WOODLAND TRUST

WoodWise

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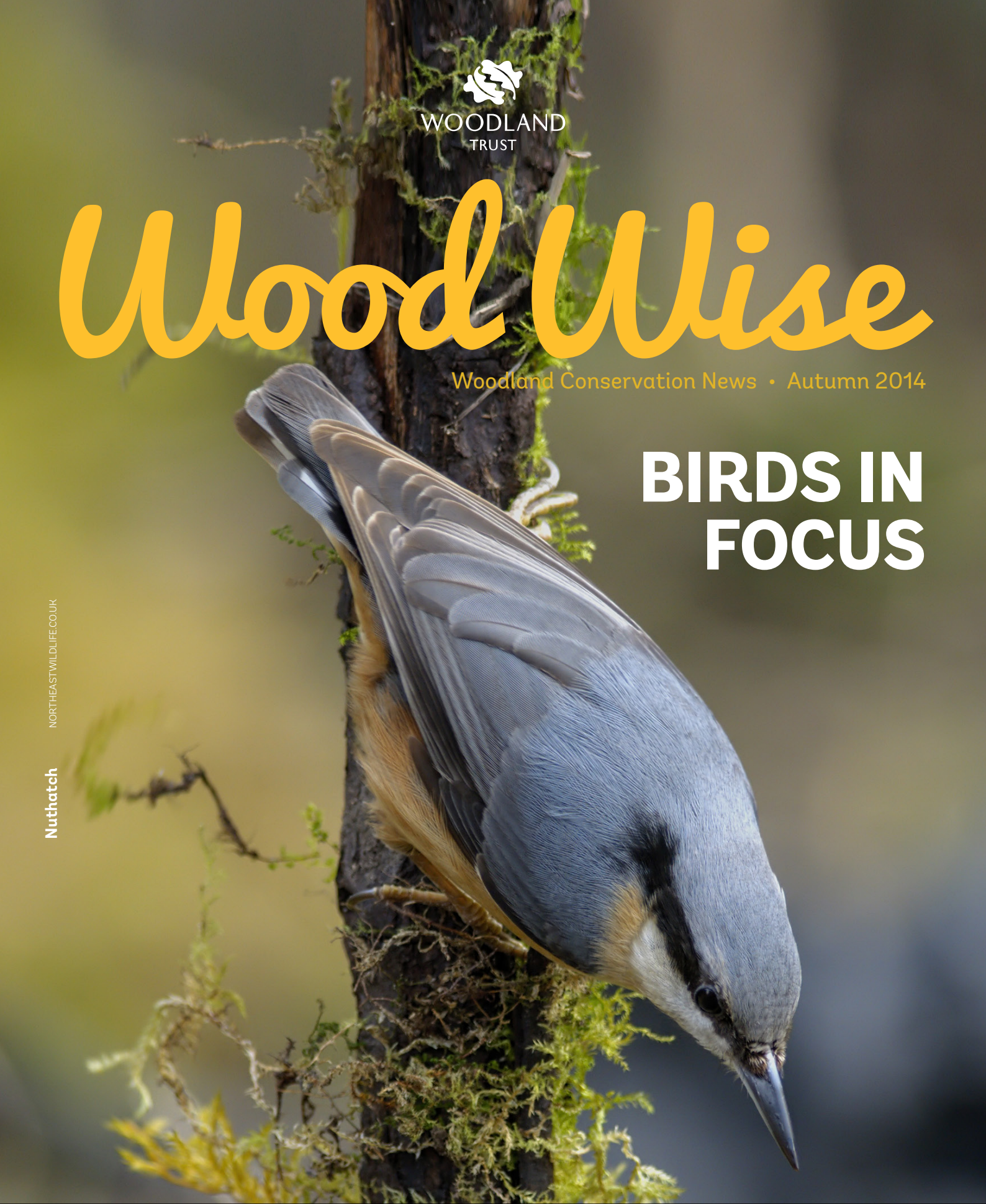
BIRDS IN FOCUS



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MAKE YOUR WOOD WORK FOR BIRDS

WILL GREAT TITS ADAPT TO SURVIVE?

WHERE ARE THE WOOD WARBLERS GOING?

BOOSTING BIRD NUMBERS AT HEARTWOOD

SPACEBIRDY-WIKIMEDIA COMMONS

Birds and woods

Adult bullfinch feeding juvenile

Birds are an iconic and important part of woodland biodiversity. Their calls and unique plumage endear them to many visitors and users of woods all over the UK and the world.

In woodland ecosystems birds are important at various trophic levels. Some are predators that control prey species; others are prey themselves and support other species. They can also be key seed dispersers, supporting natural regeneration. The cavities woodpeckers, Picidae family, create become homes for many other species, such as Bechstein's bats, *Myotis bechsteinii*. Their bodies are also inhabited by numerous parasites.

Birds are useful biodiversity indicators that can show the health, or not, of an ecosystem and change over time. This is because they are sensitive to anthropogenic impacts and there are a number of long-term studies on them.

