Wood Wise

FOREST FLORA

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WOODLAND TRUST

QUESTIONING ANCIENT WOODLAND INDICATORS

SURVEYING & RESTORING WOODLAND FLORA

TIME FOR A BUNCE WOODLAND RESURVEY

WOODLAND FLORA FOLKLORE & REMEDIES

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Introduction

Spring is probably the best time to appreciate woodland ground flora. The warming temperatures encourage shoots to burst from bulbs, breaking through the soil to reach the sunlight not yet blocked out by leaves that will soon fill the tree canopy. Their flowers bring colour to break the stark winter and inspire hope in many that see them.

The species of flora covered in this issue are vascular plants found on the woodland floor layer. Vascular plants have specialised tissues within their form that carry water and nutrients around their stems, leaves and other structures, which allow them to grow taller than non-vascular plants.

In the UK, species found on the woodland floor include bluebells, *Hyacinthoides non-scripta*, yellow archangel, *Lamiastrum galeobdolon*, and early purple orchid, *Orchis mascula*. They rely on the early lack of leaves or openness of the canopy to allow sunlight to reach them. They cannot prosper in dense shade and die off as tree leaves burst and expand to capture the light.

In this edition

Certain vascular plants have been used as indicators to assess the ancient status of woods in the UK, to support historical map data and other written records. Researchers from the University of Gloucestershire discuss recent work that has called this system into question.

The issue of bluebell hybridisation and complexities over the classification of natives and non-natives is covered by scientist Deborah Kohn, whose research has informed the Woodland Trust's own work.

The Woodland Trust's Alastair Hotchkiss focuses on the restoration of plantations on ancient woodland sites. Gradual thinning and natural regeneration of native trees can allow sunlight to reach the soil again and enable the return of wildflowers surviving in the seed bank.

The Woodland Survey of Great Britain 1971-2001 recorded a change and loss in broadleaf woodland ground flora species. The driver was thought to be a reduction in the use and management of woods. This finding encouraged an increase in management. Several experts involved look at this and the potential for a future resurvey to analyse the current situation.

Many initiatives strive to protect rare, native pinewood species. Cairngorms Wild Plants Project Officer Gwenda Diack shares some of the work being undertaken in the UK's biggest national park.

The Woodland Trust's Kay Haw reflects on the folklore and medicinal properties inspired through the centuries by the beauty and power of woodland flora.

This edition also has two new sections. The first is a tree health update, as pests and pathogens are serious and immediate threats to the UK's trees and woods. Read about current issues and simple actions you can take to help. There is also an update on three PhD projects supported by the Woodland Trust's evolving research programme; covering soils, ancient trees and social wellbeing.

Please note: external articles do not necessarily reflect the views of the Woodland Trust.

Questioning ancient woodland indicators

Julia C. Webb & Anne E. Goodenough

For years, the presence of certain vascular plants has been used to help classify woodland as ancient, but new research calls this method into question.

The identification and recognition of certain woodland as 'ancient' is vital. All woods can be valuable from a biodiversity perspective, but ancient semi-natural woodland (ASNW) is often especially important for supporting rare or declining species – such as herb Paris, *Paris quadrifolia*, wild daffodil, *Narcissus pseudonarcissus* ssp *pseudonarcissus*, and lesser skullcap, *Scutellaria minor*. Yet they are often highly fragmented and vulnerable. So the classification of woodland as ancient is an important step in informing conservation legislation, planning and land use policies.

In the late 19th century, botanist Francis Buchanan White noted that the oldest pine forests of Scotland supported a range of plant species that were much less common in younger woodland or woodland that had been disturbed. He particularly highlighted twinflower, *Linnaea borealis*, creeping lady's-tresses, *Goodyera repens*, and one-flowered wintergreen, *Moneses uniflora*, as being species that seemed to be associated with older, more established, woodland. Despite this, it was not until the 1970s that George Peterken created a list of species commonly found in ASNW and the UK started to define ASNW based on the presence of particular species.

Ancient woodland indicators

The vascular plant species most commonly associated with ancient woods are now regarded as ancient woodland indicators (AWIs). Within the UK, there are many different AWI lists depending on the floristic conditions of specific regions or counties. Other countries, including many in mainland Europe and the USA, have adopted similar systems based on their own native flora.

All AWIs have a tendency to be intolerant of non-woodland locations, often being shade-loving. They are unable to withstand disturbance, perhaps due to a shallow root base, and are slow to colonise new areas, sometimes by virtue of limited seed dispersal distance. So the presence of such species at a specific site **should** be indicative of that wood being old and undisturbed (ancient) rather than recent, disturbed or interrupted.

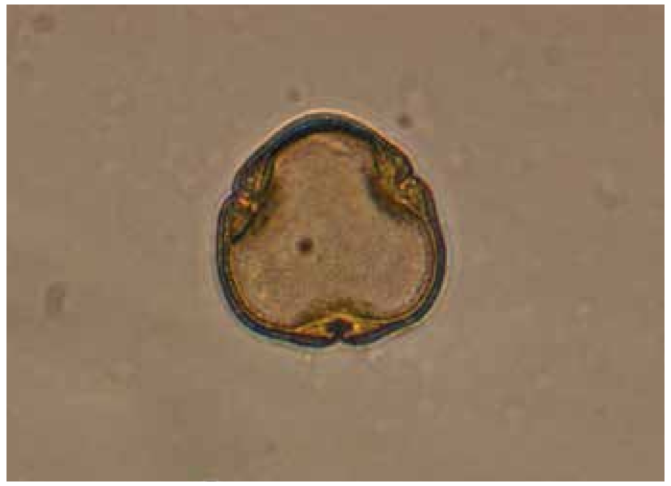
However, surprisingly, many AWIs are much more resilient to woodland interruptions or clearance than previously thought. Is it time to rethink the use of AWIs to classify ASNW?

The current AWI system

In England and Wales, ASNW is classed as an area that has been continually wooded since 1600AD. It is 1750AD in Scotland, due to the oldest, most reliable maps. However, some historical maps do not extend far enough back (with clarity) in most cases, so it can be difficult to prove the ancientness of a woodland. This has resulted in the AWI approach becoming so valuable and common. As it is rare to find good historical maps for multiple ASNW areas, it has proven difficult until now to test or validate the AWI system itself.

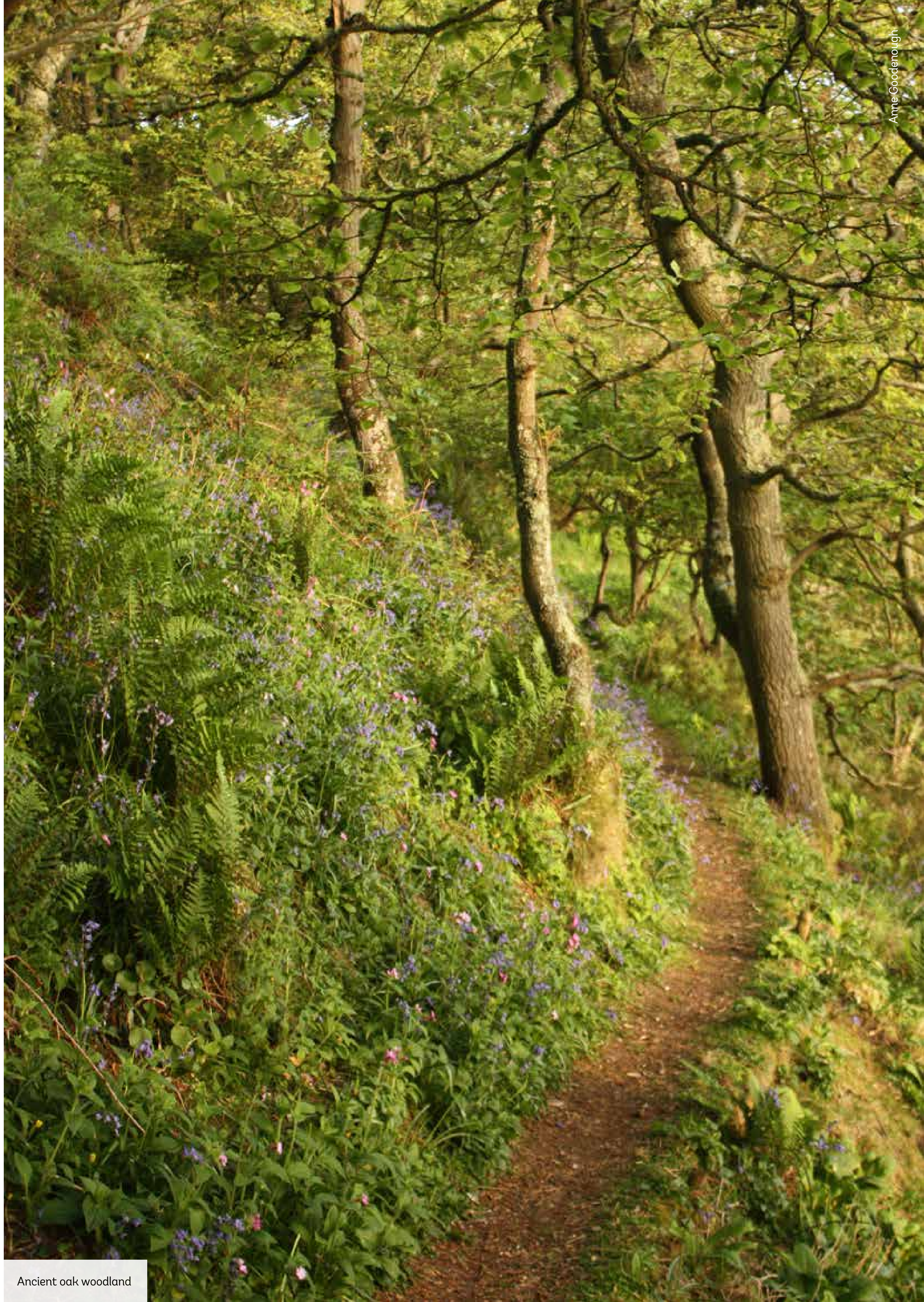
A novel way to assess the age of specific woods without using AWIs is to use fossilised pollen from woodland soil profiles in combination with radiocarbon dating. Analysis of fossilised pollen to reconstruct past environments is well established in open habitats, such as meres and wetlands, lake sediments and ice cores.

