

Wood Wise

FUTURE FORESTS

Tree & woodland conservation • Spring 2019



WOODLAND
TRUST

WHAT
WOODLAND
WILDLIFE WILL
WE PASS ON?

LEARNING
FROM THE
GREAT STORM
OF 1987

NEW
TRAJECTORIES
FOR ANCIENT
WOODLANDS

THE FUTURE
ROLE AND
SHAPE OF
FORESTRY

CONTENTS

9



3



6



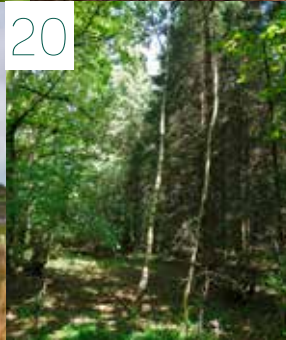
12



16



20



24



- 3 The changing fortunes and expectations of woodland
- 6 What wildlife do we want in our woodlands?
- 9 The Great Storm: nature inspiring forest management
- 12 'Old growth' thinking on ancient woodland restoration
- 16 The National Forest: learning to inform the Northern Forest
- 20 The future of forestry
- 24 Wood Wise update

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The changing fortunes and expectations of woodland

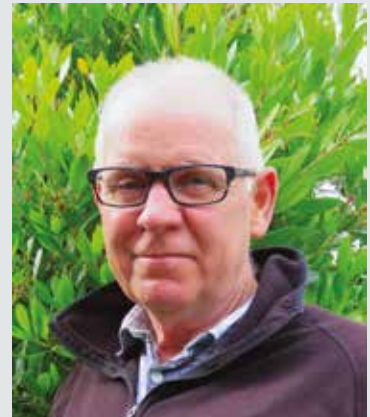
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Looking back over the last 100 years of trees and woodland in the UK, their age, location and composition provides a constant physical reminder of policies devised, implemented and superseded. It is also a reminder of emerging technologies, economic realities and changing objectives which have led to wholesale changes in our approach to trees and woodland through proactive intervention or casual abandonment.

Despite the changing priorities of forestry and, in recent times, a greater emphasis on environmental and conservation outcomes (see Box 1), the majority of forest expansion and management over the last 100 years has focused on non-native conifer woodland. The area of native broadleaved woodland in the UK is still only around 6% of total land area. Although the need to enlarge woods and increase their connectivity to other woodland is well recognised, much remains in small fragmented blocks. Trees outside woods provide linkages between these fragments and make up a significant proportion of total canopy cover in the UK, yet they have suffered from the same external pressures as woodland.

The ebb and flow of our approach to trees, woodland, and management of the agricultural landscape within which trees and woodland sit, often as islands in an ocean of farmed landscape, means that the wildlife they support has been swept along in the same tide of change. Presently many British woodland wildlife populations are experiencing declines, possibly even facing local extinction, largely due to changes in the intensity and type of woodland management. There also remains a tendency to consider only the trees and not the full range of species and ecosystem processes that make up a wood.

The time to act is now. It is essential that conservationists and woodland managers learn from the past and make positive steps towards safeguarding our woods and wildlife, nurturing healthy, resilient wooded landscapes of the future. The series of articles in this issue reflect on what woodland ecologists have learned over the decades about natural processes and wildlife responses to human intervention, and how we can all play our part in ensuring forests are fit for the future.



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Box 1: A brief overview of the last 100 years of forestry

At the beginning of the last century, woodland cover (mostly broadleaved) in the UK had declined to less than 5% of land area, one of the lowest in the world. Woodland had been cleared over the centuries for agriculture, with woods surviving mainly where the land was too challenging to farm, on difficult soils or steep slopes.

The First World War highlighted a vulnerability to naval blockades and a potential threat to essential supplies of timber in times of war. The Government began to look at ways of developing forest resources, and in 1919 established the Forestry Commission (FC), giving it responsibility for woods in England, Scotland, Wales and Ireland.

During the 1920s, the rationale for the FC was the need to rebuild a strategic timber reserve to replace stocks depleted by the demands of the First World War. The FC was given powers to acquire and plant land. By 1934 the FC estate had reached around 338,000 hectares.

In 1947 a 'dedication scheme' of afforestation and management grants for private landowners for the establishment of forests was created, the forerunner of current support for private forestry.

By the end of the 1950s the FC estate had expanded to over 404,000 hectares of planted land, with more than 202,000 hectares of private land covered by the dedication scheme. An independent report to the Government in 1957 changed the emphasis of the FC by stressing the importance of import substitution (i.e. replacing foreign imports with local production for local consumption), rather than any strategic role in the expansion of the forest estate.

Just 10 years later, the Forestry Act of 1967 placed greater emphasis on the recreational and conservation roles of the FC. This was reinforced in the 1972 White Paper, which was critical of the import substitution justification of forestry and its role in employment creation.

In the years after the Second World War, a push from government to increase domestic food production led to the loss of numerous small broadleaved woodlands, many of them ancient woodland, to increase the area available for crops. Further ancient woods were also felled and replanted as conifer plantations; a process now being reversed through the restoration of plantations on ancient woodland sites (PAWS) to predominantly native woodland.

During the 70s, 80s and 90s the focus for afforestation switched to the private sector, with tax incentives playing a major part in encouraging the creation of new commercial conifer forests, particularly in the uplands. Within the FC there was continued emphasis on its environmental role. Future timber streams coming from the FC estate were also seen as providing a guarantee of

supply for investment in timber processing.

From the mid-1980s, the Broadleaves Policy began to take account of the impacts of non-native conifers on native and ancient woodland, and grant rates were increased to encourage more planting of native woodland.

Reflecting the political and economic philosophy of free market under the premiership of Margaret Thatcher, the 1981 Forestry Act called for the disposal of a significant area of FC land. By 1996, the FC had sold 208,000 hectares of land. This still left the forest estate at more than one million hectares.

The 1990s also saw the foundation of the Community Forest programme and the National Forest in England, which aimed to demonstrate the potential of environmental improvement to economic and social regeneration. In addition to planting thousands of hectares of new woodland and creating other habitat, both the Community Forest and the National Forest have shown the importance of green infrastructure and urban green space in improving quality of life and encouraging urban renewal.

In 2005 the FC published *Keepers of Time*, which outlined their approach for protecting ancient woodland and managing trees and woods at a landscape scale. In 2019 the FC are celebrating 100 years of forestry and are England's largest landowner with over 1,500 forests. They are also the largest provider of outdoor recreation in England and undertake research in sustainable forestry.