However, between 1970 and 2012 the UK woodland bird index (of 38 species) dropped by 17 per cent from its 1970 baseline. Species such as lesser spotted woodpecker, *Dendrocopos minor*, and wood warbler, *Phylloscopus sibilatrix*, are now red-listed, while bullfinch, *Pyrrhula pyrrhula*, and nightingale, *Luscinia megarhynchos*, are amber-listed. Negative trends for long distance migrants (e.g. wood warbler) and scarce residents (e.g. lesser spotted woodpecker) are of particular concern.

Issues affecting woodland birds

Changing woodland structure is a major issue linked to the decline in birds and other species. *A guide to managing woodland for priority birds in Wales*[1] lists the following as key issues for woodland birds:

- Development of a closed canopy, and simplified shrub and field layers.
- Lack of diversity of woodland age structure.
- Changes in grazing and browsing pressure, affecting the shrub and field layers, and woodland regeneration (including deer).
- Grey squirrel damage, affecting establishment.
- Abundance and extent of clearings, glades and rides.
- Availability of wet features.
- Insufficient abundance of deadwood.
- Woodland edge management.

Other contributing factors are:

- Agricultural intensity (e.g. chemical drift affecting the woodland edge, land drainage lowering the water table and loss of hedgerows).
- Woodland fragmentation.
- Decreasing invertebrate populations.
- Human disturbance (including dogs disturbing ground nesters).
- Predation.
- Issues along migratory routes.
- Climate change causing phenological disruption.

While changing woodland structure is undoubtedly an issue, one of the challenges is untangling all the possible different causes of declines. The following case studies focus on some of the issues highlighted above, research for further evidence and work to support woodland birds.

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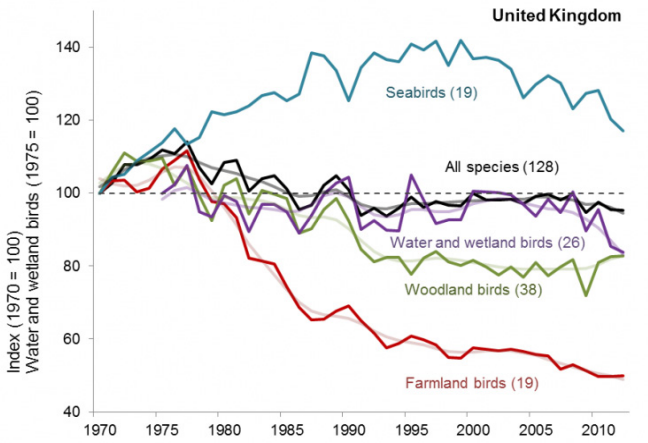
[1] *Dyda, J., Symes, N. & Lamacraft, D. (2009). Woodland management for birds: a guide to managing woodland for priority birds in Wales. The RSPB and Forestry Commission Wales.*

UK Wild Bird Indicator 2012

BTO & RSPB



Birds affected by management and deer

Populations of birds in many UK woods show large changes over the last 30 years. While numbers of many common species have increased, around a third of woodland bird species have declined, including many of the woodland specialists. Species showing large decreases in number and UK distribution are hawfinch, *Coccothraustes coccothraustes*, lesser redpoll, *Carduelis cabaret*, lesser spotted woodpecker, *Dendrocopos minor*, marsh tit, *Poecile palustris*, nightingale, *Luscinia megarhynchos*, tree pipit, *Anthus trivialis*, willow tit, *Poecile montana*, wood warbler, *Phylloscopus sibilatrix*, and woodcock, *Scolopax rusticola*.

Declines are generally less marked in the north, although the capercaillie's, *Tetrao urogallus*, Scottish range has contracted by 30 per cent over the last 40 years[1]. There is no common theme to the types of birds that have declined; they include species with very different nest sites and diets. Both residents and long-distance migrants are involved, although declines in species overwintering south of the Sahara seem especially severe.

The list of possible causes is long and many species are likely affected by multiple factors, which are the subject of various research projects. Long-distance migrants could face pressures during migration or in their African overwintering areas. Climate change may be altering food supplies in UK woods. Land-use changes outside woodland could make it more difficult for birds to move between woods. Predation pressure on nests or adult birds might also have altered.

There is considerable evidence that the vegetation structure of many woods has changed over recent decades and this may be an important factor in bird declines. This article focuses on this particular issue and its consequences for habitat suitability for birds.

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Hawfinch

Drivers of change in woodland vegetation structure

In the latter part of the last century, two main processes drove changes in woodland vegetation and are perhaps most evident in lowland woods. Due to reduced management, many woods became increasingly shaded. Management activity was low for several years because of poor timber and wood prices, which have made some recovery. Many formerly coppiced woods also exist in a neglected state, typically with uniform closed canopies.

High shading results in loss of ground cover, including bramble, *Rubus fruticose*, that many birds use as nest cover. It gradually diminishes woody shrubs beneath the canopy, which provide nest and feeding sites. Some woods also have less open space, partly due to shading and partly reduced felling.