However, it has rarely been used in woodland habitats, as only very localised vegetation tends to be represented in the pollen incorporated in the sediments of forest hollows or wet ditches. Soil profiles from these sheltered locations reflect local vegetation rather than the regional pollen signal. This makes them ideal for assessing changing species over time in that specific, developing wood, or changes generated through humans. Woodland age and continuity can be ascertained by considering the species represented and their arboreal or non-arboreal status in relation to radiocarbon dating, which provides a method for establishing the age of the changes recorded in the pollen sequence.



Julia Webb

Small leaved lime pollen under a microscope (0.045mm in diameter).



Anne Goodenough

Ancient oak woodland

Testing the AWI system

In a recent study[1], nine wooded or previously wooded sites were selected to test the AWI system. These sites had detailed pollen profiles and associated radiocarbon dates to allow detailed and objective inferences to be made in their woodland history. The sites were also surveyed for their current flora, particularly those woodland understorey plants that feature on Peterken's[2] and Rackham's[3] AWI lists.

Finding a single AWI species in a woodland does not automatically classify it as ASNW; a number of AWIs need to be present before the site is designated. The requisite number of species varies in different counties; sometimes it is as low as five, such as in Bedfordshire. More commonly, 12-20 AWI species need to be identified before a wood obtains ASNW status.

Of the nine sites studied, analysis of pollen revealed just two had been continuously wooded and four of the sites had interruptions to woodland continuity. The remaining three were not currently wooded and the pollen record revealed these sites had not been recently, as had generally been assumed. Remarkably, all nine sites currently have 12 or more AWIs present, including those that have not been wooded for over 2,000 years.

The study shows that AWIs can not only be extremely resilient to interruptions in woodland continuity, they can also persist for a very long time – approximately 2,800 years in the case of Skomer Island. This highlights the need to review, modify or reimagine our current system for defining and classifying ASNW in the UK.

Proven continuous woodland		Woodland interrupted in last 2000 years				Not currently woodland (last evidence for woodland c.2,500 years ago)		
Derrycunihy Wood Southern Ireland	**Wistman's Wood** Devon	**Garbutt Wood** Northumberland	**Sydlings Copse** Oxfordshire	**Piles Copse** Devon	**Johnny Wood** Cumbria	**Hartlebury Common** Worcestershire	**Gunnister** Sheltand Islands	**Skomer Island** Pembrokeshire
28	34	72	75	12	46	21	20	74

Table 1. Locations and outcomes of woodland history studies, along with the number of ancient woodland indicator species present at those sites.

Next steps

Using pollen analysis to establish the age of woodland and its continuity may be a useful way to classify ASNW, but this approach is not without considerable time and effort. It is unlikely that pollen analysis will become routine in assessing ancient status due to cost and time, especially given that, as with many techniques that use indicators, one of the benefits of the current AWI system is the speed with which assessments can be carried out.

One possible way forward would be to develop AWI lists further. In the early 2000s, Rackham[3] denoted a subset of AWIs as being strictly or strongly associated with ASNW. A numerical system could be introduced so particular species, such as greater stitchwort, *Stellaria holostea*, and valerian, *Valeriana officinalis*, which were never found on cleared sites, could have a higher weighting. AWI species such as ramsons, *Allium ursinum*, opposite-leaved golden saxifrage, *Chrysosplenium oppositifolium*, and bluebells, *Hyacinthoides non-scripta*, would have a lower weighting, as they can be important but can often be found in non-woodland settings too.

Consideration might also be given to defining or redefining the minimum number of species needed for a site to be regarded as ASNW. This could be a relative threshold, by site size, or percentage of total number of species present, or by incorporating species into a system that are 'reverse indicators' of ancientness – those species very tolerant of disturbance and often found in young woods, such as foxglove, *Digitalis purpurea.*

Another way to strengthen the usability of the AWI system would be to incorporate other organisms (taxa) into it. This may mean that lichens, fungi and beetles, which have previously been used in isolation as AWIs, could be incorporated into a super-system that might give the greatest precision when classifying woodland.

Fundamentally, the aim of conservationists using woodland indicator species is to preserve ASNW for its unique biodiversity. This new research does not aim to prevent ASNW being classified, but it does seek to encourage practitioners to adopt new classification systems to further promote the success of these rich and diverse environments.

Professor Anne Goodenough is Professor of Applied Ecology at the University of Gloucestershire.

Julia Webb is Senior Lecturer and Course Leader of the Biosciences programmes at University of Gloucestershire.

1. Webb, J.C and Goodenough, A.E. 2018. Questioning the reliability of "ancient" woodland indicators: Resilience to interruptions and persistence following deforestation. *Ecological Indicators, 84 354 – 363.*

2. Peterken, G.F., 1974. A method of assessing woodland flora for conservation using indicator species. *Biological Conservation*, 6, 239-245.

3. Rackham, O., 2003. *Ancient woodland: Its history, vegetation and uses in England* (revised edition). Castlepoint Press, Dumfries.

Anne Goodenough

Lesser celandine and wood anemone are both AWI species

Trouble for bluebells?

Deborah Kohn

Until a couple of decades ago, to walk in a bluebell wood was simply to be immersed in one of spring's greatest delights and enjoy one of nature's most extraordinary scenes. These days our appreciation might be tainted by a hint of uncertainty – are these all native bluebells?

The native British or English bluebell, *Hyacinthoides non-scripta*, has a range that extends from the UK into northern Europe (France, Netherlands, Belgium) and south along the Atlantic coast into northwestern Spain. There it meets, and is replaced by, a sister species, *H. hispanica*, that ranges through the western part of the Iberian Peninsula in Spain and Portugal.

These two species are closely related and in the past have been considered either to be subspecies of a single species, or *H. hispanica* a subspecies of *H. non-scripta*. *H. hispanica* was introduced into Britain in the late 1600s as an ornamental plant. The first UK hybrid between the British *H. non-scripta* and the Iberian *H. hispanica* was recorded in the wild in 1963. But the presence and particular look of a garden escape were not of great interest to recorders of wildflowers until relatively recently.

Rising concern

The idea that our bluebells might have a problem seems to have started around 1973, when a brief note suggesting that 'Spanish' and hybrid bluebells were under-recorded appeared in the May newsletter of the Botanical Society of the British Isles (BSBI). Attention to this idea heightened in 1987 with a succinct and influential letter to the BSBI newsletter, asserting that garden bluebells consisted mainly of hybrids between the British and Spanish bluebell species.

By 2001, people like Germaine Greer were making a stand for native bluebells in the national press, pointing out that commercial bulbs were more likely to be 'Spanish' than English despite their labelling. Articles followed trumpeting the 'death knell' of the English bluebell, and alarm grew with awareness. The general sense was that what damage the sturdier, more vigorous 'Spanish invader' did not wreak directly on the gentle native by muscling it out of its traditional habitats, cross-pollination would finish off.

It was not difficult to see where the concern was coming from. Knowledgeable people were reporting new prevalence of garden-type bluebells, including amongst natives in broadleaf woodland, the beloved native bluebell's most secure stronghold. *Plantlife* published the results of its volunteer survey and the alarming observation that one-quarter of the 4,500 records amassed, which could be anything from a smattering to a vast woodland carpet, were not entirely native.

It also reported that 16% of all submitted records associated with broadleaf woodland habitat were Spanish or mixtures of Spanish and native bluebells. UK distribution maps show coast-to-coast presence attributed to both *H. hispanica* and the English-Spanish hybrid, known as *H.* x *massartiana*, within the 10km^2 sampling unit.