Timeline

- 1919:** The Forestry Commission is established
- 1947:** The Dedication Woodland Grant Scheme is introduced
- 1957:** The Zukerman Report is published
- 1967:** All Forestry Acts from 1919 to 1965 are consolidated
- 1981:** Forestry Act to amend the Forestry Act 1967
- 1985:** Broadleaves Policy is introduced
- 1990:** Community Forest programme established. National Forest gets underway
- 2005:** *Keepers of Time* is published
- 2019:** Forestry Commission centenary year



WTML/Ben Lee

What wildlife do we want in our woods?

Woodlands aren't the stable habitats that we once thought they were; they are dynamic and highly varied places. Some change very gradually, others more rapidly in response to human activities. Much of our woodland wildlife depended on the ways that people managed woods in the past, but many traditional practices have now ceased. We're at a critical time in which we need to consider the wildlife legacy we want to pass on to future generations.

What is our biodiversity baseline?

15,000 years ago Britain was a land of ice and tundra; some 8000 years later it was substantially tree-covered, although there is a lot of debate around how open it was. By 1900 woodland cover was close to an all-time low of 4-5% due to human clearance. Over the last century it has been gradually increasing - mainly through the creation of conifer plantations for timber - to the current UK woodland cover of 13%.

Our early ancestors contributed to the extinction of the mega-fauna, the mammoths and woolly rhinoceroses. Later peoples saw off more of the large fauna - wild ox, elk, bear, beaver, lynx, wild boar and wolf - and split up the landscape into heaths, grassland and wooded lands.



Dr Keith Kirby is a researcher in the Department of Plant Sciences in Oxford, formerly Woodland Officer with Natural England.

Dr Rob Fuller was science director at the British Trust for Ornithology and continues to study woodland ecology in his retirement.

Many wooded areas were managed as coppice, a practice where trees or shrubs are periodically cut back to ground level to stimulate multi-stem regrowth. Woods therefore contained dense young growth with a high degree of temporary open space. Wood pasture - areas with scattered trees among open grazing land - was also abundant.

Natural and human processes have shaped the climatic and physical environment experienced by our trees and woods through the ages. The woodland biodiversity of today is a reflection of soil patterns and climatic variations across the country, but also past management. Clearly then, how we choose to manage (or not manage) our woods in future will affect what species they contain; equally if we want to maintain certain species or assemblages, that will affect what management we need to apply.

The situation is complex however, as there will need to be trade-offs between wildlife conservation and effective delivery of timber, water management, soil protection, recreation spaces and carbon sequestration, among others. Woodland of all types also has to compete with other land uses. For example, pressure to expand future cropped or developed land could be at the expense of woodland; further woodland spread could reduce open heath and moorland.

Recent changes in woodland biodiversity

The species and assemblages that have been the focus of tree and woodland conservation for the last century are largely those associated with pre-industrial farming and forestry practices. These practices have long since declined and tree cover has changed in many other ways. This includes the clearance and replanting of ancient woods with conifers, abandonment of grazing on commons, a general reduction in management of broadleaved woodland and the rise in deer numbers. Soils have also become increasingly enriched by nitrogen deposition from pollutants emitted by agriculture, transport and power stations.

Inevitably the associated species and assemblages have changed. During the 20th century, species needing open space or young-growth in woods have tended to decline, including many butterflies and birds. The ground flora has thinned out and many veteran trees have been shaded out by younger, taller trees.

Newly created woods, both broadleaved and coniferous, have yet to develop comparable meaning and value to those lost. Some might do in the future without any particular effort to speed things up, but there are suggestions for large-scale and rapid changes in British woodlands over the next 50 years, some of which are planned - such as the proposals for the Northern Forest - and some which are incidental, for example, the Climate Change Committee's recommendation that we need to eat less meat and reduce the land used

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for livestock grazing. If we are not to have large areas of relatively dull woodland, more intervention may be desirable.

Managing change

Ancient woods, including many Woodland Trust reserves, will be affected by the changing environment, as will their surroundings. As such, we need to protect and nurture them more than ever. These ancient woods hold the species and genetic diversity from which communities will emerge that are suited to future conditions, although some species may not survive in the longer term and the assemblages may be different.

Nurturing our ancient woods will take various forms (see page 12). We can restore sites converted to conifer plantations in the recent past back to native species. There are questions about the best ways to carry out restoration: when and where is it appropriate to clear-fell the conifer element, where better to open out the canopy gradually by thinning. However, in most circumstances some action is better than none.

It will be critical to reduce deer impacts. Deer control may not be possible everywhere and some woods will continue to have a high deer-grazed composition and structure. Their flora will be different to that of the past, with more grasses, bracken and moss than at present, and fewer herbs such as bluebell and dwarf shrubs like bilberry. Grey squirrel numbers will need to be controlled if we want broadleaved woods to also produce good timber, unless the spread of reintroduced pine martens, a predator of grey squirrels, could provide a welcome check on their numbers.

More management is needed if species of gaps and glades are to be maintained, and other wildlife opportunities created in the relatively small blocks of woodland that characterise most of Britain. The recent rise in the price of firewood has provided an incentive for some owners to fell trees again, reversing a trend towards increasing shadiness. There is also more interest in 'Continuous Cover Forestry' (CCF) which provides opportunities to develop mixed age and mixed species stands, as opposed to clear-felling and

restocking as single-aged stands. Few data are available from the UK on what effect these systems have in practice for wildlife, so monitoring of both traditional forms of management and new approaches is essential.

We must expect the unexpected, whether this is more severe storms such as that in 1987, droughts such as 2018, or new disease outbreaks, such as ash dieback. These events may make us rethink our priorities and actions: the best response to the 1987 storm on many sites was to do nothing (see page 9). The loss of ash through ash dieback may temporarily benefit species that depend on decaying wood and regenerating woodland, and conservation control programmes against sycamore, an introduced species, may need to be reconsidered as it supports many ash-associated species.

Developing new landscapes

Large productive conifer forests such as Kielder and Thetford were new landscapes of the last century, much needed to reduce timber imports and associated environmental damage overseas. Much is known about how to improve such forests for wildlife and there needs to be maximum application of this knowledge.

New woodland and more trees are desirable for a range of reasons. Sensitive location of new woodland is important, as is when to plant and when to allow natural regeneration to take its course. Research is beginning to unearth the biodiversity consequences of different patterns of woodland planting in the landscape in the National Forest and Central Scotland belt. These findings and other lessons need to be factored into new large-scale proposals such as the Northern Forest (see page 16).

We need to be more innovative in the creation and management of new woods to improve their biodiversity.



Alastair Hotchkiss

Grizzled skippers, *Pyrgus malvae*, require woodlands with a mixed age structure and rides and glades.



Kenneth Watkins/WTML

Hazel dormice, *Muscardinus avellanarius*, prefer the early successional phases of woodland maintained through coppicing.

