SEEING THE WOOD FOR THE TREES

Is coppicing really good for woodland wildlife? Is conifer afforestation always bad for nature conservation? CLIVE HAMBLER and MARTIN R. SPEIGHT challenge some current priorities and values in woodland conservation.

For anybody involved with international conservation, the management of Britain's woodland should be a cause for concern. Not because we have any really important forests left – we don't – but because of the signals our management strategies send overseas. How does one explain to a Malaysian student that a road created in a nature reserve in England to extract timber is a good thing, whilst one in Malaysia is not? How does one convince visitors from overseas that they should not chop down or disturb their own ancient forests, when not only have we removed most of Britain's, but we continue to advocate rotational felling of what remains?

Our ancestors in Britain did as good a job of exterminating wildlife as today's slash-and-burn farmers are doing in the rainforests – but with the very important difference that tropical forests often contain endemic species at risk of *global* and permanent extinction, whereas the glacial cycles of temperate regions left only relatively mobile and widespread species in our forests. Why then do management systems that persist in cutting trees down (such as coppicing) win favour with some conservationists, whilst others that involve planting trees (such as conifers) invoke protest from many of the same people? We will explore some of these issues in brief here, whilst a fuller explanation of the philosophy and ecological processes can be found in Hambler & Speight (1995).

The fundamental problem of British forestry is that there is not enough forest. A mere tenth of our land is covered by woodland. Of this a pathetic 1.5 per cent is ancient, even less is primary, and none is natural. What little coverage there is has become important to different people for different things, and there are controversies over what we should do with almost any fragment. Many of the disputes between conservationists of different types, and between conservationists and the forestry industry, could be resolved if there were much more forested land. However, the total amount of ancient woodland that exists is finite, and doubtless intense debate would continue over the management of these areas even if the forested area were increased.

Two issues raise particularly strong feelings. Coppice management, which all but died out 50 years ago, may make a comeback – with many conservationists arguing for and against it. Conifer plantations, in contrast, are generally met with hostility around Britain, and are the poor relations of broadleaves both in terms of incentives to plant them and in perceived wildlife value. We suggest that these issues are related, and that the traditional conservationist's impressions of these land uses are counter-productive to serious wildlife protection and enhancement.

THE FALL OF BRITISH FORESTS

The pollen record shows that a relatively continuous wildwood existed before forest clearance began in Britain. There would have been some gaps in the wildwood, caused by topography, rivers, beavers, grazers, fire, treefall and other factors. These openings were on different scales, but they were always a small proportion of the forest. The species which lived in the gaps had to be mobile, to find new habitats as gaps came and went through natural processes. When a new gap arose, these species often had to breed fast in order to colonise it and disperse before the gap closed. In contrast, the species living in the closed matrix of the wildwood had little need to move far, or grow fast, or breed fast. Their resources surrounded them. Through evolutionary time their specialisations to dark, cool, damp habitats had become so great that they were unable to live in forest gaps, which were the domain of the "early successional" or gap-tolerant species.

People changed the wildwood irreversibly. The large mammals were mostly exterminated by hunting and loss of sufficiently extensive habitat, and with them went specialist species that depended on them. The forest was fragmented to less than a tenth of its area – sufficient perhaps to have condemned to local extinction half of its species, to judge by the very general relationship between island area and species numbers. The losses due to fragmentation (known as "relaxation" of the community) may still not be fully apparent. Moreover, as Professor J.H. Lawton has pointed out, "metapopulation theory" suggests that many species may be as good as extinct now – but they just don't know it. Metapopulations are populations formed by groups of transient small populations, which are linked and created by dispersal. Therefore, removing even apparently empty habitat patches can threaten some species – particularly poor dispersers – by robbing them of potential new homes. Even some of the forest insects which managed to survive to Roman times are now extinct, and such extinctions continue, with many species in the British Red Data books being endangered or not seen in recent decades.