A non-native showing upright habit, short flowers, but curly flower tips and white pollen

An upright native in Wales

White non-natives

Quantifying the threat

The Royal Botanic Garden Edinburgh (RBGE) and Centre for Ecology and Hydrology (CEH) began investigating the threat to natives posed by non-native introduced bluebells in 2004. The Natural History Museum London was already involved in an analysis of relationships among species in the genus *Hyacinthoides* from the UK to the western Mediterranean and North Africa.

To understand what was happening with our native, we first needed a detailed account of how bluebells were distributed in the UK landscape: a snapshot that would guide inferences about habitat preferences of the different types, and perhaps suggest the processes behind the apparently rapid spread of non-natives. We needed to quantify their current prevalence in order to understand what the future might hold.

We began to collect data on bluebells in the field, looking for the distinctive features of *H. non-scripta* and *H. hispanica* to identify flowers as native, non-native or hybrids. Our first surprise was that instead of finding *H. non-scripta* and *H. hispanica* and an intermediate between them, we found a continuum of flower and plant shapes from typical natives to distinctly not native.

The specific characteristics of native plants (tubular flowers, drooping flower head and white pollen) and characteristics supposedly diagnostic of non-natives (blue pollen and no scent) did not hold up. Pollen colour was overwhelmingly white or cream, not blue (75% of all bluebells examined, including over 50% of non-natives) and most flowers (59%) had some sweet scent, while 33% of natives and 48% of non-natives seemed to have none.

White native

Other characteristics turned out to be matters of degree. Flowers ranged from tubular to bell-shaped, with tips from tightly curled to relaxed, and leaf widths from narrow (< 1 cm) to broad (2+ cm) in smooth continua. Furthermore, the distinguishing characteristics were jumbled, not clustered into distinct types. We saw native flowers arranged on all sides of upright stems or with ultra-wide leaves, and shorter, more bell-shaped flowers with creamy pollen on drooping stems.

In a final twist, we noticed flower characteristics changing over time, the inflorescences becoming upright and flowers wider as fruit developed. We found few examples of plants that could conclusively be assigned to the species *H. hispanica*.

Native with some confusing characteristics

Subtly non-native

Stripey native

Early conclusions

We did learn that natives are far more abundant than non-natives, but at a random point on the map you are slightly more likely to encounter non-natives than natives. This is because the non-natives are more evenly distributed in small groups throughout the landscape and more abundant in built habitat defined by human activities, while natives concentrate their great numbers in a few more preferred habitat types. Theoretically, these small clusters of non-natives have the ability to spread pollen to natives within distances that their pollinators can fly, usually taken to be 1-3km.

White and pink natives are rare and petals can be striped where frost has nipped a closed bud. Natives are more common and dense in the warmer, wetter west of the UK (at least in Scotland) than the drier, colder east where non-natives are more common. However, the wide distribution of natives across the UK attests to both the suitability of the UK's climate generally and to their colonisation of all suitable habitats over the 10,000 years since the last glaciation. The non-native bluebells have had comparatively little time, just over 300 years, to adapt and find their way around the UK.

What do we make then of earlier records showing roughly equal representation of *H. hispanica* and the *H.* x *massartiana* hybrid across the UK? Was it *H. hispanica* that jumped (or was pushed) over the garden wall and established itself through the landscape, hybridising with natives as it went? That could be part of the story, and there may be *H. hispanica* individuals still out there beyond our surveyed areas in south-central Scotland.

We can be sure that commercially developed varieties, not *H. hispanica* but hybrids, were planted by bluebell-loving gardeners. Dozens of bluebell varieties called 'Spanish' or '*H. hispanica*', and fewer called '*H. non-scripta*', were commercially available for decades. The 'Spanish' varieties appealed for their range of colours, height and many flowers, and are still in evidence. These garden types were also discarded, composted and guerilla-introduced into woodlands and riverbanks, often in the mistaken belief that they were native bluebell start-ups.

This casual naming of cultivars is the source of the idea that the non-native bluebells increasingly seen outside gardens were *H. hispanica*. Common names can confuse – the name 'bluebells' itself refers to different species in different places. While 'Spanish' used to serve as the common name for *H. hispanica*, the UK non-native looks very different from *H. hispanica*. If we do call them 'Spanish', we should be careful to distinguish between these naturalised plants and the species that was probably one of their ancestors.

Future work

It has proved a slow process to study bluebells, and some of our initial approaches needed swift revision. Individual plants cannot be tagged and followed over consecutive years, because the whole above-ground plant disappears from September to February. Flowers are essential for identification, restricting survey work to a few weeks of the year during the bloom. And spread of existing groups is far from rapid – a survey of *H. non-scripta* transplanted 45 years earlier into woodland in Belgium showed that in the 41% of populations that survived, the expansion rate from the point of introduction was no more than 0.06 metres per year.

Finding identification tricky pushed our research in new directions. Experimental pollen transfer between plants will tell us whether hybridisation is really as ready and bi-directional as has been assumed. Monitoring over several years how natives and non-natives live, grow and reproduce in common gardens in a range of climate zones will give us an idea whether the non-natives really are more vigorous, and whether changing rainfall or temperatures could influence competitiveness for the better or worse of the native species.

Molecular methods will refine our understanding of what makes a native (besides its fleeting appearance), reveal where in the *H. hispanica* range the Spanish element in UK bluebells comes from, and show whether and where non-native DNA has infiltrated native populations. As with all good research questions, the more we learn the more questions arise. The work goes on, as do - we hope - our native bluebells.

Dr Deborah Kohn is a research associate at Royal Botanic Garden Edinburgh and recipient of a Daphne Jackson Fellowship funded by the Natural Environment Research Council 2004-2007.

Chicken, E. 1973. *BSBI News*, Vol 2 No 2, Letter to the Editor, page 38.

Grundmann, M. et al. 2010. Phylogeny and taxonomy of the bluebell genus *Hyacinthoides*, Asparagaceae [Hyacinthaceae]. *Taxon* 59, 68–82.

Kohn, DD et al. 2009. Are native bluebells (*Hyacinthoides non-scripta*) at risk from alien congenerics? Evidence from distributions and co-occurrence in Scotland. *Biological Conservation* 142, 61-74.

Page, KW 1987. Hybrid Bluebells. *BSBI News* 46, page 9.

Pilgrim, E. & Hutchinson, N. 2004. Bluebells for Britain. Plantlife.

Van der Veken, S. et al. 2007. Over the (range) edge: a 45-year transplant experiment with the perennial forest herb *Hyacinthoides non-scripta*. *Journal of Ecology* 95, 343-351.

The world beneath your feet:

the role of ground flora in the restoration of ancient woodland sites.

Alastair Hotchkiss

Around 50% of the UK's ancient woodland has been damaged, having been cleared and replanted with dense non-native conifers and broadleaves. Restoration of these 'plantations on ancient woodland sites' (PAWS) is possible, and a rich diverse woodland flora can thrive again.

Whilst non-native plantations on ancient woodland sites lack the canopy of trees found in native ancient semi-natural woodland, they usually still contain remnants of ancient woodland specialist plants that are clinging on in the darkness. Time is of the essence to restore these sites before these features are lost forever.

Without pre-plantation survey data, it is difficult to say with any confidence what was in existence prior to the plantation. However, clues do persist and these are referred to as remnant features. They provide an unbroken link back to what stood before and act as the foundation for restoration management. Woodland specialist plants (or ancient woodland indicator species) may still survive in plantations on ancient woodland sites and are easy to identify; thus they are used as part of the Woodland Trust's PAWS assessment process.