Good research exists into why new woods usually take a long time to acquire specialist species. We should now put more effort into learning how to speed that process up by introducing ground flora species and using different levels of thinning once the trees are established to create variable light climates at ground level, benefitting gap-phase as well as shade-loving species.

Difficult decisions

By design or default we cannot avoid making decisions about what we will pass to the next generation, both in our ancient woods and the new tree cover that develops in the next 50 years.

Those decisions are not just about how we do conservation, but also what sort of lifestyles we choose to lead. How will we get our energy, farm the land, manage water supplies, move around Britain (road, rail, bicycle, foot) and the world (the flights we take)? Will we reduce our consumption? What will we do with our waste?

Our lives are generally richer and easier than they were 100 years ago, and we cannot expect people to have to go back to living as they did then. However, unless we make some major changes to how we conduct and manage our lives, there will be continued losses of habitats and species. If we make better choices our woods can be richer, if different to what we have now.

The Great Storm: nature inspiring forest management

In one night, more than 15 million trees were blown down in what has become known as the Great Storm of 1987. The effects on the landscape were dramatic, and there may have been great mortality of wildlife on that night. But structural diversity - living space for a great variety of species - was created by the storm's beneficial disturbance, and all manner of wildlife was able to thrive as a result.



Dr Tony Whitbread has worked for the Sussex Wildlife Trust for 27 years, being chief executive for 12. Before that he worked for the Wildlife Trusts national office and the then Nature Conservancy Council.

Overnight on the 15th October 1987, gale-force winds around 100mph hit the South East of Britain, from Hampshire to Suffolk, some 14 counties in all. It was the strongest storm that this part of the country had seen for over 300 years. Enormous amounts of damage had been done, not to mention the human tragedy involved. Huge areas were blown flat and most woods had holes and canopy gaps blasted into them. Surely this was nature gone mad - we needed to clear up the mess, mend the damage, replant and get back to normal. Or did we?

The storm was seen as a freak of nature. But individual trees live for a long time, forests even longer. And there have been similar events in the past - the Great Storm of 1703, for instance. Storms like this may have a return time of around 300 years, but in terms of the lifespan of trees and forests, this was not an unusual event.

Disturbance creates diversity

Ecologists had for a long time been looking at how natural disturbance creates diversity in nature. The old idea of nature being stable and unchanging, and that disturbance was a bad thing to be avoided, was dispelled a long time ago (even if it still remains in current popular thinking). Here we had an example of natural disturbance on a huge scale - a rare chance to see how nature works.

The disturbance created by the storm generated great gaps in forests that had become dense and overshadowed. Light was able to get to the forest floor for the first time in decades, and in the years that followed there was a burst of regrowth. Ground flora flourished and as the years went by shrubs and trees regenerated in the gaps - species that would not have stood a chance under dense woodland. Flowering plants attracted nectar-feeding insects, in turn attracting insect-eating birds, bats and other animals.

Damaged trees supported more fungi and wood-boring insects. Hole-nesting birds had more of a chance to nest and piles of decomposing brushwood provided homes for birds and small mammals. Windblown trees left upturned root plates in which kingfishers excavated nests, and water filled hollows that were colonised by wetland plants and amphibians. The impetus, in some quarters, to go in and clear up the mess, replant and start again, was misplaced, often just destroying the very diversity that had been created.



Storm damaged trees

Lessons from nature

The storm was not damage inflicted upon nature. The storm was an inherent, necessary part of nature – a natural process that drives the way nature works. If we understand that, then we can gain a better insight into forest management guided by nature. Better still, it may help us encourage our natural world to look after itself without human intervention, and maybe even gain a better understanding of our relationship with nature.

High levels of disturbance may cause some damage, but too little disturbance is also damaging – woods become dark and monotonous and so support a limited range of species. Undisturbed, dense, shaded woods are not 'natural', because humans have excluded the agents of natural disturbance. Take away disturbance and you are not left with nature, you are left with abandonment. This leaves nature to suffer the consequences of our past mismanagement. Multiple, intermediate levels of disturbance along with patches of undisturbed old growth forest in a variable, changing patchwork better explains the presence of our native species.

However, one thing that has become clear since 1987 is that one big storm every 300 years is not enough to explain the diversity of our native species. The 1987 canopy gaps have since disappeared and become part of the forest canopy. The storm gave us great insight, but if we wish to understand nature then we need to look more broadly at *all* the different forms of natural disturbance.

Natural disturbance and succession

Windstorms are just one form of natural disturbance. Others include flooding, erosion and accretion. Tree diseases also cause gaps in forests. Some areas might have been damaged by fire. Grazing and browsing herbivores are a huge driving force in some areas – an area opened up by windstorms may be kept open as grazers are drawn into the area. In the distant past wild forests would have been roamed by herds of wild aurochs (an extinct wild cow). Wild boar virtually plough up areas creating swathes of disturbed soil. Beavers are well known for creating clearings in wetland areas.

The 1987 storm reminded us that **natural disturbance** is the contra-directional force to **succession**, two key natural processes continually at work. With succession plants grow, tall plants take over from shorter ones, then scrub colonises, to be taken over by small trees, which grow into large trees and eventually a forest

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The storm was not damage inflicted upon nature. The storm was an inherent, necessary part of nature.

forms – the so-called ‘climax forest’. The climax forest is however only a concept – in practice it is continually knocked back by natural disturbance. This is what creates diversity in nature; indeed most native species do not live in dense forest.

There has been much debate recently about ‘rewilding’ – the restoration of nature by promoting and restoring natural processes. In some cases this means bringing back those processes (succession and/or natural disturbance) that are absent. Rewilding is a great ambition that should be promoted over a far larger area in the UK to yield great gains for nature and people.

Can disturbance by humans have a similar effect?

Much of our current landscape is a cultural landscape where ecology is driven by human management. But think of the effects of the 1987 storm. Areas of woodland were blown flat, letting light in, followed by a burst of regeneration supporting a range of different wildlife. With traditional forest management, an area is cleared, light gets in and there follows a burst of regeneration – pretty similar. Woodland management can do a similar ecological job as natural disturbance, but this is not *carte blanche* for any management. Managers need to consider (1) whether management is



Uprooted trees

needed at all and (2) how management mimics, or is a substitute for, natural processes.

The parallel of natural vs managed disturbance also extends to other comparisons. Large mammals would have grazed a wild forest, creating open habitats like grassland and heathland. Abandonment destroys these but copying nature with domestic animals puts back the natural process of grazing. Just adding grazers, however, creates over-grazing, potentially reducing diversity, not improving it. Predators would have impacted on grazers and their behaviour. Management of domestic grazers by moving them around, avoiding over-grazing and creating patches of different vegetation can have a similar effect.