The other major change is the large increase in deer numbers across much of southern, central and eastern England. By browsing on low woody growth, deer produce similar effects on vegetation structure to those of shading – loss of bramble, shrubs and saplings. They can also cause a large shift towards a high cover of grasses and sedges that are unpalatable to deer but not attractive to birds.

These complex changes have almost certainly reduced the quality of many woods for bird species, especially those depending on low-growing vegetation for food, nest sites or shelter. Birds potentially affected include some of the strongly declining species, as well as others that have become less locally abundant in woodland, such as bullfinch, *Pyrrhula pyrrhula*, dunnock, *Prunella modularis*, garden warbler, *Sylvia borin*, nightingale, song thrush, *Turdus philomelos*, tree pipit, willow tit, willow warbler, *Phylloscopus trochilus*, and woodcock. The detailed requirements of these and other woodland birds vary greatly, as do their exact responses to habitat management and deer[2]. Nonetheless, some general patterns can be discerned.

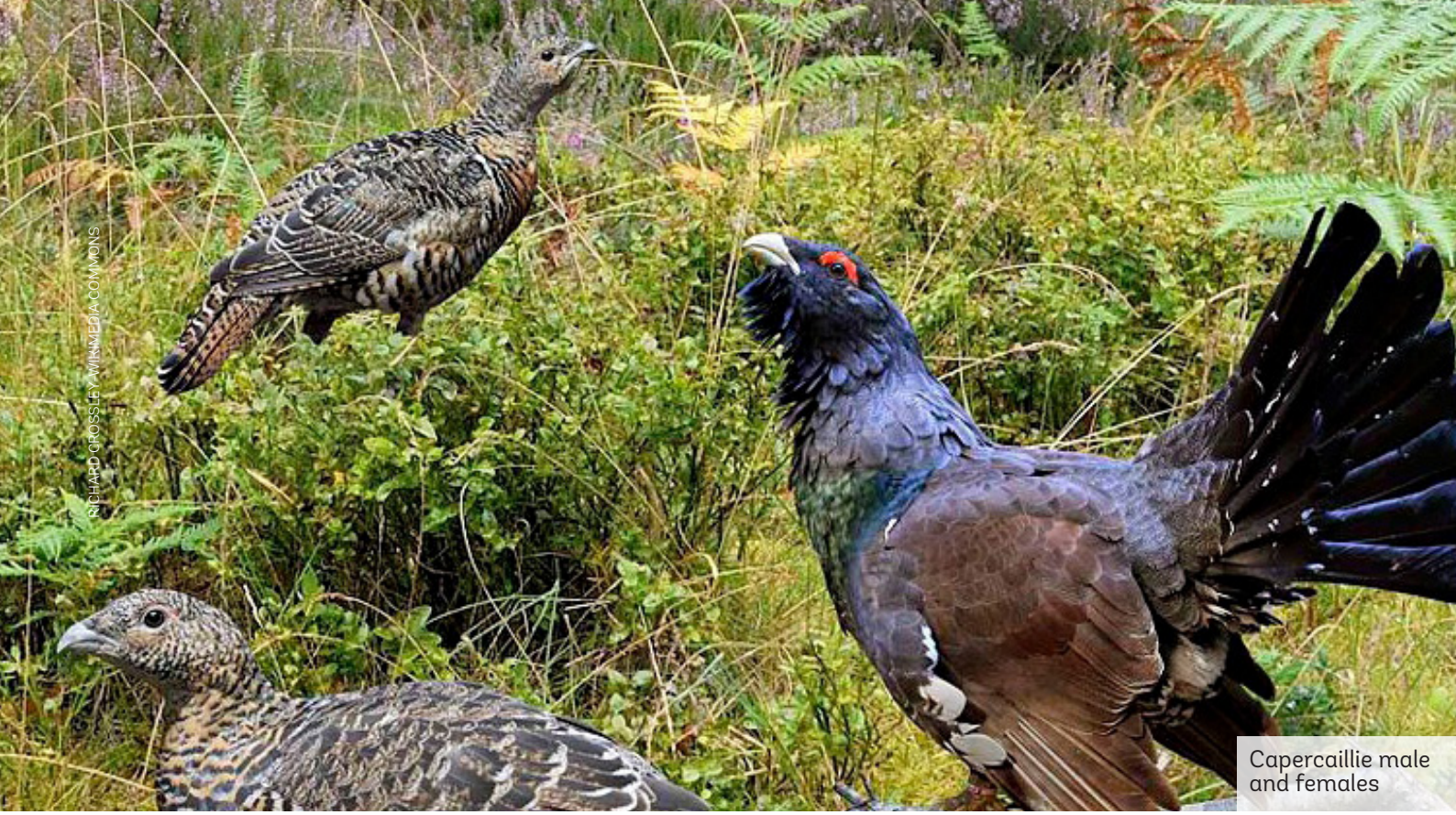
Red deer

Woodland management and birds

The various approaches to managing woods create very different kinds of environments and opportunities for birds.