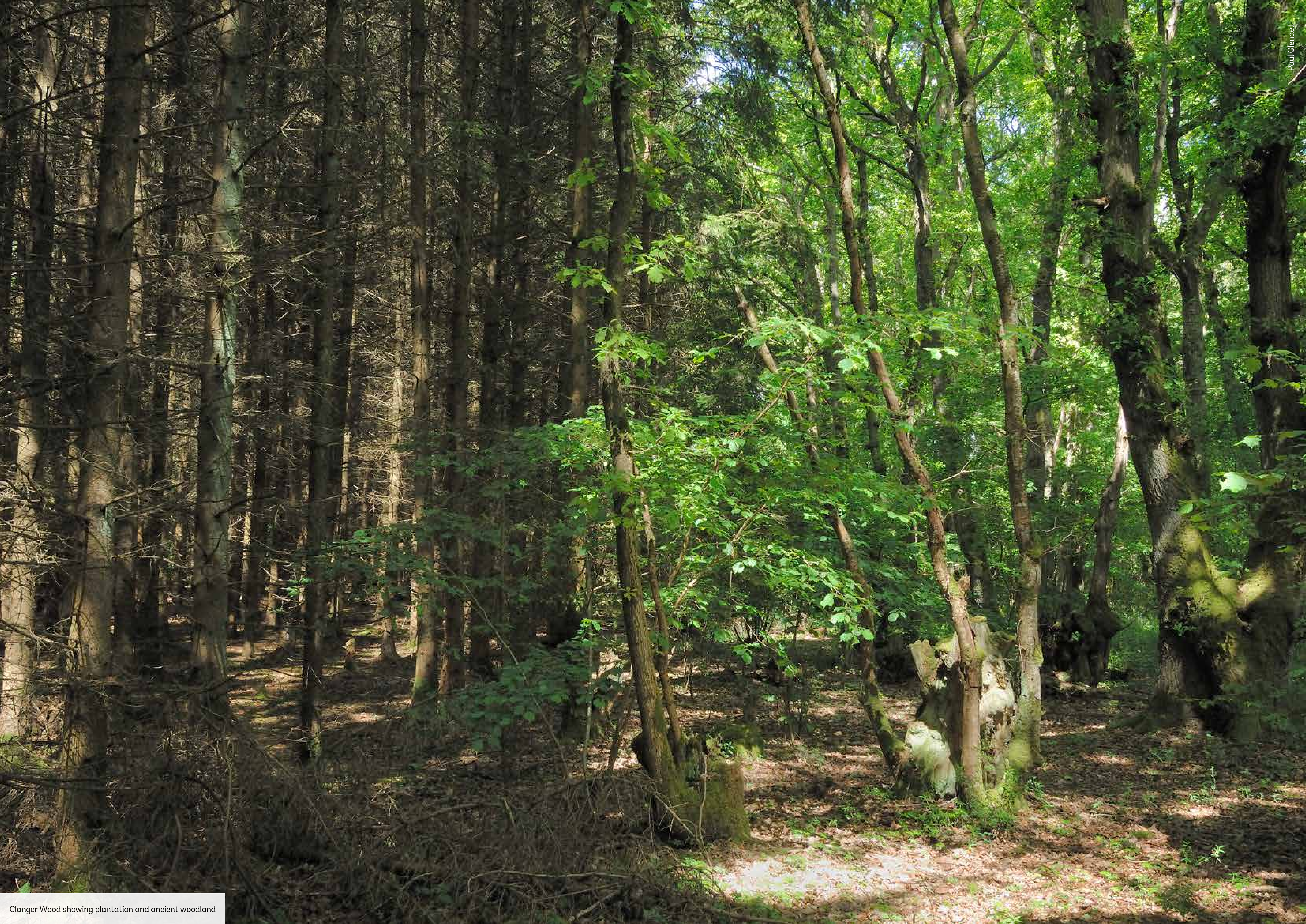
'Hotspots' or concentrations of remnant ancient woodland specialist plants are mapped and identified as features in need of management to enhance them, such as when heavily shaded by plantation trees or invasive species. They are also identified to avoid damage and destruction during harvesting operations, being smothered in brash, track construction or impacted by compaction.

Woodland specialist plants

The ground flora of our woodland varies greatly across the UK, determined by underlying geology, soil types and land use history among other factors. Plants help to distinguish and characterise the regional distinctiveness of our ancient woodlands, from the oxlip, *Primula elatior*, woodlands of East Anglia, to the twinflower, *Linnaea borealis*, of Caledonian pinewoods, and all the assortments of different plants which combine into locally distinctive communities.

This regional and local variation is an important consideration in assessing PAWS. Some indicator species can tolerate the shady conditions in conifer plantations, for example wood sorrel, *Oxalis acetosella*, is often abundant in dark Sitka spruce plantations, and may actually be taking advantage of these situations. There is great variation from species that tolerate deep shade to those that flourish in dappled sunlight or exposure to the full sun. Not all ancient woodland would naturally have a rich ground flora. Some ancient beech woods have a very poor ground flora, but have a richness of fungal and insect life associated with the trees themselves, especially when they are dead or decaying.

Rich ground flora of ancient woodland specialists


Paul Glendell

Clanger Wood showing plantation and ancient woodland

Critical Streamside with tutsan, marsh hawks beard, sanicle, scaly male fern, garlic, ash, wych elm and rowan

Ground flora hotspot in PAWS with bluebell and archangel where light reaches

Wild garlic hoverfly *Portevinia maculata*

Shady beech, *Fagus sylvatica*, woods have their own specialist plants such as yellow birds-nest, *Monotropa hypopitys*, and the similar sounding birds-nest orchid, *Neottia nidus-avis* - a saprophyte, meaning it lives on dead or decaying organic matter, in the deep humus of densely shaded *Fagus* woods on chalky soils. The critically endangered ghost orchid, *Epipogium aphyllum*, is another saprophytic herb which grows in deep leaf-litter in *Fagus* woods on chalk, with little or no associated ground flora. However, outside the range of ancient native beech woods, the shade and leaf litter from dense beech PAWS can create unfavourable conditions for the remnant native ancient woodland ground vegetation.

Another contrast to the classic spring flower woodland of the lowlands is our more acidic woodland on poorer soils or upland regions. For example, our oceanic oakwoods can sometimes be a lush carpet of mosses and liverworts (bryophytes), with greater fork-moss, *Dicranum majus*, little shaggy-moss, *Rhytidiadelphus loreus*, greater whipwort, *Bazzania trilobata*, and a whole host of scarce and rare species associated with these humid woods. Some other ancient woods can be dominated by grasses or ferns, such as birch woods dominated by wavy hair-grass, *Deschampsia flexuosa*, or bracken, *Pteridium aquilinum*, in some of our oak and beech woodland on more acidic brown soils.

Understanding remnant features as proxies

Ancient woodland ground flora supports a much wider host of ancient woodland specialist species. For example, patches of wild garlic, *Allium ursinum*, can support the wild garlic hoverfly, *Portevinia maculata*, whose larvae develop only in the bulbs and stem-bases of this plant. The drab looper, *Minoa murinata*, is one of our few day-flying moths and depends on populations of its food plant wood-spurge, *Euphorbia amygdaloides*. These are just two examples from the thousands of plant-insect interactions. Pre-plantation and relic native broadleaves could retain old woodland lichens like the barnacle lichen, *Thelotrema lepadinum*, and oak stumps or pre-plantation lying oak deadwood could support numerous saproxylic invertebrates associated with decaying wood.

The ancient woodland soil is a significant refuge of remnant biological diversity and richness. Many species of ancient woodland specialist flora have an ability to respond from a seedbank, if conditions become suitable. Generally it is those plants with very small seeds that are most long lived, and Rackham's (2003) example of Chalkney Wood in Essex demonstrates how restored PAWS stands resulted in regeneration from the seed bank of numerous ancient woodland plants, such as red campion, *Silene dioica*, remote sedge, *Carex remota*, yellow pimpernel, *Lysimachia nemorum*, wood sedge, *Carex sylvatica*, hairy wood-rush, *Luzula pilosa*, figwort, *Scrophularia nodosa*, wild strawberry, *Fragaria vesca* and barren strawberry, *Potentilla sterilis*.

Ecological restoration from the seedbank is not always straightforward though and the recent paper by MacLean et al (2017) highlighted how sometimes an 'alternate stable state' can occur. They found that semi-natural native communities may be unable to recover effectively of their own accord following invasive species removal, and may require further management interventions in order to achieve restoration. In this case, oakwoods in Scotland were cleared of invasive *Rhododendron ponticum*, but showed no evidence of returning to the target community, even after 30 years of recovery. Instead they formed a closed novel bryophyte-dominated community, containing few of the typical oak woodland vascular plants

Ancient woodland restoration

Although it varies between species, many of our native woodland plants need a certain level of light. The dappled sunlight that filters through a canopy of broadleaved trees is often ideal. Too little light, like that found under the canopy of dense conifer trees in PAWS, and these species decline. Too much light, however, can shock native ground flora species and often creates conditions that are ideal for coarse vegetation such as brambles and bracken to dominate, suppressing the regeneration of other plants.

Additionally, the impact of the plantations on the ground flora varies between tree species planted. Although it depends a lot on density and thinning history, certain conifer species such as western hemlock and western red cedar, or broadleaves in the wrong places, such as some beech PAWS, can be most impactful, whereas others such as pines and larch may have retained more elements of the native ancient woodland ground flora. Unfortunately, the disease *Phythopthera ramorum* has resulted in the clearfelling of many larch plantations which are now being restocked with spruce and Douglas fir. This will ultimately result in declining condition and loss of any remnant ground flora that survived under the larch.

The Woodland Trust's favoured approach to the restoration of ancient woodland involves the gradual and selective thinning of the existing conifer canopy over many years, to slowly allow light levels to increase without shocking the existing remnant features. Brown et al (2015) found that the loss of specialist woodland plant species was strongly correlated with the degree of canopy opening. Their research suggested that a careful assessment and prioritisation of conservation values is needed before restoration, and that rapid removal of an exotic species may have an adverse effect on subsequent succession.

Alastair Hotchkiss is the Woodland Trust's conservation adviser for ancient woodland, with an expertise in restoration and an interest in space and time in nature.

Brown et al (2015) Effects of clear-felling versus gradual removal of conifer trees on the survival of understorey plants during the restoration of ancient woodlands. *Forest Ecology and Management* 348 (2015) 15–22.