One big difference to our wild past is that forests are but tiny fragments compared to the extensive, connected natural habitat that would have clothed our landscape. Natural disturbance generally works on a large scale. For instance, 100 acres blown down in a natural forest covering many thousands of acres is just one patch of disturbance. But in a modern landscape, a 100-acre woodland could all blow down at once. Woodland management effectively creates smaller patches of disturbance in our smaller managed woods. In so doing, a measure of diversity is retained.

If we learn from natural disturbance, then far from having a damaging impact, management can be a beneficial force, replacing the natural processes that have been excluded from our landscape.

So, 30 years on, what have we learnt?

Some may consider that there are two divergent views in nature conservation. On one hand with rewilding, nature knows best, therefore we should restore natural processes and let nature get on. On the other hand is the view that we should take responsibility for sympathetically managing our human-dominated landscape. Often these are presented as opposites. This is not the case. An understanding of natural disturbance, like the 1987 storm, and an understanding of how human management is similar to natural disturbance, can provide a unifying theme to bring these views together.

After thousands of years of impact from humans, nature is depleted and incomplete. We have taken away not just the species but also the drivers of natural processes. We must be far less timid about putting nature back together, restoring and reintroducing natural processes and encouraging nature to work for itself through rewilding. But abandonment must not be mistaken for rewilding. If nature can't function well because of us it is our responsibility to ensure that our management replicates the natural processes that have been lost.

Rewilding and management are not opposites – they are two essential and complementary sides of the same coin.

‘Old-growth’ thinking on ancient woodland restoration

‘Restoration’ is often construed as an aspiration to return a woodland to some past condition, with an exact composition of historical plant and animal communities. However, the Woodland Trust believes restoration is really about restoring the ecological integrity of these places. Rather than looking backwards, we must think ahead to how we can re-establish missing or lost processes and ecological niches. This is so we can maximise the ecological functioning of ancient woodland sites as core parts of wider landscape-scale recovery.



Alastair Hotchkiss is the Woodland Trust’s conservation adviser on ancient woodland. His interests include trying to comprehend the complex ecology of ancient woods, restoration management, irregular silviculture and nitrogen air pollution.



Alastair Hotchkiss



The concept of ecological integrity helps to focus restoration towards the development of future ecosystems, which are considered to be characteristic of their locality and largely self-regulating. While this could often result in ecological similarities to historic communities, this is not the management objective in itself.

Rebuilding ecological integrity

Over the past few decades, the Woodland Trust's approach has been focused on addressing the 'front end' of restoration: the 'first-aid' type interventions to maintain and enhance the most critical remnant ancient woodland features, such as ground flora and pre-plantation trees. These are the building blocks and in many respects, the vestiges of any ancient woodland integrity remaining in these places. So for this reason, it still forms the first phase in our defined restoration process: 'halting further decline' in the most critical areas.

But restoration thinking and practice must go beyond this, and aspire to recover the wider woodland ecosystem, ultimately endeavouring to rebuild ecological integrity. As part of this, we are developing guidance on a third phase of restoration, which is about 'new trajectories for ancient woodlands'. This phase looks at how ecological integrity can be maximised, and places ancient woodland sites much more in the landscape-scale. External pressures and impacts that constrain ecological integrity need consideration (e.g. nitrogen air pollution and excessive deer browsing), as well as what else is missing within the wood itself and the wider landscape it occurs in.

All ancient woodlands retain ecological continuity associated with woodlands. However, while the classification importantly captures elements such as plant communities and soils, 'ancient woodland' does not include anything regarding the age of trees. We recognise that old trees and associated decaying wood, aka 'old-growth characteristics', contribute immensely to the overall richness, functioning and integrity of temperate wooded ecosystems. With the absence of these old-growth characteristics, the ecological integrity of ancient woodland will not be complete.

Old-growth thinking

To achieve old-growth characteristics, a significant proportion of individual trees should be living out their natural life spans, and standing and fallen dead wood must remain *in situ*. Continuity of old trees and associated wood decay results in rich ancient woodland with the greatest ecological integrity.

The UK has some impressive areas where old-growth characteristics are abundant, such as New Forest and Caledonian pinewoods, but there are few statistics. Many ancient woodland sites have been mapped, but

there is limited knowledge about what proportion of these retain old-growth characteristics. Knowing this would enable us to begin to restore these characteristics where they are missing.

Old-growth characteristics tend to persist more in multi-use systems where, for example, grazing or hunting and tree-cutting have been combined. Some of the best old growth is found where use of the trees has been fairly limited, and animals were the main interest. Such systems are often called pasture woodlands, wood pasture or parkland. But, in essence, they are simply more open areas of ancient wooded habitats that are rich with old-growth characteristics and should be recognised as such in policies. There are opportunities to address this, for example with the revision to the Ancient Woodland Inventory in England, which aims to include these more open ancient woodland habitats.

Dynamism and disturbance

Disturbance and dynamism in ancient woodland sites is often restricted to events like uprooted trees in

storms, or as a consequence of sporadically harvesting timber at varying scales and intensities which may not be ecologically optimal. Many ancient woodland sites and landscapes are missing large, heavy mammals to drive important disturbance processes and dynamics. While it may not be appropriate everywhere, or at all times, there does need to be more consideration given to restoring some large animal-driven disturbance dynamics in certain landscapes and woodland types.

Some ancient woodland plants are closely associated with disturbance in woodlands, particularly annuals and biennials such as three-nerved sandwort, climbing corydalis, narrow-leaved bitter-cress and small teasel, as well as rare or declining species like spreading bellflower, upright spurge or the native touch-me-not balsam. Relatively few ancient woodland specialist plants are annual or biennial, but several perennials also tend to establish following disturbance such as wood spurge and violets. Disturbance, and the exposure of mineral soil, also benefits the establishment of birch seedlings and other tree regeneration. Oliver Rackham



Alastair Hotchkiss

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Embracing multiple land uses on some ancient woodland sites, like grazing cattle, could actually be a good way to achieve the restoration of old-growth characteristics. Paradoxically, with less focus on the trees, it could ensure that more old trees actually occur in our future landscapes.

describes ‘circumboscal plants’ as plants that occur on the edges around ancient woodlands - e.g. saw-wort, betony and the rare hemiparasitic crested cow-wheat. This emphasises the juxtaposition between open agricultural lands and enclosed woodland in many UK landscapes. A whole host of invertebrates and other taxa rely on disturbance and resulting ecotone/wood-edge habitats, such as the declining pearl-bordered fritillary and tree pipits. Common and generalist species like the robin will readily forage on recently disturbed ground.