In the forests that survived – which are so small they should perhaps all be called woods – the assault continued. Old timber was repeatedly removed, and in some there has been a continuous absence of such habitat for thousands of years. To the species of bird, lichen, spider or insect that require old trees, coppiced woodland was as hostile as farmland. Some such species survived in remote forest relicts, wood pastures, riverside pollards and other sites where there was different short-term traditional exploitation. Even here, some are now threatened by acid rain.

In the wildwood about half the timber would be dead or dying. This is one of the

Recent coppice in Oxfordshire, with biomass ready for burning or removal. Only tough species can survive the coppice cycle.

most fundamental resources for forest species (Elton 1966). It is timber that makes a forest, not open ground and herbs. It is the species that depend on timber and trees, and on the humid microclimate they create, that are the true inhabitants of the bulk of the British Isles. We shall call such species forest or woodland specialists. Such species are the norm in rainforests, and in Europe many of them survive only in sites such as Białowieza – which also retains its bison, other large mammals, and relatively natural assemblages of birds.

THE RISE OF TOLERANT SPECIES

We know that in the Americas forest birds decline when forest is fragmented, and that a new community of tough, generalist species usurps them. The impact of generalists increases as forest size decreases and forest edge increases (eg, Soulé 1986). In Britain, we will perhaps never know if we lost sensitive forest species through fragmentation effects – some woodpeckers, perhaps?

We suggest that at a smaller scale the process continues, with invertebrate species which require large woodlands continuing to go extinct. Moreover, such species will be rarer on the edges of woods and near paths and clearings. For example, Dr Philip Sterling and ourselves have found that a number of leaf-mining insects on hawthorn are rarer on the edges of coppice blocks, and even more so in open, recently coppiced areas. In repeatedly creating gaps, rotational management such as coppicing may perennially exclude forest species – whilst benefiting a range of tough species which were originally very scarce in Britain.

THE ROLE OF COPPICING

Rotational felling of woodland has been carried out on some sites for thousands of years. A balance may be achieved where the yield from such a system depends on the rate of nutrient replacement – through rainfall, nitrogen fixation and other inputs. Not surprisingly, people have come to see coppicing as a "sustainable" harvesting system, "in harmony" with wildlife. Perhaps it could even be a model for other nations? But people have short memories, and have no knowledge of what they are missing unless they can see the alternatives.

When part of a wood is coppiced, people very soon forget the complexity and wildlife that was there, and see mainly the new growth of bluebells and anemones (or, much more likely these days, nettles, bramble or other smothering species). When one sees a rainforest felled and replaced by open ground, it is almost impossible to picture it again without looking at an area which is still covered in forest. It is all too easy to start to feel that the area normally looks open, and that the regrowth is the change. Moreover, the wildlife of deep woodland is very hard for people to see, as anyone who has been in primary rainforest can confirm. Forest wildlife has often evolved to *avoid* being seen.

Neglected coppice can support many invertebrates – and flowers in the glades. The longer coppice is neglected the more valuable to wildlife it becomes.

To understand coppicing, we suggest, one should not look at coppice woodlands but at non-coppice woodlands. It is vitally important to attempt to see what was there before coppicing, and what might be there without coppicing. Only then can the current wildlife value of coppice be defined.

Those woodlands which were not coppiced contribute to Britain's internationally important lichen communities, particularly in the west where there is clean, moist and warm air from the Atlantic. The woodlands which were not coppiced also support most of the notable sites for deadwood feeding (saproxylic) insects (Harding & Rose 1986; Sterling 1988; Sterling & Hambler 1988; Speight 1989; Harding & Alexander 1993). Again, Britain is most notable for its species of damper woodlands (McLean & Speight 1993).

ARE THERE BENEFITS TO COPPICING?

