

Indicators of ancient woodland

The use of vascular plants in evaluating ancient woods for nature conservation

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It is a useful rule of thumb that the older the habitat, the more species it will support. And the more species it supports, the greater, in general terms, will be the site's importance for nature conservation. Hence, in theory, it should be possible to use the number of species present as an indication of habitat quality. In practice, however, there are drawbacks. It is exceedingly difficult to find out how many species of, say, insects or fungi are present, and even small sites would require

many years to survey adequately. Mammals are too elusive, birds too mobile, and bryophytes or lichens often too difficult to identify to be useful indicators of habitat quality (with lichens the situation is confused by air pollution and by coppice management, which eliminates many lichens of mature trees and causes large fluctuations in light levels and humidity). The only really useful group, which is both relatively easy to locate and identify, is the vascular plants, that is the flowering plants,



Herb-Paris, Solomon's-seal and Dog's Mercury growing in an ancient woodland in southern England. Andrew Cleave/Nature Photographers

native conifers, ferns and fern-allies.

The use of vascular plants as indicators of habitat age had an immediate practical aim in the 1980s, when the Nature Conservancy Council (NCC), under Dr George Peterken, was required to identify ancient and semi-natural woodland in Britain, so that such woods could be given sympathetic treatment. Identifying ancient woodland is not so easy as it may sound, and, except in the rare instances where adequate documentation exists, and has been researched, the process is rather like a murder mystery, proceeding on the basis of clues and probabilities.

Ancient woodlands

How old is ancient? The chosen cut-off date, AD1600, around the time of the death of Queen Elizabeth I, is not entirely arbitrary. It marks the beginning of reasonably accurate estate maps, and also the first known widespread tree-plantings. Any wood known to exist in its present form by that date is almost certainly natural in composition even if it was heavily managed. In ecological terms, anything that happened before 1600 was in the 'Middle Ages'. The NCC's surveyors became experts on landscape ecology, local geography and

even local names, seeking serpentine ditches and banks, sunken lanes, old coppice compartments and other visible landmarks, and used the original works of Peterken and Oliver Rackham as their 'bibles'. Some of them probably ended up with a good working knowledge of how manors and estates were run in the distant past. However, most of these clues refer to a wood's *use* long ago, and not directly to its richness as an ancient habitat. For that, surveyors need biological clues, especially flowering plants and ferns, which most of them had been trained to identify.

Developing a workable approach

It has long been known that some woodland plants are restricted more or less to natural-looking woods, and that they are not speedy or effective colonisers of plantations and recent, secondary woodland. More than a century ago, the naturalist F Buchanan White recognised that the Caledonian pine forests of Scotland have a suite of plants, such as Twinflower *Linnaea borealis*, Creeping Lady's-tresses *Goodyera repens* or One-flowered Wintergreen *Moneses uniflora*, that are much less common outside relatively undisturbed woods. The conservation pioneers knew that certain trees, such as Small-leaved Lime *Tilia cordata* and Wild Service *Sorbus torminalis*, are normally associated with sites of high conservation interest, as are some woodland wild flowers, such as Herb-Paris *Paris quadrifolia*, Oxlip *Primula elatior* and Lily-of-the-Valley *Convallaria majalis*.

But such observations seemed to say more about the ecological limitations of the species concerned than about the nature and history of their woodland habitat. Besides, few plants, except for the very rarest, seemed to be strictly confined to seemingly old woods: Lily-of-the-Valley, for example, occurs also in moorland, and Wild Service and Small-leaved Lime are occasionally found in hedges.

The first detailed study of the plants of specially ancient woodland was carried out by Peterken (1974) in the native lime woods of Lincolnshire during the early 1970s, initially for the purposes of nature-reserve selection. By comparing the flora of known old woods with that of recent secondary ones, Peterken found that 62 out of about 174 species of woodland plant strongly preferred the former. Some species, and not just the scarcer

ones, were seldom found in any quantity outside the older woods, so that, if you saw Pendulous Sedge *Carex pendula*, Wood Spurge *Euphorbia amygdaloides*, Sweet Woodruff *Galium odoratum* or even Wood-sorrel *Oxalis acetosella* in this part of England, you were probably in ancient woodland, and seeing several of them in the same place practically guaranteed it. This does not necessarily hold true for these species in other parts of Britain, however. It might have been that Lincolnshire, with its dry climate and isolated woods, was a special case.