It may seem like old growth and disturbance/dynamism are somewhat conflicting aspirations. However, this is not the case across space and time. Embracing multiple land uses on some ancient woodland sites, like grazing cattle, could actually be a good way to achieve the restoration of old-growth characteristics. Paradoxically, with less focus on the trees, it could ensure that more old trees actually occur in our future landscapes.

Inspiring landscapes

Although restoration should not seek to return to some historical analogue, there is definitely merit in looking at certain locations for a model/aspiration for more of our ancient woodlands and where restoration could take them. In a part of southern Snowdonia, a piece of common land is one such example. Within its boulder-strewn groves of slightly closer-together sessile oak, birch and rowan are old-growth lichens like *Sticta* and *Parmeliella*, insects like the welsh clearwing moth whose larvae only develop inside the wood of ancient birches, and the awl-fly *Xylophagus ater*, which is associated with beetle larvae found in dead branches. These old-growth groves are interspersed with pockets

of more open marshy vegetation, where hardy Welsh black cattle graze and create tracks through the trees. Species that are more typically associated with open conditions are present, such as marsh fritillary butterflies feeding on devil’s-bit scabious and rare plants such as globeflower, frog orchid, bog orchid and slender green feather-moss.

This type of ecotone-rich glade-grove landscape is clearly also seen in the New Forest or parts of the Scottish Highlands, for example. Although these places have often largely developed as unintended consequences of culture, history and ecology combined, in a few places there are some proactive attempts to try to establish some of this dynamism and disturbance as an objective for ancient woodland restoration. Wyre Forest in Worcestershire is one example, where a small herd of Dexter cattle now roam the forest, and pigs have also been turned out periodically.

In trying to embrace the spatial and temporal complexities of landscape-scale ecosystem recovery, we should be prepared to leave space and time for more venerable old growth.



Pearl bordered fritillary, *Boloria euphrosyne*



Small teasel, *Dipsacus pilosus*



The National Forest: learning to inform the Northern Forest

The National Forest is now one of the best demonstrations that lowland forest can be planted at scale and deliver better biodiversity, new business opportunities, better places to live, investment confidence and an economic return. But what has made it successful and what might its success have to tell us as the Northern Forest gets into its stride?



Dr Sophie Churchill OBE was the National Forest's CEO from 2006 to 2014.



Planting saplings, with Marsden town in the background

The National Forest covers 200 square miles north of Birmingham, an area previously dominated by coal mining and other extraction industries. It germinated some 30 years ago in the Thatcher years, under the stewardship of the then John Gummer, now Lord Deben. Forest cover (including open space as in the medieval meaning of 'forest') has gone from around 6% to around 20%. If you head on a forest holiday in one of the 'new woods' in 2019, you will truly feel you are in a forest.

The National Forest has – mostly – enjoyed support and enthusiasm across the board, from primary school children to ministers of whatever political colour. It has been voluntary, involving landowners of many different kinds while not becoming a major landowner itself. Certainly, it has needed and received unique financial incentives, and security of central government support, but the National Forest has not had massive budgets compared with mainstream regeneration

or infrastructure projects. Nor has it the power of a planning authority.

What has made it both popular and successful and what lessons might we take forward for future large-scale woodland creation projects such as the Northern Forest?

Have a clear focus on 'why?'

Any forester knows that whatever your motivation, be it commercial, biodiversity, biofuel or public benefit, the purpose of a planting has to be clear. This certainly applied to the National Forest, where the central area was pretty much devastated by mining and its communities depressed. It therefore had to achieve regeneration - economic and social as well as environmental. But this was to be done at a higher quality than the rough remediation current at that time, and with an ambition for tourism, community renewal and a wonderful wooded landscape. The great

late Oliver Rackham would say this country has a fetish for tree planting and, if you want new woodland, fence the area off and let it regenerate naturally. But here we wanted a quicker, bigger and more planned transformation.

So, in the very early stages during the late 1980s, without today's technologies to help, the area was demarcated for different kinds of planting, depending on current land use, soil type and existing woodland. For example, in the further reaches of the forest, to the west and east, were remnants of ancient forest. They required different, sensitive treatment with less intervention compared with the mining areas in the centre, where tough pioneer trees like birch and alder were the foot soldiers.

The National Forest was always realistic about not being able to compete with good agricultural land and indeed did not set out to reduce significantly the food production of the area. The planting of trees was deliberately kept voluntary and while a large number of farmers participated, very few turned all their land to forestry. With Brexit and a focus on food production it is important that forestry projects are not seen to conflict with the farming community.

Be part of the area, not imposed on it

Of course, changing the landscape is always political and often contested. The National Forest was not immune to this, but strong local relationships won hearts with a vision, far better than attempting to win battles through the apparent objectivity of a plan or a map. Indeed it was because of the local support that the area was chosen.

Crucially, the National Forest is part of its organisational landscape. It is not run from a headquarters elsewhere, or from the office of a few forestry consultants. As part of their wider family, it is a friend to its six local authorities, its three counties and the organisational machinery of the area. Not being a planning authority like a National Park, nor led by one local authority, has benefitted the National Forest. It has worked by influencing, being part of wider plans and helping stakeholders meet their own targets, on sustainability for example.

If a key local plan (a document produced by a local authority which sets out local planning policies and identifies what will be built where) was discussing green infrastructure, the National Forest would want and expect to be name-checked. These are the hooks around which funding can be pursued. The forest has succeeded by going with economic development, caring about weekday jobs as well as weekend walks.

Have a robust governance structure

Government support and funding meant that the National Forest's board was appointed with government involvement, including the chair being appointed by the



Sapling planting in the Northern Forest

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Whatever your motivation, be it commercial, biodiversity, biofuel or public benefit, the purpose of a planting has to be clear.

minister. This meant that the board was not caught up with local politics, as it would have been if it was based on local representation. On the other hand, having board members mostly emanating from outside the forest meant it could be perceived as remote.

Ensure security of support and resources

Compared with the Community Forests, which have also achieved major change in the landscape and in communities through trees, the National Forest was fortunate to have a grant scheme that meant it could engage individual landowners to plant on their

land and enough of them, at scale, so that gradually the woodland sites would connect. Contracts with landowners were the major mechanism, rather than the National Forest Company buying land. This reduces liabilities, but you still need a way to enforce contracts into the future.

Wherever it comes from, security of funding, with a core that can be relied on complemented by a need to go and find more, is essential for such a large-scale transformation project. It is indeed irresponsible to embark on landscape change without the programmes and money to manage the new woodland as it matures. On sustainable public access, the county councils were great allies, with the National Forest Way being created entirely on public footpaths.

Have flexibility in species and strategy

The original strategy needs to have flexibility built into it, especially around tree species, the balance of hardwoods and softwoods and densities of planting. Climate change and disease are no respecters of the orthodoxies of 20 years ago. The Royal Forestry Society and the Forestry Commission, along with others, have been helping landowners make informed choices over the last 10 years.