Coppicing is still practiced on a small scale but may become more popular in future as a system of producing woodfuel. Most coppice is cut on short rotations, less than 30 years, which creates woodland with a high proportion of young shrubby regrowth. Where the vegetation is dense this can support nightingales and high numbers of warblers, as well as resident species such as song thrush and dunnock. On well-drained soils, the years immediately after harvesting can be suitable for tree pipits. Once the canopy closes and the low, dense vegetation is shaded out, these species disappear and the maturing coppice then holds very low densities of birds. The earliest years of coppice regrowth can also be highly attractive to several specialised butterflies.

Clearfelling also creates substantial areas of young growth, but the vegetation is typically less dense than in coppice and, because rotations are longer, these early woodland stages form a smaller proportion of the total



Capercaillie male and females

woodland area. However, clearfelling systems potentially provide a diverse range of habitats, including those for birds needing stands of mature trees.

Continuous cover systems are increasingly used as an alternative to clearfelling, especially in lowland broadleaved woods. They maintain greater evenness in forest structure through the use of small-scale patch felling or single tree harvesting. The implications for birds are not entirely clear, but species that benefit from bushy regrowth in recently coppiced or clearfelled woodland may not find much suitable habitat. Commercial thinning does not generally open the canopy sufficiently to stimulate development of the dense understorey that many bird species need. Thinning can also remove dead and decaying wood that may provide food and nest sites for birds, such as woodpeckers, *Picidae family*.

Effects of deer

The removal of low vegetation by heavy deer browsing certainly reduces the suitability of woodland for some birds. This is clearly shown through studies in coppiced woodland. Densities of migrant birds, such as nightingale and garden warbler, were considerably lower in deer-browsed coppice than areas protected from deer[3].

However, moderate levels of deer browsing may actually produce patchy diverse habitat structures beneficial to wildlife. A few birds, including redstart, *Phoenicurus phoenicurus*, tree pipit and wood warbler even prefer open woodland created by grazing. Apart from altering habitat structure, deer can reduce the diversity of tree species and consume fruits and seeds that may lower food supplies for birds.

Best practice

The exact causes of woodland bird declines are not fully understood. However, much can be done to improve opportunities for birds through habitat and deer management (where necessary).

Different species need different habitats, so a 'one size fits all' approach is ineffective at supporting the full array of woodland birds. Use of varied management approaches can potentially provide continuity of suitable habitats for some increasingly scarce species,

as well as ensuring our woodland continues to support a rich and wide spectrum of wildlife.

Offering diverse structures within a single large wood can be important but, to be most effective, a variety of structures is needed across woods at a landscape scale. For example, if the majority of woods in a district are predominantly mature and closed canopy, then managing a few woods as coppice could have a positive effect on the range of habitats available.

[1] For more information about recent changes in the distribution and trends of woodland birds visit these two areas of the BTO website: Bird Atlas Mapstore http://blx1.bto.org/mapstore/StoreServlet and BirdTrends http://www.bto.org/about-birds/birdtrends/2013.

[2] More information is available about requirements of woodland birds and effects of woodland management and deer from a recent study: 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 – WC0793. Available online via the Science and Research Projects section of the Defra website.

[3] Holt, C.A., Fuller, R.J. & Dolman, P.M. (2013) Exclusion of deer affects responses of birds to woodland regeneration in winter and summer. Ibis, 156, 116-131

Dunnock

Great tit survival

Wytham Woods cover 390 hectares of mixed habitats (including ancient semi-natural woodland) containing a rich fauna and flora typical of lowland England. The woods were given to the University of Oxford in 1942 and have been used for education and research ever since.

One of Wytham's long-term studies involves great tits, *Parus major*. The study was started by David Lack after he realised how much more convenient it would be to research a bird content to use nest boxes. In the winter of 1946-47 several boxes were erected and the first studied breeding season was 1947. This year's (2014) research means the great tits of Wytham Woods have been studied for 68 seasons. This is one of the longest running bird studies in the world.

Since 1963 there have been just over 1,000 nest boxes at Wytham, in an almost constant pattern – bar the replacement of those lost to fallen trees. Because all the chicks are ringed, and the parents caught to read their rings, great tits nesting in them can be tracked back through as many as 38 generations. One research area looks at the ability of birds to adjust to the changing climate and the phenological advancement of spring.

Phenotypic plasticity

Phenotypic plasticity is the ability of an individual to change its morphology, physiology, behaviour, or life history in response to changing environmental conditions[1]. However, rapid climate change could mean some species or populations may struggle to adapt if they lack plasticity. For the last 53 years the great tits of Wytham Wood have been studied to assess their ability to adapt to this change.

Phenological data gathered by Nature's Calendar recorders shows on average over the last 30 years insects have started appearing three weeks earlier, while birds have begun nesting activity a week earlier and tree budburst starts 10-14 days earlier. If a species is too highly specific and has co-evolved with another particular species (food source) that becomes unavailable to it due to their differing plasticity, then it may struggle to survive in the future. This may become true of certain butterfly species whose larvae rely on only one foodplant.