Open coppice woodland may in a few respects mimic the natural gaps in the wildwood, and species which used gaps may have survived in such habitats to the present day. However, it is impossible to find species living in coppice woodland which do not survive elsewhere: remember, these are the tough and adaptable species. Contrary to popular statements, no species on Earth depends on coppicing. For example, some so-called "woodland butterflies" (Warren 1995), including the pearl-bordered, small pearl bordered and heath fritillaries, have alternative habitats; their adaptability and mobility has allowed them to be widespread or common in Europe – on heaths, railway cuttings, and even up mountains!

Woodland flowers may create a pretty picture in *regularly* coppiced woods, but generally do not die out and indeed may be more abundant in neglected ones (Simpson 1989). If we want to garden some of our woodlands for such species, so be it – but let us not pretend these are representative of most woodland inhabitants (Hambler 1994).

However, after coppice has been neglected for some years, it may be hard to gain even these limited benefits. Butterflies, mobile as they are compared to many saproxylic species, may not recolonise unaided. The woodland plants may be smothered by nettles and bramble since, in the absence of regular harvesting of the biomass, soil nutrients have built up – and these competitive species love them! Only after many coppice cycles, and possibly re-introductions, might woodlands be as they were in our grandparents' days. Can such repeated intervention be justified, or planned for, in a changing economy?

COPPICING AND JOBS

If one accepts that coppicing is not wholly beneficial to wildlife, then it is very disturbing to see an industry developing which may increase the amount of coppice woodland (eg, Edwards *et al.* 1993). What if jobs are created for new markets, and then conservationists or the public lose confidence in this management? We could end up with jobs versus wildlife controversies.

A common defence of coppicing is that the total area now under coppice is low, so we need more to increase habitat diversity, and it will not do much harm even if it is not always good management. We suggest it muddies conservation philosophy to condone a suspect management on nature reserves on the grounds that there is not much of it going on! Coppicing is not natural, and should be justified first, before it is undertaken anywhere, on any scale and particularly on nature reserves.

It is also regrettable that the energetically wasteful cooking process of barbecuing, already injuring mangrove and other really important habitats, may increase the markets for coppice products in Britain (Dewis 1994/5). We must encourage a decline of mangrove abuse, but shouldn't we encourage less barbecuing, not more coppicing?

Fuelwood plantations may provide an alternative to coppicing in ancient or more recent woodlands (EconoMatters 1994). Large-scale, short-rotation coppice, including exotics such as sweet chestnut, is a better use of land than set-aside to grassland: it is more like a forest than grassland, and some woodland species may use it. However, it is important to check that such sites do not become a sink for woodland species. Fuelwood, moreover, is dirty, dangerous and inefficient (Hambler 1990), and since the higher biomass of an area of neglected coppice stores more carbon than does active coppice, reinstatement of coppicing probably adds to the greenhouse effect.

EXOTIC SPECIES

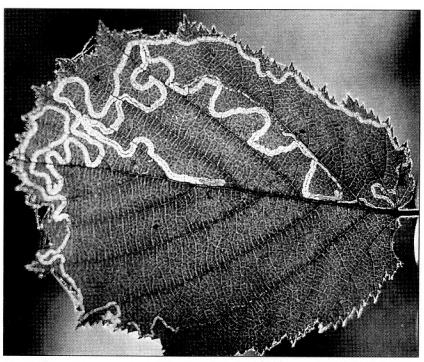
Plantations of exotic species, such as sweet chestnut or most conifers, arouse what we suggest is a naive negative response from conservationists. Monoculture seems contrary to most peoples' idea of diversity, yet natural habitats are often monocultures. We do not know how much of Britain was under local natural monoculture. Much of Siberia, Scandinavia and north America is or was under monoculture. Many tropical forests are monocultures – eucalyptus or some mangrove stands, for example. Monoculture means lots of exactly the right habitat for some species, and this can mean lots of food for others. Diversity can be built on abundant simplicity. In Britain we must work hard to shed the image of conifer woodlands being poor for wildlife.

Sycamore is another interesting species (Binggeli 1994). It supports massive aphid densities – which Richard Woodburn has found to be used extensively by tits in Wytham Woods. Sycamore grows fast, rapidly creating some woodland conditions. It remains to be seen whether it can compete in the long term, or if it must be controlled to encourage other trees.