Natural regeneration might turn out to be a more plausible option in the Northern Forest than was thought with the National Forest. It is cheaper and reduces the risk of imported disease, a greater threat now than when the National Forest began. It would also please Oliver Rackham, who thought that keeping deer out was one of the best things a landowner could do if they wanted to establish a wood.

Take the public on the journey to management

There is no room for complacency about the quality of the plantings in the future. Disease, grey squirrel damage and climate change are making it even harder to know whether young woodlands will grow into healthy maturity. It was important for the National Forest to shift from a passionate focus on planting the forest to an equivalent commitment to preserving it for the future.

Get written in to key documents from the outset

A scan through government web pages on the Northern Powerhouse does not bring up the Northern Forest. At this stage, this is perhaps to be expected. But it does suggest that keeping the Northern Forest right there as the biggest single contributor to climate change abatement, biodiversity and quality of life in the programme will need to be fought for. The National Forest learnt that a strong policy and planning capacity was essential to keep an eye on its embeddedness in local plans.

Based on the experience with the National Forest, here are some suggested questions those working on the Northern Forest might ask themselves as they anticipate being able to complete its c£500m investment in 25 years' time:

1. Are we prepared to be evidence-based and not ideological about the amount of trees needed, the species and the densities, so that we address climate change, disease and getting value out of the plantings?
2. If the Community Forests have not yet joined up the area into a sustainable forested landscape, what has prevented this and is there reason to think the Northern Forest will do this? Money? Other things?
3. Does the money really cover all that's needed, including public education, planning expertise and the ability to inspect growing woodland?
4. If the main funding taps are turned down or off, can the programme halt and we still have something of value? What happens about future management of the sites?
5. Trees bend in the wind. Do our strategies, governance and structures have the ability to evolve in the face of changing times?



The National Forest has so far achieved:

8,695,000 total trees planted

20.7% woodland cover

70% of woodlands under management.

The future of forestry

This year marks the centenary of the Forestry Act, often regarded as the birth of modern forestry in the UK. This provides an opportunity to celebrate the Act's achievements in shaping the forestry sector, as well as a chance to take stock and look at the potential future role and shape of forestry for the next 100 years.

Coming into force on 1st September 1919, the Act created the Forestry Commission to take responsibility for woods and forests in England, Scotland, Wales and Ireland. Over the last century the drivers of change have ebbed and flowed, and the pace of change has accelerated as trees have been planted, felled and replanted. One hundred years on, the economic, political and environmental context has changed, and just as importantly so has our understanding and appreciation of the varied roles and functions that trees and woods play in our landscapes.

Where are we today?

Woodland cover in the UK (now 13%) has more than doubled from the meagre remnants at the end of the First World War. Notwithstanding this increase in woodland area, we have witnessed catastrophic declines in our biodiversity, including many species which are specifically associated with woodland habitats. Since the 1970s planting rates of new woodland have declined steadily and, despite ambitious government targets for new woodland, it is unclear how further tree cover will be balanced with competing land uses.

Policies which encouraged plantations of non-native trees on around 40% of all ancient woodland sites have been disastrous for native woodland wildlife. Some wildlife losses are a result of changes in surrounding agricultural landscapes, where the environmental consequences of large scale uniformity, simplification of systems, and use of agri-chemicals were largely unforeseen. But the same uniformity of structure and species composition became a characteristic of an increasing proportion of woodland cover too. From the mid-1980s, the Broadleaves Policy began to take account of the impacts of non-native conifers on native and ancient woodland, and grant rates were increased to encourage more planting of native woodland.



Saul Herbert has been a senior conservation adviser at the Woodland Trust since 2017, and previously managed sites in Worcestershire and Herefordshire, delivering innovative approaches to the restoration of ancient woodland and historic wood pasture.

Christine Reid is the head of conservation at the Woodland Trust, particularly interested in effects of woodland management and creation methods on biodiversity at a landscape scale.

Woodland covers approximately **13%** of the UK, about half of which is non-native plantations.

Ancient woodland covers less than **2.5%** of the land area, around **40%** of which has been planted with non-native trees.

Softwood timber production is now at a peak, realising the huge investment made in planting in the 1960s and 70s. In 2018, 11 million tonnes of UK-grown softwood was delivered to saw-mills. And yet the UK remains the second largest importer of timber products in the world, exceeded only by China. The volume and diversity of biological material being shipped around the globe has increased exponentially; in conjunction with a changing climate this increases the likelihood of damaging pests and diseases becoming established in the UK. As such, tree health concerns have never been more prevalent.

In the last century, traditional forms of woodland management, such as coppicing, have nearly been eliminated (for commercial production at least), capacity to process native hardwoods has fallen in the last 20 years and over 40% of our native woodland now stands unmanaged¹. Challenges have arisen as management has faltered, such as uncontrolled growth of deer populations and the spread of invasive plants such as rhododendron.

We know more about the complex ecosystem that supports healthy tree growth, including soils, mycorrhizal fungi and saproxylic (deadwood-dependant) invertebrates. And we know more about the range of benefits that trees provide to people and wildlife, and their role in ecosystems: air quality and mitigation of pollution, carbon sequestration, water quality and flood risk, soil stability and nutrient cycles, and wellbeing, of both people and animals.

Among all stakeholders there is a sense that the original goals of the Forestry Act - to address the lack of a strategic timber reserve, which was later reframed as re-balancing timber imports - need an update to reflect the changed world and our enhanced understanding of it. Much of the focus for conferences and events taking place during the centenary year is looking ahead. So, what do we need and want the forestry sector to deliver and achieve over the next 100 years?

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To remain effective and relevant for another 100 years, forestry - the way we manage woods and trees - will need to address a range of new and emerging challenges and deliver a more complex range of benefits to people.



Strategically planted trees can mitigate flood risk

What next?

To remain effective and relevant for another 100 years, forestry - the way we manage woods and trees - will need to address a range of new and emerging challenges and deliver a more complex range of benefits to people.

Changing climate, tree diseases, invasive species and pests are presenting new challenges which could not have been imagined a hundred years ago. Creating resilient treescapes, in which wildlife can thrive and recover from the impacts of extreme weather and disease events, is key to addressing these issues.

Success should not just be measured in timber volumes, but in the contribution to carbon sequestration, management of flood risk and water quality, provision of recreation and contribution to people's health and wellbeing, and critically to sustaining biodiversity and supporting nature's recovery.

To deliver such a complex suite of outcomes under such challenging conditions forestry needs to adapt and change.