Great tits are particularly useful indicators of woodland bird health as they can represent a variety of species in deciduous woods. As with other insectivorous birds, great tits need to time their breeding with a peak in an abundance of insects, and because they have large broods – more than 10 nestlings is not uncommon – matching this peak is particularly important. If these fall out of synchronisation then fewer young will be successfully raised.

Great tits have evolved to exploit the seasonal peak in the larvae of Lepidoptera, especially winter moths, *Operophtera brumata*, that feed on newly emerged leaves.

The mean breeding date of Wytham Woods' great tit population has advanced by about 14 days since the mid-1970s. Research suggests this is due to an intimate relationship between the mean egg-laying date and the temperature preceding it. Peak abundance of winter moths shows a similarly strong relationship with early spring temperatures. This similar response to temperature in the two different species means they are advancing together.

Great tits are a short-lived species that can breed when one year old. This makes them more capable of adapting to a rapidly changing climate than those that are longer-lived. This is primarily because evolution can work faster in short-lived species, so genetic adaptation and natural selection can better keep pace with rapid environmental changes. Species with

Great tit

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Great tit chicks

long lifecycles tend to have fewer offspring and reach sexual maturity at a much older age, reducing their capability for genetic evolution over short timescales.

In one paper, researchers, including Professor Ben Sheldon, at the University of Oxford state that *'the importance of phenotypic plasticity in adaptation to climate change is strongly dependent on life history. Short-lived species, with high reproductive rates, are more resilient to expected rates of climate change even with relatively little phenotypic plasticity, and while phenotypic plasticity is likely to be an adaptive response to environmental uncertainty in such species, it is not the only potential form of adaptation to climate change unless generation time encompasses multiple years and the rate of reproduction is slow.'* [2]

Specialists and generalists

Another key element to adaptation is for a species to adjust its behaviour to cope with whatever environment is being experienced at the time. Generalists therefore have a greater survival advantage than specialists, as specialists have a much narrower and specific set of requirements for survival, whether this is climate, habitat or food source.

The 33 woodland species of the UK Wildbird Populations Framework Indicator are split into generalists and specialists. Across the UK, a resurvey of breeding bird populations of broadleaved and mixed woodlands in 2003-04 [3] showed declines in 10 of the 17 woodland specialist species. But it showed declines in only three of the 12 woodland generalists.

If the climate continues to change at the current rate, or indeed faster, we risk losing those species that will not be able to keep pace with or adapt to the changing environmental conditions. It is important for humans to concentrate on limiting the speed of this change and providing healthy, resilient landscapes that allow the natural world the best possible chance of adapting to what may come.

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[1] *Whitman, D.W. & Agrawal, A.A. (2009). What is phenotypic plasticity and why is it important? Phenotypic Plasticity of Insects: Mechanisms and Consequences, p. 1-63. Science Publishers.*

[2] *Vedder, O., Bouwhuis, S. & Sheldon, B.C. (2013). Quantitative assessment of the importance of phenotypic plasticity in adaptation to climate change in wild bird populations. PLOS Biology. Available online: http://www.plosbiology.org/article/info%3Adoi%2F10.1371%2Fjournal.pbio.1001605*

[3] *Amar, A. et. al. (2005). A re-survey of breeding bird populations of broadleaved and mixed woodlands in 2003-04 to examine changes since the 1960s, 1970s and 1980s and test these changes against a range of hypotheses for their causes. Available online: http://forestry.gov.uk/pdf/rwbs-full-report.pdf/$FILE/rwbs-full-report.pdf*

SPACEBIRDY-WIKIMEDIA COMMONS

Wintermoth caterpillar

Wood warbler declines

Malcolm Burgess and staff from the RSPB Centre for Conservation Science conducted a five year project[1] to investigate the decline of the UK wood warbler, *Phylloscopus sibilatrix*, currently a red-listed species. Wood warblers are long distance migrants, and are just spring and summer visitors to the UK, breeding in mainly upland woodlands in western parts of the UK. After breeding they return to sub-Saharan Africa.

These insectivorous passerines require closed canopy, mature woodland. However, in the UK wood warblers have declined by 69 per cent since the mid-1990s and have disappeared from 50 per cent of their former range.

Several theories have been suggested to explain the decline:

- Increased nest predation.
- Declines in invertebrate food (especially caterpillars).
- Changes in caterpillar phenology due to climate change.
- Changes in woodland phenology due to climate change affecting food availability.

To test these possibilities fieldwork took place in Wales 2009-2011 and Devon 2012-13. This detailed work included finding and monitoring nests and identifying nest predators with nest cameras, recording habitat in occupied and unoccupied woodlands to determine preferences, collecting droppings to look at diet, and recording in great detail numbers of invertebrates available to wood warblers throughout their breeding season. Additionally, adult and young wood warblers were each uniquely colour marked to enable the team to monitor their movements and yearly return rates.

