined by 20% or more since 1994. The reasons for snipe's better fortune aren't clear, but could include superior avoidance of predators due to its cryptic plumage and habits. Also, the affinity of this species for rank vegetation may have enabled it to benefit more from recent decreases in grazing intensity than other waders (Gill *et al.* 2006). Golden eagle was the subject of a national survey in 2015, which revealed that breeding numbers have been increasing faster than the difference between the last two



surveys suggested. The most recent national estimate of 508 breeding pairs (Hayhow pers. comm.) meets the favourable conservation target of 500 occupied territories set out in Whitfield *et al.* (2006). However, there is still substantial variation between regions in territorial occupancy, suggesting that the influence of population constraints, such as persecution and live prey availability, still varies between different parts of Scotland (Whitfield *et al.*, 2006).

Declining upland species include curlew and dotterel. Curlew declines are likely to be linked to land use, with predation a likely mechanism (Douglas *al.*, 2014) as well as more direct impacts through reductions of the quality of foraging habitat in grasslands and trampling by cattle (Brown *et al.*, 2015). Dotterel is an alpine specialist, only found on high mountain tops. Several possible reasons for their decline have been put forward (Whitfield, 2002; Hayhow *et al.*, 2015), including changes on their north African and Iberian wintering grounds, lower breeding success due to climate change, predation or nitrogen deposition on their breeding grounds, and redistribution of breeding birds from Scotland to other parts of Europe.

Birds not specific to any of the habitats

Eight bird species are not included in the habitat-specific trends, either because they do not show a strong association to any of the habitats reported, or insufficient data were available to calculate a habitat-specific trend. Long-term trends remain similar for most of these species, most notable among these being the decline of swift and contrasting large increases for house martin and, to a lesser extent, house sparrow. Short-term changes since 2014 include a continued decrease for grey heron, and a return to 2013 levels for grey wagtail.

Source data and updates

Data for 56 of the 66 species come from the Breeding Bird Survey (BBS) run by British Trust for Ornithology (BTO) on behalf of a partnership that also includes the Joint Nature Conservation Committee (JNCC) and Royal Society for the Protection of Birds (RSPB) (view map of BBS sites [in this report](#)).

The data for BBS consist of annual counts made over a period of years at a series of sites. Generalised Linear Models were used to generate trends. To prevent short-term population variability and statistical error having an undue influence, trends were smoothed and long-term trends assessed using techniques recommended by Fewster *et al.* (2000). The smoothed indices were used to assess the significance of long-term changes and the unsmoothed indices were used to assess the significance of short-term changes of the indicators. There are no confidence intervals associated with species-specific changes listed in the tables and therefore no associated statistical significance. Details of species changes are provided to help the reader understand the changes in the Official Statistic.

Details of the methods used to calculate the indices are available from <http://www.bto.org/birdtrends2010/methodology.htm>.

Trends for common sandpiper and dipper are derived from the BTO Waterways Bird Survey and the Waterways Breeding Bird Survey. Grey heron trends are derived from the Heronries Census. Trends for seven species (golden eagle, hen harrier, peregrine, dotterel, corncrake, black grouse and capercaillie) are estimated from single-species surveys carried out periodically, during the period 1994 to 2015 as part of the SCARABBS (Statutory Conservation Agency/RSPB Annual Breeding Bird Scheme) programme. A further 46 terrestrial species regularly breed in Scotland (being found in at least 100 10k squares in Bird Atlas 2007-11), but insufficient data are available through current monitoring schemes to permit their inclusion in these indicators.

In Scotland, the production of multi-species indicators is limited to a start date in 1994 as this is when BBS was first implemented, and achieved broad-scale representative coverage of many terrestrial species in Scotland. Changes reported through these indicators exclude any changes that occurred prior to 1994, which based on UK data show marked declines in many farmland and woodland species.

Results for the UK are available from <https://www.gov.uk/government/statistics/wild-bird-populations-in-the-uk>

The index will be next updated in November 2017.



Official Statistics are produced by professionally independent statistical staff in accordance with the Code of Practice for Official Statistics.

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Table 1. Percentage changes in abundance for the Scottish Terrestrial Breeding Birds, 1994-2015 and 2014-2015, species listed in order of overall change 1994 to 2015.

Summarised trends for individual species and their habitat associations from 1994 to 2015, and the most recent year of change. A blank entry denotes that the species did not show a strong association to that habitat, or that insufficient data were available to calculate a habitat-specific trend.

Species name	All habitats		Woodland		Farmland		Upland	
	94-15	14-15	94-15	14-15	94-15	14-15	94-15	14-15
Chiffchaff	752	23	752	23				
Great Spotted Woodpecker	530	-8	530	-8				
Blackcap	399	10	332	9				
Goldfinch	253	36			429	40		
House Martin	244	2						
Bullfinch	204	44	204	44				
Corncrake	127	-17			127	-17		
Great Tit	115	11	112	6	176	11		
Raven	101	0					101	0
Whitethroat	99	-30			99	-30		
Tree Pipit	86	-30	86	-30				
Siskin	86	30	86	30				
Reed Bunting	83	13			83	13		
Magpie	78	25			143	48		
Cuckoo	75	1	34	11			129	3
Wren	74	-8	74	-8				
Lesser Redpoll	64	1	64	1				
Treecreeper	61	2	61	2				
Dunnock	59	0	82	-7	41	10		
House Sparrow	57	0						
Willow/Red Grouse	52	23					52	23
Willow Warbler	46	-3	46	-3				
Yellowhammer	42	-4			42	-4		
Snipe	41	12					41	12
Jackdaw	41	9			47	10		
Buzzard	37	-7	4	-13	57	-3		
Song Thrush	36	9	33	-5	69	10		
Blackbird	34	4	12	-8	55	5		
Sedge Warbler	34	3			34	3		
Goldcrest	34	-8	34	-8				
Swallow	33	10			33	10		
Mistle Thrush	32	-5	32	-5				
Blue Tit	29	2	5	-4	42	-5		
Robin	23	4	34	3				
Golden Eagle	19	1					19	1
Collared Dove	12	-1						
Wheatear	11	11					11	11
Pied Wagtail	11	-9			11	-9		
Chaffinch	9	7	15	5	13	5		
Woodpigeon	6	5			8	12		
Linnet	5	65			5	65		
Stonechat	-5	-32						



Species name	All habitats		Woodland		Farmland		Upland	
	94-15	14-15	94-15	14-15	94-15	14-15	94-15	14-15
Meadow Pipit	-6	1					-6	1
Starling	-7	2			3	-8		
Mallard	-7	-7						
Hen Harrier	-8	-4					-8	-4
Carrion Crow	-10	-9			1	-6		
Grey Heron	-13	-8						
Coal Tit	-13	-13	-13	-13				
Dipper	-17	6					-17	6
Grey Wagtail	-21	-41						
Golden Plover	-24	20					-24	20
Peregrine	-24	-1					-24	-1
Rook	-25	16			-25	16		
Skylark	-25	-3			-28	-6	-18	-10
Common Sandpiper	-26	15					-26	15
Hooded Crow	-28	-1					-28	-1
Oystercatcher	-40	-8			-40	-8		
Greenfinch	-46	17			-41	20		
Black Grouse	-51	-3					-51	-3
Swift	-52	5						
Lapwing	-53	14			-53	14		
Dotterel	-58	-5					-58	-5
Capercaillie	-59	-7	-59	-7				
Kestrel	-60	45			-60	45		
Curlew	-61	-18					-61	-18