Glaves, P., Rotherham, I.D., Wright, B., Handley, C., & Birbeck, J. (2009) A Report to the Woodland Trust: A Survey of the Coverage, Use, and Application of Ancient Woodland Indicator Lists in the UK. Available via core.ac.uk/display/4149223

Hotchkiss and Harper (2016) Guide to Ancient Woodland Indicator Plants – Field Studies Council - http://www.field-studies-council.org/publications/pubs/ancient-woodland-indicator-plants.aspx

MacLean et al (2016) Understorey plant community composition reflects invasion history decades after invasive Rhododendron has been removed. *J Appl Ecol.* 2017;1–11.

Rackham (2003) Ancient Woodland: its history, vegetation and uses in England. Castlepoint Press.

The Woodland Trust has just published the second module of our Practical Guidance series on ancient woodland restoration. This module covers the survey and assessment process for plantations on ancient woodland sites and can be downloaded from the publications section of the website - **woodlandtrust.org.uk/publications.**

Time for a Bunce resurvey

Simon Smart, Sian Atkinson, Robert Bunce & Claire Wood

There is an old saying that the best time to plant a tree was 20 years ago, and the next best time is now. The same could be said of surveys and monitoring.

Conservationists are sometimes so focused on action that the importance of measuring the difference it makes is overlooked. Alternatively, conditions change, sometimes rapidly, as with tree disease, or more slowly, as with climate change, and there is a need for long-term data to fully understand the impact on nature, which is often not available.

As the natural world faces multiplying threats and challenges, the value of long-term datasets to help understand and mitigate these issues increases rapidly. One long term survey is the 'Bunce survey' of woodlands, named after Professor Robert Bunce who originally ran it in 1971. It was groundbreaking, setting out a robust methodology for surveying soils and vegetation (understorey and canopy) and providing a baseline for tracking change in British woodland.

Building on the knowledge base

The Woodland Trust and Centre for Ecology and Hydrology, aided by Professor Bunce, hope to repeat this survey over the next few years with the support of a number of other organisations. The time is ripe. The UK's woods are suffering the impacts of increasing numbers of new pests and diseases, inappropriate levels of grazing and browsing, climate change, nitrogen deposition, and improper use or management.

A survey of vegetation and soils can tell us a great deal about a wood and its direction of travel. Vegetation responds to changes in light levels, soil pH, hydrology, and the activities of other species, which are in turn affected by wider environmental drivers, both natural and man-made, and by the management regime adopted for the wood itself.

In 1971, the original Bunce survey focused on 103 broadleaved woods across Britain (Fig. 1), and 26 native pinewoods in Scotland. These sites were drawn from a larger survey carried out in the 1960s for the Nature Conservation Review. They were therefore mainly ancient semi-natural woodlands (ASNW) and so reflect the state of woods of conservation interest.

The broadleaved woodland survey was repeated during 2000-2003 (the '2001 survey'). Comparing the 1971 and 2001 surveys showed the woods were becoming increasingly homogenised in species composition and structure, with a decline in woodland specialist plants, and reduced regeneration of trees and shrubs. Change was correlated with increased shade and an increase in soil fertility, thought to be due to nitrogen deposition, lack of active management, and climate change[1].

It is more than 45 years since the original surveys and 15 years since the broadleaved woods repeat survey. The pinewoods have yet to be resurveyed. Since then the urgency to understand the changes in woods has increased. Factors identified in the original surveys are thought to be creating greater pressure on woods, while others bring new pressures – particularly grazing, browsing, and the impacts of tree disease, such as Chalara ash dieback.

Many of the pinewood sites were altered through commercial planting, although some are now being restored. These important sites form the core of the remaining Caledonian pinewoods dominated by native Scots pine, *Pinus sylvestris*[2].

Changes in ground flora between 1971 and 2001

A comparison of the two broadleaf surveys showed a striking loss of around eight plant species per $200m^2$ plot. The woods had 16 survey plots per site. The results differed slightly between upland woods, with a mean loss of seven species, and lowland woods, with a mean loss of 10 species. Sites of Special Scientific and ASNW sites showed the same loss of nine species per plot[3].

Further analysis showed the most likely cause of the decline to be increased shading from a canopy that had previously been more open. Between the two surveys, most woodland canopies aged and signs of managed disturbance declined. Older stems were more common in 2001, replacing cohorts of younger trees.

As trees and their canopies grow they cast more shade, preventing light reaching the lower levels. This led to a dramatic reduction in understorey species richness because the ageing trend occurred strongly across such a large proportion of the sites. Hence many woods in the sample started with young and sparse distributions of stems, leading to a higher diversity of understorey species because light, a key limiting resource, was more available at ground level.

The most likely driver of this change is believed to be widespread removal of timber during and shortly after the Second World War. The 1971 survey may have coincided with unusually open canopies and species-rich understoreys that were still recovering from a widespread episode of major woodland disturbance (Fig. 2).

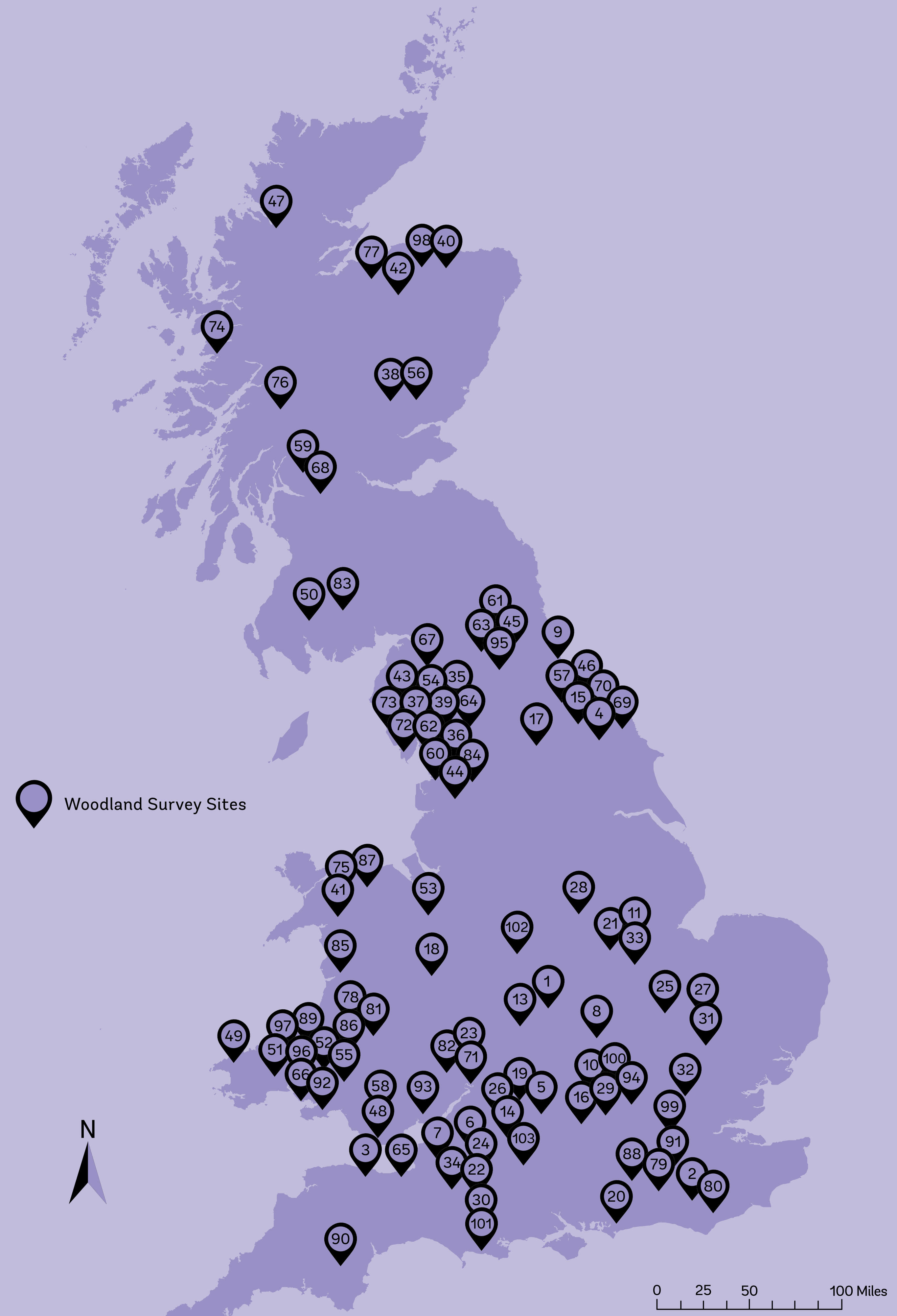


Figure 1: Broadleaved woodland survey sites

This assumption is still unproven and is eminently suitable for further research. Regardless of the drivers, the unusually open nature of the woods in 1971 suggests the subsequent species loss should perhaps also be considered as highly unusual.