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Jay

Wood warbler

ALGIRDAS-WIKIMEDIA COMMONS

Wood warbler chicks

Nest predation

Nest cameras clearly showed nest predation was mainly by jays, *Garrulus glandarius*, and other birds that locate prey using visual clues, although a long list of predators was identified. Predation was more likely once nests contained young, as nests became easier to find because parent birds made more visits to them to feed their young. Ground nesting birds, like wood warblers, will always have high rates of nest predation, but comparisons of nest predation rates from studies conducted in the 1980s showed no significant change – suggesting increased predation is not a cause of declines.

Invertebrate numbers

In direct comparison with work carried out in the same Welsh woodlands in the 1980s, caterpillar numbers showed declines in some woods, but not all. Differences were small and could simply be due to natural cyclical caterpillar population cycles. The team found wood warblers are able to alter their diet depending on the groups of invertebrate species available, without any apparent cost to the young.

Caterpillar phenology

The availability of different invertebrates changes during the spring, with distinct peaks in availability for short periods of time. This is especially true of caterpillars, an important food source for wood warblers. The mean timing of wood warbler breeding has advanced since the 1980s, but has not kept pace with changes in caterpillar phenology. However, this was not a problem for wood warblers as they altered their diet according to what was available at the time. The young were unaffected by this change in diet, fledging at the same weight regardless of what they were fed. When caterpillars ran out wood warblers switched to flying insects and spiders. So wood warblers are not affected by changes in spring invertebrate phenology.

Woodland structure

Wood warblers prefer woodlands with an open understory and sparse ground flora. Although the structure of many woods has changed since the 1980s, due to altered management and grazing, the data suggested these changes are not significant or widespread enough to explain the observed population decline.

Ecology in Africa and along migration routes

So the research provides no compelling evidence to suggest problems at UK breeding sites for wood warblers. This therefore points to problems along the wood warblers migratory routes or at their wintering grounds. Long distance migrants have shown some of the most significant declines of all UK woodland bird species, with all seven species having declined[3].

Very little is known about the non-breeding ecology of wood warblers or even where exactly the UK population ends up in sub-Saharan Africa. The RSPB 'Birds Without Borders' programme aims to address this and since 2009 staff have been working with African partners.

To date, the RSPB's work has focused on Ghana and Burkina Faso, and has been looking in detail at the habitats used by wood warblers in Africa – very different from the oak woods of the UK. The project has already found some important stop-over sites soon after the desert crossing, and these sites are visited by the same individuals in different years.

Back in the UK, the work now continues in Devon thanks to the support of Devon Birds. Colour ringing continued in 2013 and 2014 in order to look at return rates each year. This will hopefully give some insight into understanding what influences survival when the birds are on migration or in Africa. The RSPB are now in discussion with the Woodland Trust to carry out woodland management and woodland restoration to benefit wood warblers, using the detailed understanding of preferred wood warbler habitat now gathered.

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[1] *RSPB (2014). Ecology of wood warblers. Available online: http://www.rspb.org.uk/whatwedo/projects/details.aspx?id=293774*