Firstly, the separation of woods and trees is an artificial construct; a consequence of forestry systems and doesn't reflect how landscapes function. A more holistic view of stewardship and management of woods and trees at landscape scale can bring multiple benefits, broadening the scope of forestry to encompass trees outside woods, urban trees and trees and woods integrated into farming systems.

We need to take a more 'nature-led' approach to managing woods and trees. Learning from, and making space for natural processes, such as natural regeneration of native trees, more natural age structures, pollination, seed dispersal and the natural dynamics of changing composition, rather than seeking to impose uniform structure on woodland. We need a renewed emphasis on protecting and restoring ancient woodlands, because of what these native ecosystems can teach us about resilience.

Foresters have understood for decades the need to match tree species to local soil and site conditions, however to develop long-term resilience we need to understand the ecological function of any species promoted or introduced for timber production. We need to understand the wildlife that each tree species can directly support, and also its traits and characteristics: shade tolerance, response to competition, role in nutrient cycles, impact on hydrology, soil structure and chemistry. Only with this deeper understanding can we appreciate the impact of species choice on woodland ecosystems and make better decisions.

Such information could be used, for example, to mitigate the loss of ash trees from ash dieback. Research by Natural England² revealed that a small suite of native tree species can support wildlife associated with ash and replicate the particular functions and traits of ash, with its nutrient-rich rapidly decaying leaf litter and relatively high bark pH. This illustrates the need for an informed and considered response, rather than any simplistic notion that widening the range of tree species used in forestry systems will increase ecological resilience, and of the importance of research to inform good decision-making in the forestry sector.

Delivering resilient treescapes will require all woodland managers to look outwards, beyond their woods and beyond immediate production goals. We will need a broader range of knowledge and skills; of ecology, hydrology, people management and collaborative working.

Critically, it will require society and policy makers to start to attach meaningful value to all of the benefits that woods and trees provide for people and wildlife, and reward and incentivise landowners and managers for delivering these benefits.

1. Forestry Commission, 2018. *Forestry Statistics 2018: A compendium of statistics about woodland, forestry and primary wood processing in the United Kingdom*, UK: IFOS-Statistics.

2. Mitchell, R.J., Broome, A., Harmer, R., Beaton, J.K., et al. 2014 *Assessing and addressing the impacts of ash dieback on UK woodlands and trees of conservation importance (Phase 2)*. Natural England Commissioned Reports, Number 151.



Paul Glendell/WTTML



Wood Wise update

Latest happenings in tree and woodland conservation



Ross Watson

If you know of twinflower patches in the North Highland Area, please contact Ross Watson, rosswatson@woodlandtrust.org.uk

Twinflower translocated

- Ross Watson, site manager for North Scotland

Ledmore & Migdale, a Woodland Trust site in the North Highlands of Scotland, has been identified as a suitable and sustainable location for the rare twinflower, *Linnaea borealis*. Once thought to be far more widespread, it is now a rare find in the pine woods of the Highlands.

Now reduced to just 18 isolated patches spread across a large geographical area, twinflower is under threat from reducing light from a thickening canopy, overgrazing, or competing vegetation shrinking the suitable area. If you are lucky enough to stumble upon an isolated patch, which may be many metres across, it is almost always a single clone, unable to produce seed and growing in a carpet if conditions allow.

To give this charismatic little plant a chance, a dedicated group called the North Highland Twinflower Project are translocating material from all identified clones into suitable woodlands.

At Ledmore & Migdale five new patches were planted in January, with material representing five of the clones. Once these have established, the patches will be topped up, with representation of the remaining clones being planted up to the end of 2020. The patches have been intentionally planted near a path, ensuring monitoring can be done easily, but also so they can be used to tell the public about restoration of the woodland, the importance of connected habitats, and the work of conservation organisations across the North Highlands.



Committee on Climate Change calls for massive woodland expansion

– Dr Nick Atkinson, senior conservation advisor

The Committee on Climate Change, which advises UK Government on meeting carbon reduction targets, published a report in November 2018 looking at the complex issue of land use over the coming decades. Anticipating changes in agriculture, particularly in the uplands, the report recommends a rapid large-scale increase in the UK's woodland area from the current level of around 13% to a total of 19%.

While this would still leave the UK as one of the least wooded countries in Europe, the scale of increase required is mind-bending; to reach 19% woodland cover by 2060 would require the creation of almost 50,000 hectares, one third the area of London, every single year. Put another way, that's 75 million trees annually.

This highlights the need for a clear narrative for woodland creation, how much is needed and more importantly how much is realistically achievable.



Richard Becker/WTML

Research update

- Dr Christine Tansey, research and evidence coordinator

Poster prize for WT researcher:

In December 2018, Justin Byrne, our woodland soils PhD researcher from Newcastle University, presented his work at the British Ecological Society's Annual Meeting, a gathering of 1200 ecologists.

We are delighted to report that Justin was the winner of the 2018 Student Poster prize.

Investigating mycorrhizae:

In early 2019 we started working with Tim Peters, a doctoral researcher from Bangor University. He is summarising the myriad benefits of mycorrhizae, and why this matters, from impacts on the carbon storage of forests to tree health.

Research prospectus:

Hot off the press is our newly published Woodland Trust Conservation Research Prospectus, which outlines our research interests across five major themes. Find out more and download at: www.woodlandtrust.org.uk/research



Just launched!

A new web-based support tool for woodland managers, agents and advisers, the Woodland Wildlife Toolkit, provides advice on woodland management that benefits species which are currently in decline. Visit the website at www.woodlandwildlifetoolkit.org.uk to find out which important species may be present at a site, download species factsheets and obtain practical advice to assess your wood's condition.

UK's rarest bumblebee found at Woodland Trust site

- Claire Inglis, assistant site manager for Kent

Late last summer the UK's rarest bumblebee, the shrill carder bee, *Bombus sylvarum*, was recorded at Victory Wood, a Woodland Trust-owned site since 2004.

So named because of its high-pitched buzz, this species is now only found in fragmented communities at a few sites in southern Wales and England. Due to its late emergence from hibernation and specialist feeding habits (requiring long tubular flowers) the population has been heavily impacted by both the early cutting and general loss of flower-rich meadows. The semi-natural open ground habitat present within Victory Wood is perfect for this and many other invertebrate, bird and plant species.

The UK government is committed to taking action in relation to bee advocacy and addressing pollinator decline, and both national and local initiatives are steadily gaining momentum. The Bumblebee Conservation Trust are currently coordinating the ambitious project 'Making a buzz for the coast', which aims to restore bee-friendly habitat along the Kent coastline. Located just over 2km from the north Kent coast, Victory Wood sits within a key range for monitoring rare bumblebees.