A reduction in active management within the woods was another contributor to the increase in shade. Surveyors noted long-neglected coppice stools at 23 sites and no signs of recent management at 68 sites. Closure of the woodland canopy was associated with an increase in saplings of shade-tolerant species, such as beech, *Fagus sylvatica*, yew, *Taxus baccata*, and holly, *Ilex aquifolium*. These all increased despite increased signs of deer grazing[1].

Among vascular plants, woodland specialists showed the biggest decline. However, shade-tolerant species, such as ramsons, *Allium ursinum*, bluebell, *Hyacinthoides non-scripta*, broad buckler-fern, *Dryopteris dilatata*, and wood speedwell, *Veronica montana*, increased in cover as they are able to tolerate the lower light levels caused by the denser canopies. In turn, numerous open ground species declined in frequency[3].

The causal link between shading, canopy closure and reduction in understorey plant species richness was also supported by studying the impact of the Great Storm of 1987. This devastating event caused major canopy disturbance and the loss of 15 million trees across south east England. Ten of the Bunce survey sites were affected and these all bucked the national trend. The increased levels of light from loss of trees and branches in these woods caused understorey species richness to increase by 32% between 1971 and 2001[4].

Importance of understorey species richness

Flowering plants are undoubtedly an attractive feature of the woodland environment. Aside from the simple aesthetic pleasure they bring, flowers help make broadleaved woodland the second-most important source of potential nectar provision in Britain, with calcareous grasslands taking pole position[5].

While many nectar-producers are trees and shrubs, sufficient light is also needed for understorey plants to produce flowers and nectar. Light availability for the understorey is greater in canopy gaps and along paths and rides. Dependent on the sun's warmth, foraging invertebrates are also better able to access flowers in such places.

Figure 2: Devastated woodland. The best stems of oak and sweet chestnut have been felled, leaving only small and crooked trees, too sparse to form a crop.

Woodlands, especially in the lowlands of Britain, provide a refuge for many species that were previously more common in the wider countryside. While the plant species that declined between 1971 and 2001 were more likely to be woodland specialists, they also included plants broadly associated with lower fertility and grazing pressure that were not necessarily restricted to woodland habitats.

Many ancient woodland indicator plants are not as shade tolerant as one might expect[6]. The specialist shade tolerators are just a subset of the many species associated with long-continuity woodland. In the lowlands of Britain many herbs that contribute to woodland plant diversity do not necessarily prefer woods because they are 'ancient'. Rather a varied woodland environment provides more preferable habitat to the surrounding farmland that is often artificially fertile and intensively managed.

Resurveying to build the current picture

Repeating the Bunce survey would provide a vital update to a story that goes back to at least the 1940s, when timber removal was high and is thought to have created open woods. Since 2001, deer grazing pressure and nitrogen deposition have remained high in many places, while sulphur deposition has greatly decreased since the 1970s.

Many woods are still embedded in the agricultural factory floor of the British countryside, where intensive land use prevails. In other places the matrix surrounding woods is more naturally benign or ought to have been made so by nearly 40 years of agri-environment scheme funding. A resurvey would provide a vital update on the impact of these various drivers, especially pertinent at a time when agricultural policy could change drastically due to Brexit.

It could also provide new evidence to show the efficacy of woodland management in the face of wider landscape scale influence. It offers the opportunity to answer key questions that may help shape the future of landscape management:

- Has soil pH continued to increase in response to reduced sulphur load? Has this favoured more nutrient-demanding species in managed woodland gaps, especially in areas where nitrogen loads remain high and where adjacent land use intensity is high?
- Has managed intervention created beneficial gap dynamics at some sites and how many sites remain unmanaged?
- At unmanaged sites, has understorey richness stabilised or continued to decline, and have shade tolerators continued to increase, perhaps helping to offset the loss of open ground species seen between 1971 and 2001?
- Have succession and canopy closure reduced the signs of deer grazing pressure?
- And the big question, how is climate change affecting our precious woods?

These are only a smattering of the issues that can be addressed by a timely resurvey of the Bunce woodland sites across Britain. The possibility of major changes in land use post-Brexit makes this a timely moment to revisit and reassess the status of Britain's woods, and understand their needs for the future.

Dr Simon Smart is a botanist and ecologist based at CEH Lancaster.

Sian Atkinson works in the Woodland Trust's northern operations team and has a particular interest in ancient woodland ecology and history.

Professor Robert Bunce worked at Merlewood Research Station for 34 years, initially working on woodlands and later developing the GB Countryside Survey. He is now Professor of Environmental Science in Tartu, Estonia.

Claire Wood is a member of the Land Use research group at CEH Lancaster, specialising in GIS and data management.

1. Kirby, K.J., Smart, S.M., Black, H.I.J., Bunce, R.G.H., Corney, P.M. & Smithers, R.J. (2005a) Long-Term Ecological Changes in British Broadleaved Woodland 1971-2002. English Nature, Research Report. 653, part 1. Peterborough, UK. http://publications.naturalengland.org.uk/publication/94019?category=550043

2. Steven, H.M., Carlisle, A. (1959) The native pinewoods of Scotland. Edinburgh: Oliver and Boyd.

3. Kirby, K.J., Smart, S.M., Black, H.I.J., Bunce, R.G.H., Corney, P.M. & Smithers, R.J. (2005b) Long-Term Ecological Changes in British Broadleaved Woodland 1971-2002. Appendices. English Nature, Research Report. 653, part 2. Peterborough, UK. http://publications.naturalengland.org.uk/publication/94019?category=550043

4. Smart, SM et al. (2014) Quantifying the impact of an extreme climate event on species diversity in fragmented temperate forests: the effect of the October 1987 storms on British broadleaved woodlands. *Journal of Ecology 102*, 1273-1287

5. Baude, M., Kunin, W.E., Boatman, N.D., Conyers, S., Davies, N., Gillespie, M.A.K., Morton, R.D., Smart, S.M & Memmott, J. (2016) Historical assessment of change in nectar provision across Britain. *Nature*, 530: 85-88

6. Kimberley, A., et al. (2013) Identifying the trait syndromes of conservation indicator species: how distinct are British ancient woodland indicator plants from other woodland species? *Applied Vegetation Science* 16, 667-675

WTML

Wild plants of the Cairngorms

Gwenda Diack

Twinflower, *Linnaea borealis*

The Cairngorms National Park is an exceptional area of Scotland recognised for its landscape, mountains and forests, its wildlife and people. What is less well known is its great importance for a huge number of plant species.

The Cairngorms hold significant populations of endangered species and a rich diversity of flora and habitats. Rare arctic alpine flora can be found living on the high tops of the Cairngorm plateau, and rare bryophytes and lichens on the rocky outcrops and hidden in crevices.

The ancient Caledonian pinewoods that cloak the lower slopes are home to rare species such as twinflower and one-flowered wintergreen. Three quarters of the wooded area in the Cairngorms is coniferous and whilst these pinewoods have been greatly influenced by human activity, the Cairngorms encompass the most extensive tracts of Caledonian pine forest in Britain and are a stronghold for many of these rare pinewood plants.

In 2007, Plantlife identified the Cairngorms as one of its Important Plant Areas (IPA), which are areas of landscape nominated for their internationally important wild plant populations. Since then we have been actively raising awareness of these ecologically important habitats and encouraging their long-term protection and improvement.

Benefits of Important Plant Area recognition

The IPA approach can be used for prioritising conservation work and highlighting the significance of sites at a landscape scale. This is particularly important for plants which can suffer when sites become isolated from one another. For example, if continuous woodland habitat is broken up into smaller patches, plants which rely on cross pollination, like twinflower, can struggle to survive if the distance between populations of plants increases.

'Core IPA areas' of botanically important habitat have been identified and the first priority is to help safeguard and improve the habitat condition for plants in these areas. There are also IPA 'zones of opportunity' where fragmented habitats could potentially expand and link as part of a larger network. This would help to address the issues of isolation and increase resilience of plant communities and habitats to a range of impacts including the effects of climate change.

The Cairngorms Wild Plants Project

In 2017, Plantlife secured funding for a three year Cairngorms Wild Plants Project through Cairngorms LEADER, Cairngorms Nature, Scottish Natural Heritage (SNH) and donations from members of the public. In addition to the IPA work, which set out to identify where the botanically important areas are, the Cairngorms Wild Plants Project aims to increase awareness amongst communities, land managers and visitors of how special this area is for plants. It also aims to provide additional guidance and support for land managers to help conserve them.

A further aim is to empower local people to take action and to raise awareness of the value of these special places for plants. One way it is doing this is by recruiting volunteers known as flora guardians. Flora guardians are engaged in monitoring the health of plant communities and sharing their knowledge with others through public events or social media.

People don't need to be experts in plant identification to get involved, just a willingness to learn and a desire to communicate their passion for wild plants to others. Training is provided to flora guardians to strengthen their knowledge of plants and help them share this with others.

Another objective of the project is to get the information gathered by flora guardians to land managers so that they can use it to manage their land in a way which protects these wild plants. It will also be shared with land management advisers within the National Park Authority, SNH and the Forestry Commission so that they can build this information into their advice.