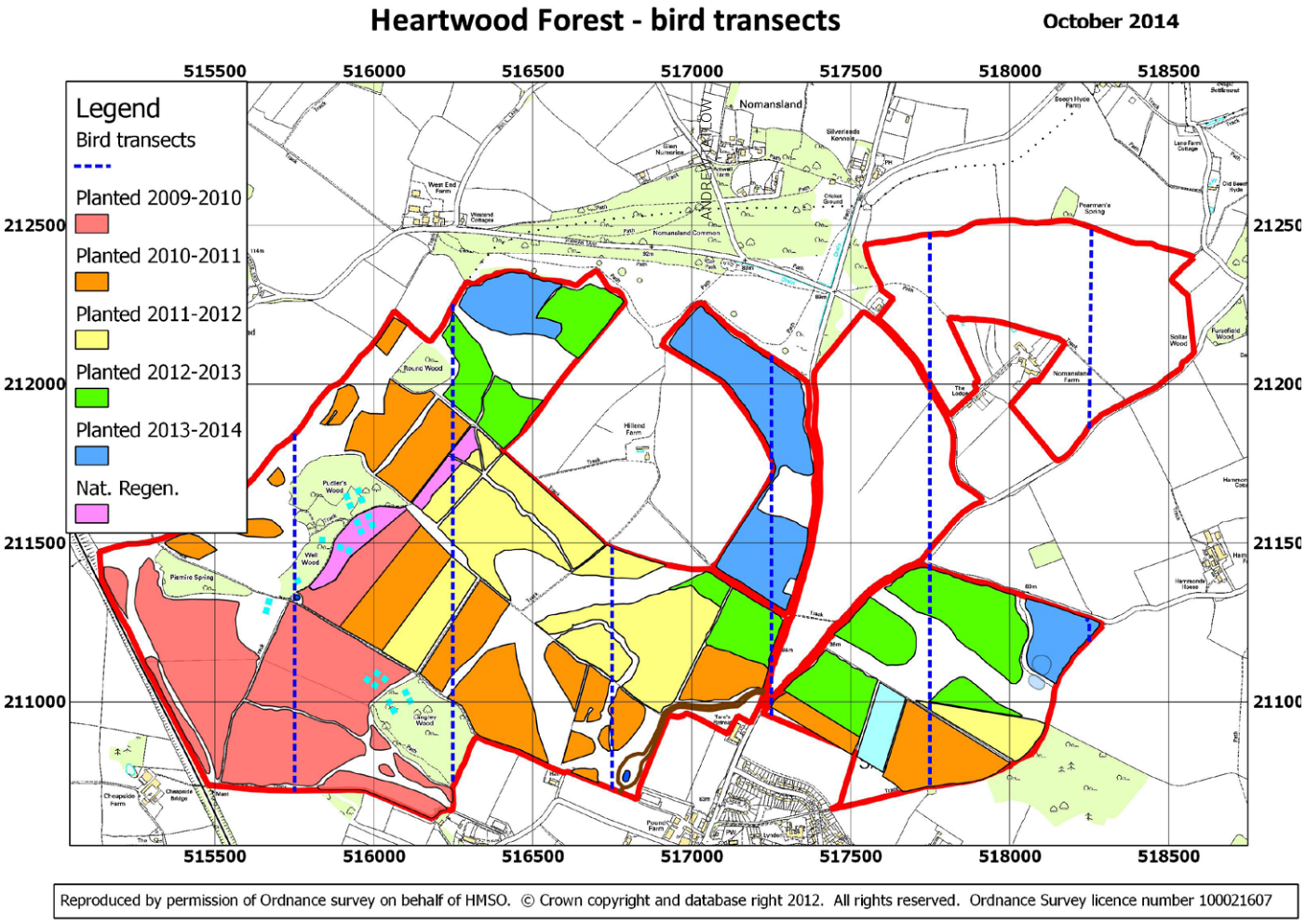
[2] *Mallord, J. W. et. al. (2012). Mortality of Wood Warbler Phylloscopus sibilatrix nests in Welsh Oakwoods: predation rates and the identification of nest predators using miniature nest cameras. Bird Study, 59:286-295*

[3] *Amar, A. et. al. (2005). A re-survey of breeding bird populations of broadleaved and mixed woodlands in 2003-04 to examine changes since the 1960s, 1970s and 1980s and test these changes against a range of hypotheses for their causes. Available online: http://forestry.gov.uk/pdf/rwbs-full-report.pdf/$FILE/rwbs-full-report.pdf*

Woodland creation for bird diversity

Heartwood Forest is a 347 hectare site just north of St Albans in Hertfordshire, in the heart of London's greenbelt. The Woodland Trust is transforming the site into the largest new native forest in England - its most ambitious woodland creation project to date. The aim is to increase biodiversity, protect ancient woodland and engage and inspire thousands of people.

The former agricultural land was intensively farmed for wheat and oilseed rape. Since 2009, this has gradually been replaced with grassland and saplings. With the help of many dedicated volunteers, 600,000 native trees have been planted. The new wooded areas join up the original four patches of ancient woodland on the site. Heartwood's ancient woodland areas are classed as County Wildlife Sites and already support an abundance of plants, mammals, birds,



Heartwood showing the areas planted so far and the bird transect walking route

fungi and insects.

The site now has a rich mosaic of habitats including grassland, wildflower meadows and scrub, which are starting to attract a wide variety of species – including some rare butterflies. A percentage of grassland at the site is regularly cut to maintain a short sward.

Bird monitoring

Volunteers, including Linda and Ken Smith, from the Hertfordshire Natural History Society have been monitoring the site for breeding birds since 2009. A baseline survey was carried out before any planting took place using the Breeding Birds Survey (BBS) method[1]. This standard survey method is used by the British Trust for Ornithology (BTO) and the RSPB.

Surveys took place over two days in early April and early June. A series of walking transects were carried out running from north to south over the site (see diagram), recording all birds seen in each 200m section recorded in three distance bands (0-25m, 25-100m and >100m) from the transect line. Birds in flight were recorded separately. The total length of the transects walked is 6.5km. This has been repeated annually by Ken and Linda, and will be useful for comparing biodiversity at Heartwood to local and national levels.

The total number of species recorded during the surveys has increased steadily from 35 in 2009 to 63 over the period to 2014. The total number of birds recorded each year has also risen steadily from 360 (excluding pigeons) in 2009 to 745 in 2014. This shows that both the diversity and abundance of birds at Heartwood has increased.

Five red-listed bird species have been recorded, including yellowhammers, *Emberiza citrinella*, skylarks, *Alauda arvensis*, (an increase from 70

in April 2009 to 110 in April 2014) and a high number of linnets, *Carduelis cannabina* (all classed as farmland birds). The numbers of species favouring farmland and scrub have increased steadily as the land is taken out of intensive agriculture, see Figure 2.