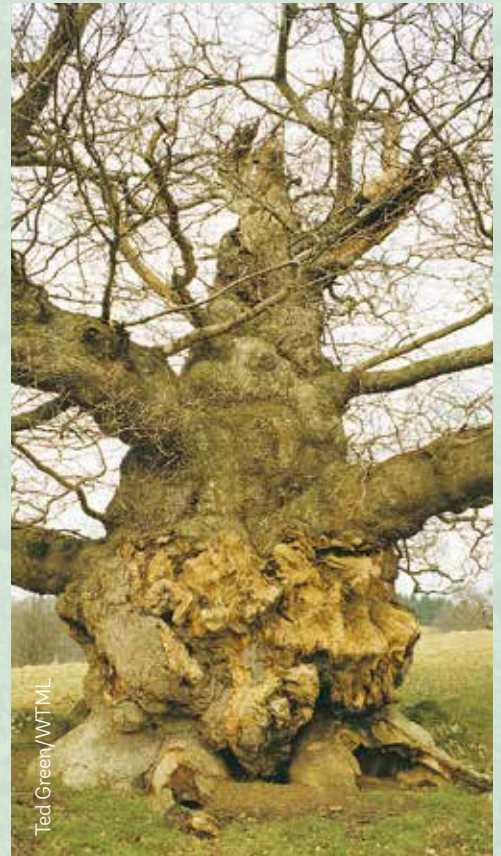
This year, experienced wildlife monitors will help record habitat and species diversity at Victory Wood. These volunteers will be offered additional training in bee identification, ecology and survey methodology to contribute data to the Bumblebee Conservation Trust project. Botanical surveys will also take place during early, mid- and late flight season to identify the wildflowers that are most readily used for foraging. The information gathered will help inform how to best manage the open ground habitat for bees, while safeguarding a potential stronghold for rare species such as the shrill carder bee.

For more information see:

www.bumblebeeconservation.org/making-a-buzz-for-the-coast/

www.bumblebeeconservation.org/wp-content/uploads/2017/08/BBC037-Shrill-Carder-bee-Leaflet-02.17.pdf

Bumblebee Conservation Trust



Ted Green/WTML

Ancient oak tree, *Quercus* sp.

Stronger protection for ancient and veteran trees

- Kylie Harrison Mellor, citizen science officer

The revised National Planning Policy Framework (NPPF) provides stronger protection for ancient and veteran trees in England. With this protection comes an increased need to identify important trees and safeguard them for the future. The Ancient Tree Inventory, a partnership project between the Woodland Trust, Ancient Tree Forum and the Tree Register of the British Isles, provides an unparalleled resource, holding records of more than 170,000 ancient, veteran and notable trees around the UK. Records are added by members of the public or organisations and are verified by trained volunteers. The data is used in research to better understand the oldest trees in the UK and Natural England recommends that planners consult the inventory when assessing the impacts of developments.

Go to <https://ati.woodlandtrust.org.uk/>

Rot holes - deluxe fly hotels!

- Dr Robert Wolton of the Dipterists Forum and The Society for the study of flies (Diptera)

2019 is the International Year of the Fly! Learn about some tree-dwelling flies you may spot near you.

Over 1,800 species of invertebrate are known to be dependent on decaying wood in Britain. Yet, rot holes are often hard to find in many woods, either because the trees are too young or more often because older trees have been removed in the interest of commercial forestry or general tidiness. A veteran tree with rot holes and hollows cannot be replaced – its loss can be a catastrophe for this special fauna.

Such trees occur in many places: ancient deer parks, hedgerows and ancient pasture woodland where pollarding has created a bonanza of habitat for rot hole inhabitants. Similar habitat also occurs in many street trees, where regular cutting has speeded up the aging process. So, although many of the most charismatic denizens may be seen in special places, there are lots of opportunities for them in a tree not far from you!

A number of large charismatic species develop in rot holes. Some are comparatively rare but there are some very common ones too. Everybody should be able to find the batman hoverfly, *Myathropa florea*, which can be seen in urban gardens. Its larvae live in water-filled rot holes, relying on long breathing tubes. The adults have a pattern of grey marks on the thorax that resembles the batman logo. Other rot hole specialists include *Pocota personata*, which is a remarkably good white-tailed bumblebee mimic. If you see what appears to be a bumblebee exploring rot holes at the base of trees, especially beech, double check that it's not this special fly.

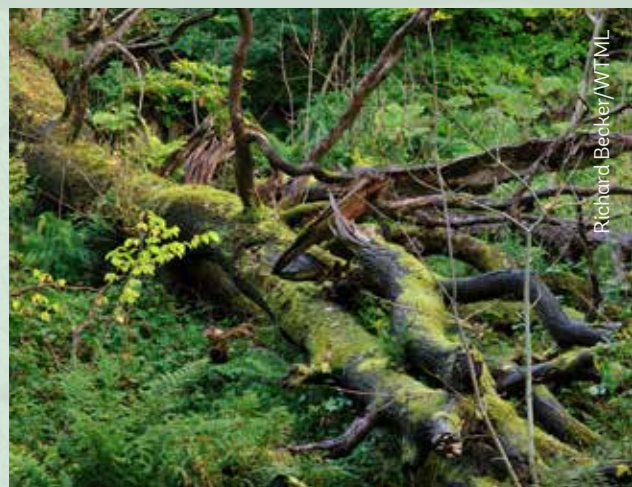
Many rot hole species are equally spectacular. Comb-horned craneflies are large and day-flying, and are among the most exotic looking of all our insects; most are banded yellow and black or red and black. They look dangerous but in reality they are completely harmless. Their larvae, or leatherjackets, develop in wet wood, often of a porridge-like consistency, as found in rot holes. They are excellent indicators of high quality habitat for the conservation of saproxylic (decaying wood) insects. The wasp-banded comb-horn, *Ctenophora flaveolata*, is aptly named since it looks very wasp-like in flight. It used to be regarded as a great southern rarity but in recent years it has been seen in a wide scatter of sites across England and Wales.

A few Caledonian pinewoods in Scotland are host to the critically endangered pine hoverfly, *Blera fallax*. A conservation partnership including Scottish

Natural Heritage, RSPB, Cairngorms National Park and Forestry Commission Scotland, are working hard to keep this species going, by creating new artificial rot holes and by captive breeding of adults. Rot hole re-creation in pine stumps further south has also revealed the presence of another pine speciality, *Callicera rufa*, in places it was previously unknown. This success points to action that can be taken to help conserve rot hole species across the country: artificial habitat creation. Can you help by making sure wildlife managers and tree officers fully appreciate the value of trees with rot holes in them?



Batman hoverfly, *Myathropa florea*



Over 1,800 species of invertebrate are known to be dependent on decaying wood

Wood Wise



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