Training days and resources

As well as gathering and sharing up to date survey information on some important plant sites, the project is hosting training days for land managers, advisers and people working in the Cairngorms that could use this knowledge to help conserve these plants across the national park.

Last year, events were held for SNH advisers staff, The Mountains & The People apprentices who carry out a variety of land management tasks such as upland path work, and University of the Highlands and Islands School of Forestry students. All of these field days help to increase awareness of the conservation needs of the different plant species which make the Cairngorms so special.

Another major objective of the project is to work with outdoor leaders to help them to share the love of wild plants with people who visit the Cairngorms. The Cairngorms is a fantastic place for people to come and enjoy a variety of outdoor pursuits such as hillwalking and mountain biking, but many visitors do not know about the plants that make it so special.

In 2018, the Cairngorms Wild Plants Project is producing resources for outdoor leaders including rangers, mountain guides, outdoor activity providers and health walk leaders to use with groups out in the field.

The project will be running training events for these leaders on how to make best use of them. The group leader resources are designed to be used whether a leader has only a few minutes, or a longer period. If you are a group leader and would like to know more about these resources or attend a training session see the contact details below.

For more information on where to go to see some of these amazing plants, look out for a series of self-guided walks leaflets which will be produced next year for the Caledonian pinewoods and the arctic alpine habitats in the Cairngorms.

The Cairngorms Wild Plants Project will make a positive difference to the way that this special part of the world for wild plants is viewed by those who visit or live here and those who manage the land. If you would like to keep in touch with how things are going, follow us on Facebook, search #CairngormsWildPlants on social media and visit www.plantlife.org.uk/scotland/blog for regular updates.

If you live in the Cairngorms and would like to get involved in the project then do get in touch.

Gwenda Diack works for Plantlife as the Cairngorms Wild Plants Project Officer.
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Mar Lodge Caledonian Pinewoods

This project has been part-financed by the Scottish Government and the European Community (Cairngorms Local Action Group) LEADER 2014-2020 Programme

Woodland flora folklore and remedies

Kay Haw

Rose hips from the dog rose

Humans have long had a special connection to the wonders and uses of the natural world. However, western, science-led ('logos') society has lost much of its belief in the mysticism ('mythos') that ancient cultures revered, and now relies heavily on manufactured and synthesised drugs rather than natural remedies.

'Mythos' is rooted in myth, belief and culture, and can have a deep connection to our inner emotions and spirituality. 'Logos' is rationale and pragmatism, a fact-led viewpoint that provides a basis for the scientific understanding of reality.

These two forms of knowledge once complemented each other: mythos giving life meaning and logos enabling practical survival. In the West, the rise of science since the Renaissance and the loss of nature-based, pre-Christian beliefs have fragmented knowledge of and connection to ancient heritage.

Long before pharmaceutical companies dominated western healing, people relied on the power of nature to cure disease and relieve ailments. A resurgence of these traditional practices is shining an ever-expanding light on this knowledge, with science now supporting the efficacy of some of these long-practised treatments. At the same time many pharmaceutical drugs are developed from plants, for example aspirin from willow bark.

Is it possible to find a balance between these two worlds, between the old and the new, between past and present, and build a new paradigm for the future?

Flora in folklore

Forests, woods and their plants are steeped in folklore, taking different forms in different countries and regions. They also have myriad practical uses. In fact, the common and/or binomial (Latin) names for some plants were created from stories about or uses for them.

Bluebell, *Hyacinthoides non-scripta:* it is easy to see how this mostly blue, bell-shaped, woodland flower got its common name. It has a number of stories attached to it, including being a flower of the fairy folk. Walking in bluebells or picking them is said to cause bewilderment and being led away by the pixies.

However, its Latin name refers to a Greek myth. The sun god Apollo, son of Zeus, was playing a game with Hyakinthos, a Spartan prince, which angered Zephyrus, the god of west wind. In a fit of jealousy Zephyrus blew one of the discs in the game, accidentally hitting Hyakinthos in the head and killing him.

There are differing versions of the myth, but in grief Apollo transformed the prince or his fallen blood into a larkspur flower, *Delphinium ajacis*, whose petals were marked with the letters AI – 'alas' in Greek. The bluebell is said to be related to the flower Apollo created, but without the AI inscription. So, hyacinth comes from Hyakinthos' name, while non-scripta means 'unwritten' in Latin – lacking the AI lettering.

Deadly nightshade, *Atropa belladonna:* for centuries, this attractive yet toxic woodland plant has been used as a painkiller. Atropine sulfate is made from the plant and used to regulate the heartbeat during surgery, as well as being able to counter the effects of pesticide and nerve agent poisoning. However, it can also bring on delirium, hallucinations and a quick but unpleasant death, which led to its use in murders and suicides.

In its refined state, atropine can be used by modern day eye surgeons as it dilates the pupils, as well as reducing inflammation. Its ability to dilate pupils also made it popular with ladies in the past as a means of beautification through a drop in each eye.

These attributes contributed to its Latin name, *Atropa belladonna*. In Greek mythology, Atropos was one of the three goddesses of fate and destiny; the one that brought about a mortal's final death. Bella donna means beautiful lady in Italian.

The power of plants

Natural remedies are often scorned and thought to be nonsense by many. Yet our ancestors developed these practices and remedies over thousands of years.

There are those that are often called into question, not only for not having any real effect but also for driving destructive activities. For example, the global issue of the poaching of endangered animals is exacerbated by a belief that several of their body parts, such as rhino horns, can cure humans of issues from baldness to demonic possession, despite the lack of any scientific evidence.

On the other hand there are those, including many plants, being investigated for their unique and healing properties. Modern science is proving some traditional practices and remedies were effective and based on trial and success.

Dog rose, *Rosa canina:* rose hips are an excellent source of vitamin C, a powerful antioxidant vital for healthy cells, strong immune systems and in the production of collagen, which is important for healthy skin and bones. The human body cannot store vitamin C, so needs a regular supply. In the past, many sailors died from scurvy, a disease caused by a prolonged lack of vitamin C, as they were at sea for long periods without access to fresh fruit and vegetables.

Deadly nightshade

Foxglove

Rose hips can be collected during the autumn and turned into syrups, jams and teas, or dried and stored to be taken as needed. This is especially useful during the winter when immune systems need to be boosted to stave off the germs and viruses often more prolific at that time of year.

Foxglove, *Digitalis purpurea*: a striking plant with vibrant pink-purple flowers, foxgloves favour woodland edges and hedgerows, among other habitats. The plant is poisonous if eaten, but digitalis extract from the foxglove has reportedly been used since the Middle Ages.

The Scottish doctor William Withering was told about digitalis by a natural healer. After conducting tests on many patients, in 1785 he published his book *An account of the foxglove* and some of its medical uses with practical remarks on dropsy and other diseases, and brought its use into the medical profession.

Today, digitalis extract is used to create cardiotonic drugs such as digitalin, digitoxin and digoxin. They have positive effects on regulating the heart, especially when treating cardiac arrhythmias, and reducing the rate while increasing the intensity of contractions.

St John's wort, *Hypericum perforatum*: this yellow-flowered plant grows in open woodland, hedgerows and meadows. The common name, St John's wort, can refer to any plant in the genus *Hypericum*. Our native species is *Hypericum perforatum*, or perforate St John's-wort, which can be found in Europe, northern Africa and south-west Asia.

It has been used for centuries to lift people's moods, relieve depression and combat anxiety and sleep disorders. It is also said to have anti-inflammatory properties and help with fluid retention. However, it can have side effects and unintended interactions with other medicines being taken.

Protecting the future

Scientists are constantly finding new species and new uses for species. Yet at the same time the human race is destroying habitats and pushing species to the brink of extinction before fully understanding their importance and function. The links *Homo sapiens* formed from the species' evolutionary beginning must not be lost, while the balance between mythos and logos needs to be rediscovered and embraced for the sake of all.

Kay Haw is the Woodland Trust's conservation adviser for evidence, Wood Wise editor and ecopsychology enthusiast.


WTPL

Tree health update

Matt Elliot

The number of serious tree pests and diseases (TP&D) brought into the UK has increased significantly over the last 20 years. Many of them pose devastating threats to the survival of the UK's native and non-native trees.

Chalara dieback of ash

The fungus *Hymenoscyphus fraxineus* is responsible for the current ash, *Fraxinus excelsior*, dieback epidemic. It was introduced via imported ash saplings around 20 years ago, though it was not identified until 2012. It is now widespread across the UK.

Our most severely affected area is the South East of England, but dead and dying ash trees can now been seen across the UK. The Forestry Commission monitors the disease using a 10km^2 grid system. If Chalara dieback of ash is found within a 10km^2 Ordnance Survey grid square, that whole area is classed as being infected. As of 1 December 2017, 44.4% of grid squares showed a positive presence of the disease.

The epidemic has inflicted a devastating blow to native ash trees. It has also brought about some big challenges for tree and woodland management, particularly when it comes to trees outside woods (TOWs). Ash is especially common in hedgerows and its loss will have a serious negative impact on connectivity between wooded habitats and the many species that rely on them for safe passage between these areas.