Barn owls, *Tyto alba*, have been seen hunting from the beginning of the project, particularly over the grassy areas that attract mice and voles. In spring 2012, a barn owl nesting box was erected in a mature hedgerow tree in a newly planted area. A pair nested and six chicks were successfully raised that summer. This went against the trend, as poor weather conditions meant barn owl chick survival was low elsewhere in the area. The site now has nesting boxes for barn owls, tawny owls, *Strix aluco*, and kestrels, *Falco tinnunculus*. In 2011 to 2012 three short-eared owls, *Asio flammeus*, were seen overwintering.

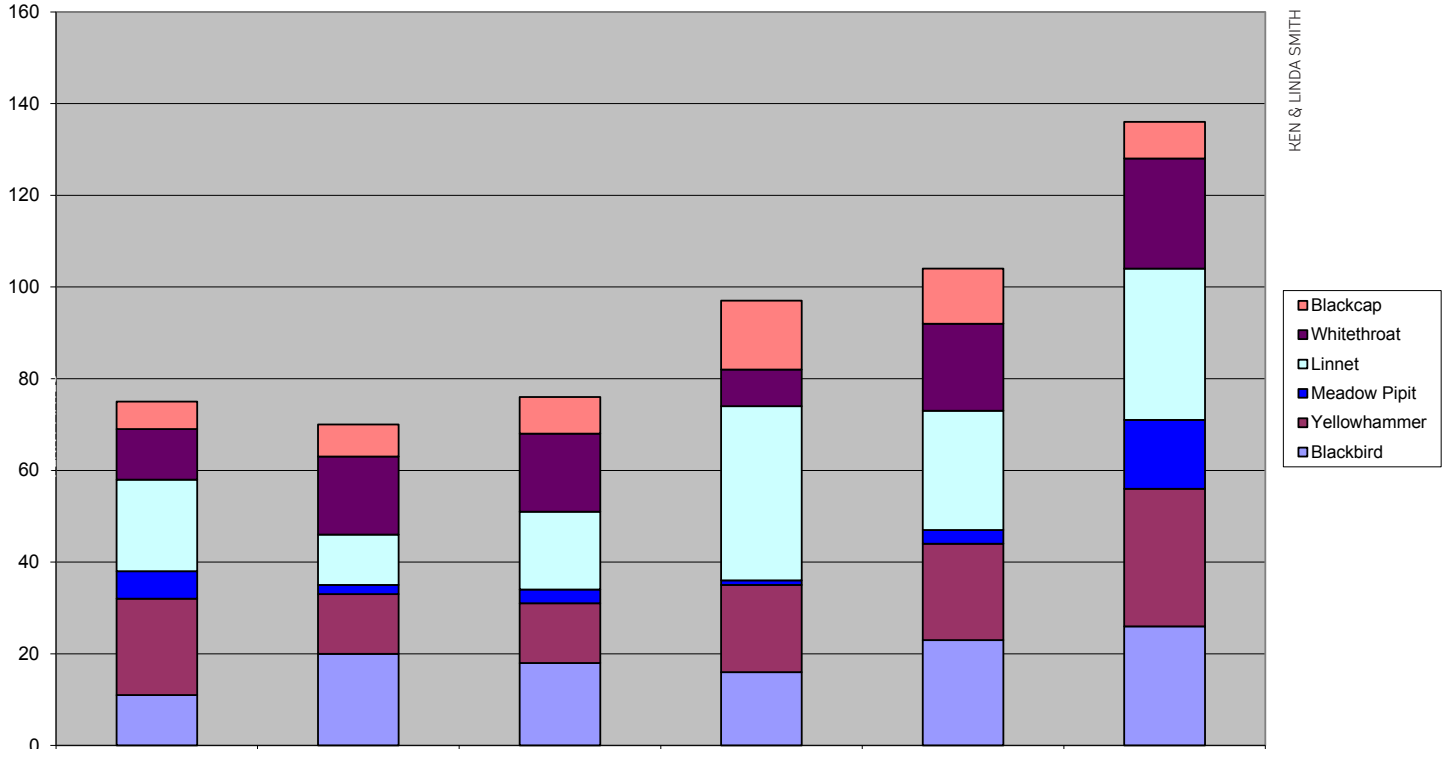
Wintering birds

In November 2013, Ken and Linda started surveying birds in the winter months using the BTO Birdtrack 'complete list' method. This involves walking the same route each month, noting all the birds seen or heard and the time taken. This gives an estimate of the abundance of winter birds and has already shown Heartwood is now one of the best places in Hertfordshire for wintering farmland birds.

Continued monitoring of the site is important to see how wildlife responds as the woodland and other habitats mature. This will contribute towards a growing body of data that shows what effect new woodland has on biodiversity over time.

[1] *Risely K, Noble D G & Baillie S R (2008). The Breeding Bird Survey 2007. BTO Research Report 508, BTO, Thetford*

Figure 2. Heartwood BBS data, the number of birds counted per visit in each year from 2009-2014



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Yellowhammer

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