CONIFER WOODLANDS

Natural conifer woodlands occurred both in Scotland and, to an extent which is not yet clear, in England. Many species use conifers, and many of these can also use broadleaf trees. What matters to them is that a tree is a rigid structure with a lot of surface area, providing biomass and cover. "Exotic" conifers, such as Norway spruce, support similar communities to the "native" species (Ozanne 1991). Most of Britain's woodland wildlife can also be found on the European continent, some of it in Norway spruce. So bringing spruce to Britain reunited woodland species with a habitat they are well able to use. Indeed, Norway spruce was naturally here in the last interglacial, and might have got here in the end unaided by man: it is more of a "native" than some broadleaves.

Conifer plantations, of whatever species, are arguably more like natural forests than coppice woodland. They have high humidity, low light, low windspeeds, and lots of biomass per unit of land. Coppice, in contrast, is a peculiar form of scrub – suffering microclimatic stresses on a daily cycle, as well as on the cycle of the rotation. Conifers are criticised for their apparent paucity of ground-dwelling species – although can be surprisingly close to deciduous woodlands in richness and abundance. Because people can't easily see the richness of the canopy community, they are swayed by appearances near ground level. Moreover, how many people would defend the suggestion that beech should be replaced in its native range by less dense forests, just because it has as dark and "sterile" a ground-layer as a conifer plantation?



Leaf miners on hazel become more common when coppice is neglected

Theory and research suggest that the denser the conifers, the more wildlife there will be in the canopy; work by Drs Claire Ozanne, Andy Foggo and ourselves suggests that low light levels at ground level correlate with high biomass of arthropods such as insects and spiders in the canopy. The more cover, the more damp surface area for fungi which grow on the plant surface – and the biodiversity which eats them.

It may surprise people that some of the highest densities of wildlife per square metre on land, and some of the highest richness of species, are recorded from conifer woodland. Conifers can support several times the abundance of invertebrates on oak. They can also support more species of spider per square metre (but not per hectare!) than Malaysian rainforests (vun Chen, Speight & Hambler in prep.), or Kenyan agroforests (Mbai, Speight & Hambler in prep.) – or indeed most other tropical and temperate forests that have been sampled. It is a problem of public perception and education that such inconspicuous species are often deemed less worthwhile than the big, flashy species such as the butterflies.

It may be an even greater disappointment to conservation volunteers to know that the highest densities of canopy biodiversity yet recorded are in dwarf rhododendron monocultures in Japan (18,000 per square metre, Dr Hiroyuki Watanabe, pers. comm.). And remember, some rhododendron once occurred naturally in Britain . . .

So, dark and continuous habitats favour some wildlife. What then of many conservationists' favourite sunny habitats, like paths and clearings?

PATHS AND RIDES

Open habitats in woodlands are exploited by tough, gap-loving species. They are also useful to some stages of the true forest species – as nectar sources for some deadwood feeding beetles, for example. But they influence the woodland interior in ways that cannot be beneficial to deep-forest specialists: they make it drier, windier and lighter for some tens of metres from the edge. The narrower the path, the better for forest species – in contrast to the general dogma of wide rides. Power-lines and roads, creating tracts through forests in America, disturb woodland birds for tens or even hundreds of metres.

Paths and rides and clearings are fun for people. But people are not the only things to consider in conservation.

POSITIVE MANAGEMENT OF HABITATS

Woodlands in Britain can seldom be left entirely unmanaged, economically or for conservation. It is important to control the effects of the artificially influential deer species. It may be necessary to control other exotic species, such as grey squirrel and sycamore. It would be helpful to increase the dead timber content by injuring some trees (Speight 1989) (as in Moccas Park in Herefordshire), and importing dead wood from local sources. Reintroductions of less mobile animals, fungi and plants which used to occur on sites should be carefully considered (Speight 1989). And of course, a few sites should continue to be coppiced for their historic interest, their beautiful species and their scientific interest – but not for general biodiversity.