Large ash trees, many veteran or ancient, often grow next to roads, rail lines and paths. This has implications for public safety because the large numbers of dead and dying trees have to be managed in order to make them safe. It is extremely important that we increase our efforts to plant more trees, not only to replace ash but to make our treed landscapes more resilient to future threats.

Oak disease and decline

Oak is another species under threat. Both native species, *Quercus robur* and *Q. patraea*, are declining, particularly in the south of England, due to a number of factors that are not clearly understood. It seems the trees may initially be weakened by environmental conditions such as drought, flooding and pollution. This then allows other organisms such as fungi, bacteria and bark beetles to move in and attack the trees while they are in a weakened state. A number of studies are underway to try to understand the decline in oak and what can be done to prevent this and protect the trees.

Xylella threat on horizon

There are a number of serious TP&Ds causing problems in Europe and beyond that have not yet made it to the UK, such as *Xylella fastidiosa*. This bacterium has caused the loss of thousands of ancient olive trees in southern Italy and can now be found in France, Spain and the Balearics.

It infects many different species of plants, many of which we import as ornamentals, for example olive, lavender, cherry and rosemary. If it got to the UK it could infect many of our native broadleaf species and have a severely destructive impact.

Help stop the spread of TP&Ds

To lower the risk of importing new TP&Ds it is imperative when buying plants to check where they have come from. By choosing to buy only UK sourced and grown (UKSG) plants whenever possible, the risk of introducing TP&Ds is greatly reduced. If there is a native plant that can do the same job as a non-native species and can be sourced locally, then that needs to be the first choice for buyers. The Woodland Trust is committed to planting native trees that are UKSG certified.

Dr Matt Elliot is the Woodland Trust's conservation adviser for tree and woodland health.


Bacterial leaf scorch from *Xylella fastidiosa*


Honey fungus, *Ammillaria mellea*, can kill weakened trees

Woodland Trust research update

Christine Tansey

At the Woodland Trust, we underpin our conservation work for woods and trees with evidence, often gathered through research carried out by universities and other research institutions.

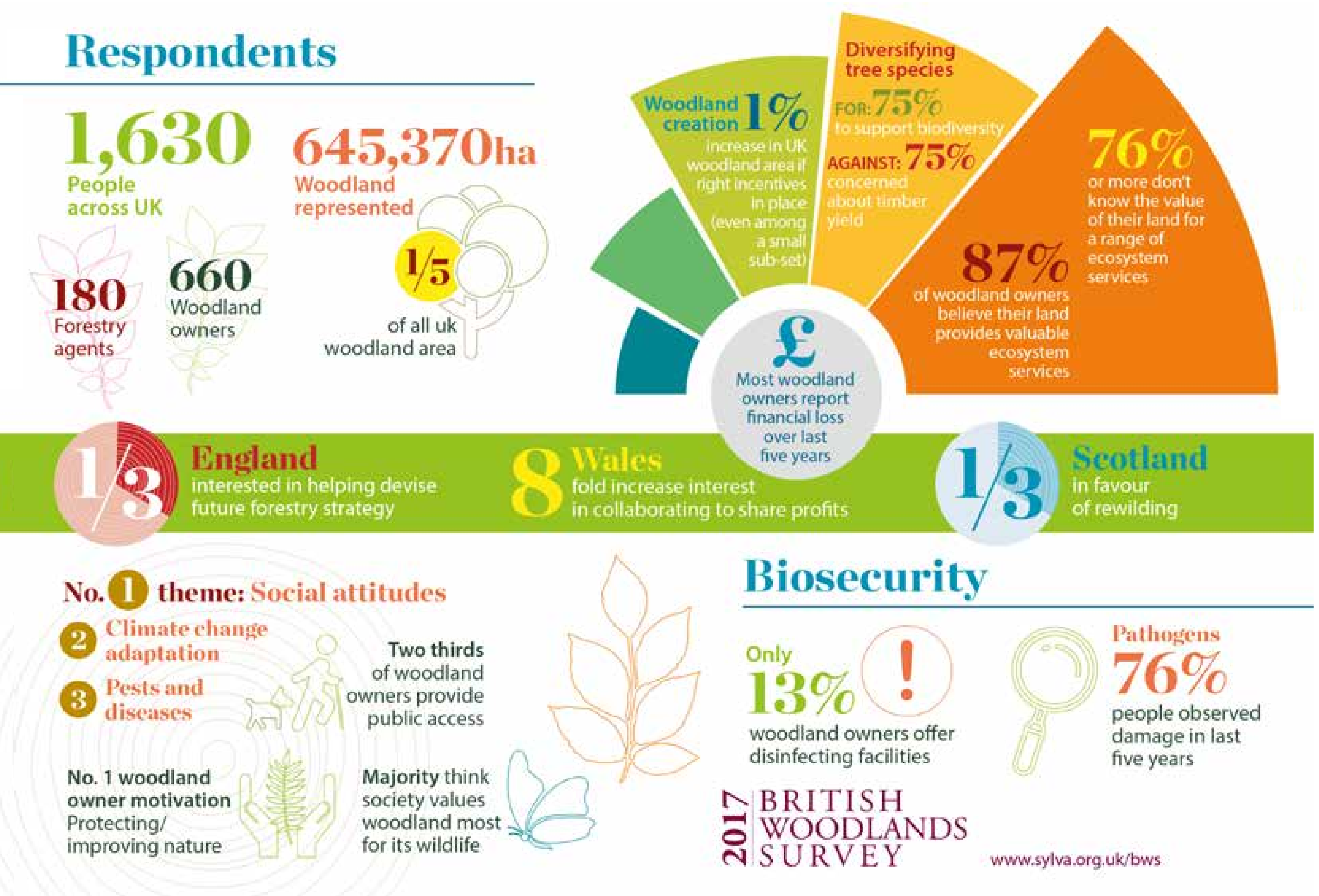
Over the last few years, we have been increasing the amount of support we offer to researchers around the UK. We are now working directly to help provide the evidence that the Woodland Trust and others working for trees, woods and people need to make the right conservation decisions. The range of research we support helps to inform the management of woods, planting and restoring woodland, outreach work with other landowners, and campaigns to protect existing woodland and influence future policy.

Read on to learn about some of the projects that have recently received our support.

British Woodlands Survey 2017

The British Woodlands Survey is co-ordinated by the Sylva Foundation with the Woodland Trust as one of several supporting partners. In 2017 a series of workshops were conducted to identify themes and questions for the UK-wide survey of woodland owners, managers and others working in the woodland and forestry sector.

The final report of the 2017 survey shows the number one motivator for woodland owners is protecting/improving nature. Download the report from the Sylva website: sylva.org.uk/bws2017



Key findings from the 2017 British Woodlands Survey (Image: Sylva Foundation)

Postgraduate research projects

A number of postgraduate research students across the UK are receiving Woodland Trust support. These PhD projects will run over three or four years.

Woodland soils at Newcastle University

Justin Byrne is now in the second year of his PhD which is looking at the differences in decomposer communities in woodland soils. He aims to identify which fungi and bacteria are decomposing leaf litter in woods of different ages. In 2018, he will be taking samples from the rotting leaves of different tree species in ancient and newly planted woods. Justin has been out conducting fieldwork in recent weeks visiting woodland and burying leaf litter. This work will help us understand how woodland soils function and which tree species may be important to plant to help develop a healthy soil ecosystem.

Bags of buried leaves which will be dug up later in the year and analysed to see which fungi and bacteria are present

Woods and wellbeing at Bangor University

Heli Gittens is also in the second year of her PhD, working with both the Woodland Trust and Coed Lleol (the Small Woods Association in Wales) who run Actif Woods Wales, a network of woodland activity groups. She is working with participants of these groups to identify the effects of taking part in woodland activity on their wellbeing. In 2018 she will be conducting interviews and questionnaires with volunteers, as well as looking at what encourages or dissuades people from using woods.

There is currently a gap in research that looks at long term impacts of woodland activity, so this project aims to find out how taking part in a 12 week programme affects people's behaviour in the long term. For example, it will look at whether they gain confidence to visit the woods independently or with friends and family after taking the programme. Ultimately, Heli's research will help provide information on encouraging woodland use, which is important for understanding the relationships between people and trees.

Ancient trees in the UK at the University of Nottingham

Victoria Granger started her PhD in autumn 2017 looking at the distribution, location and status of ancient trees in the UK. She will be using statistical modelling to look at differences in the landscape around ancient and non-ancient trees. She will then use important features in the environment to help predict the locations of other, so far unknown, ancient trees. In the long term, her work will help us locate and protect more ancient trees in the UK.

This work will make use of records from the Ancient Tree Inventory, an amazing resource full of information collected by volunteers.

Dr Christine Tansey is the research and evidence co-ordinator at the Woodland Trust.

If you are interested in finding out about the Woodland Trust's support for research, please get in touch:
research@woodlandtrust.org.uk

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