Positive restoration management should focus on expanding rare habitats, rather than on species. Management for locally "rare" species may carry some risks. Some such species may assume pest status if conditions change – as with the British Red Data Book species *Platypus cylindrus* in oak. Many of the "rare" species of the south of Britain, including the New Forest, are limited by temperature and could become as common as they already are in continental Europe under even slight global warming. Some rare species may disappear under climate change – not by going extinct but by becoming common!

AFFORESTATION OF OPEN SPACES

It is sad, but understandable, that there is so much opposition to planting trees. People want their open landscapes, their traditional and historic landscapes, and

their landscapes full of colourful, lively species.

We believe it will be a matter of education, and a slow process, to encourage a change in attitudes. When we take masters degree students from many nations to the Lake District or the South Downs, on field trips in environmental science, they are struck with the peculiarity of the British obsession with holding forest in check – for example through grazing, scrub-clearance or coppicing. British attitudes make little sense in the present international climate of declining forests (and the need for carbon dioxide stores). We must overcome the attitude that forests are hostile places: as Paul Burke explains to visitors in the Lake District, phrases such as "we're not out of the woods yet" demonstrate the cultural conditioning that must be overcome.

It is possible to defend some open landscapes, up to a point. There may now be few ancient heathlands or grasslands in Europe, and what remain have merit aesthetically and scientifically. Yet preservation of more-or-less improved sheep pastures, or ex-arable land, as open space is less worthwhile.

Of course, internationally- and nationally-minded conservationists should vigorously obstruct tree planting in areas where trees were naturally scarce. The Flow Country is of massive significance to Britain, and of international renown. Afforestation here (or peat cutting) is as unethical as America or Australia felling old growth forest. Drainage and planting of wetlands generally is indefensible, given that wetland wildlife is in even more desperate straits than forest wildlife.

SYNTHESIS FOR THE FUTURE

People like open habitats. They like to see pretty things through open spaces. Plants, flowers, butterflies and a few other minority groups are similar to people, in that they communicate visually and often enjoy the sun. But we should not forget the species for which darkness is not just a habitat – it is essential.

In order to conserve the species of open habitats, the species of scrub and gaps (such as some "woodland" butterflies), and the more important true woodland specialists, we should aim for larger forest tracts in Britain. These should have fewer gaps, and gaps should be near the edges. The forests should be linked by broad corridors or chains of woodland patches, and managed as little as possible. There is no lower limit to the scale of this philosophy – it will be generally beneficial to expand even small woodlands. Missing species should be reintroduced when possible – perhaps including boar, wolves and beaver!

Such a view is not only idealistic, it is controversial. One can expect a hostile response from the conservation and landowning establishment if one suggests that existing management is dogmatic or inappropriate (see letters to *British Wildlife*, June 1995). Yet it is important to think more carefully about these issues, and to discuss them: the slow growth of trees, and the slow development of forest, suggest that mistakes made today may take decades or centuries to repair.

There are some signs of change: recent authors have accepted the call to clarify the aims of woodland management (Sterling & Hambler 1988), and to leave some areas unmanaged. We suggest that it is important to go even further towards making explicit the motivation for conservation: is it for aesthetics and recreation, or for sensitive biodiversity. It must be made clear that a site often cannot have both, and that zoned use of British forests is becoming important.

There are also signs of hope that the government at least is taking general biodiversity seriously (DoE 1994) – although much more funding is required for research and practice. We are relatively optimistic about forest conservation in Britain. If the ideal, well forested landscape is even partly met, we shall be on the road to reversing as far as is possible the damage our ancestors wrought on our landscape – and we shall be less out of tune with international efforts to save the biodiversity that really matters. As well as their value for people, woodlands are for the trees, and the species that really need them.

Recent coppice has very little structural diversity – species which inhabit it can usually be found in other habitats

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