Studies of this kind take a great deal of time and effort. They require an unusual mixture of skills – many hours in the field coupled with documentary research for which few ecologists have acquired skills. The Government and universities are seldom willing to pay for such labour-intensive research, and so, until the 1980s, one was forced to extrapolate general principles from a few scattered sites. Most evidence for ‘ancient-woodland indicators’ was (and is) purely empirical (which is not to say that it is inaccurate).

Nonetheless, in a relatively well-recorded district, such as the NCC’s then South Region (Hants, Wilts, Oxon, Bucks and Berks), the concept seemed to have great potential for conservation evaluation. Consequently, the NCC’s Richard Hornby and I started to think about compiling a list of ancient-woodland vascular plants. We wished to restrict the list to species which showed a strong affinity for such places and which were, in our experience, typical members of botanically rich semi-natural woods. There were no absolutes or strictly objective methods for compiling the list. If the list were too short, it would lose its statistical validity. If it were too long, more ecologically tolerant species would begin to dilute its meaning. We investigated the published literature and sought the views of a number of experienced field botanists in the region. By 1978, we had refined the list to 120 species which either:

- a) seldom occur outside woodland, or
- b) even if they do, are nonetheless indicative of long continuity of woodland cover, or
- c) seem to be reliable indicators in at least part of the region.

Ultimately, any choice of species is a matter of personal opinion, and the proof of its value is whether it works in the field. The advantage of a



Wild Daffodils, Wood Anemones, Toothwort and the leaves of Ramsons growing in a Somerset woodland. Bob Gibbons

relatively short list is that it helps rapid assessment in the field, and enables one site to be compared more easily with another. Moreover, one can be more confident of finding more of the species present in a short list than those in a long one.

We had decided early on to omit extreme rarities, such as Red Helleborine *Cephalanthera rubra*, Ghost Orchid *Epipogium aphyllum* or (in

A display of Bluebells in a Dorset wood. Bob Gibbons





Very rare species, such as this Red Helleborine, were omitted from the main list of AWVPs. Andrew Branson

central southern England) Hay-scented Buckler-fern *Dryopteris aemula*, because the ordinary surveyor was unlikely to encounter them, and their occurrence in a particular wood might be the result of historical chance.

Subsequent fieldwork using the provisional list enabled us to refine it further, by transferring more of the scarcer plants to a separate list of rare vascular plants (see Table 1). Clearly, although their presence is very important when evaluating a wood for conservation purposes, only exceptionally does one find two or more rare plants in the same wood, and we felt that the main list would be easier to use without them. We were also able to remove species such as Common Figwort *Scrophularia nodosa* which experience showed were not particularly characteristic of ancient woodland in southern England. By adding a number of overlooked species, such as Barren Strawberry *Potentilla sterilis* and Bush Vetch *Vicia sepium*, we eventually happened on a round figure of 100 species of Ancient Woodland Vascular Plants (AWVPs) which we believe to be the most reliable indicators of ancient, botanically rich woodland in the South Region. Not everyone we consulted agreed on each and every species, but we believe the list (Table 2) to be as close as possible to a

consensus of botanical opinion.

The next step was to try to produce similar 100-species lists for the NCC's regions in south-west England, south-east England and East Anglia. I initially drafted lists of candidate species based on my data on woodlands from these areas. As before, the lists were then sent to prominent field botanists, asking for their views, and where necessary they were adjusted to achieve a consensus within the overall constraints of consistency of approach. One could undoubtedly refine them further if we adopted the finer scale of a county (when Cornwall, for example, would look very different from Dorset, though both are combined in the South-west Region). We did not do so, but we hope the exercise will encourage others to try.

On the separate lists of Rare Woodland Vascular Plants (RWVPs), shown in Table 1, South Region had the most with 39 species, followed by the South-east with 35 and the South-west with 26. We defined these plants as those either occurring in very few sites in the region (i.e. fewer than ten) or confined to a very localised area. Admittedly, it is not always clear where the line should be drawn, and some of our rare species might be quite faithful indicators of ancient woodland within the area in which they occur, for example Coralroot *Cardamine bulbifera* in the Chilterns or Fingered Sedge *Carex digitata* in the Cotswolds. Where rare species occur on a site, they are combined with the sum of the AWVPs to produce the total score.

Some results of using AWVP lists

We (Rose and Hornby) tested the usefulness of the South Region list by plotting the number of Ancient Woodland Vascular Plants against the full list of 450 woodland ('shade-casting' and 'shade-bearing') plants developed by the NCC for woods within two 10km squares (SU46 and SU56) in West Berkshire. The two variables consistently showed a strong positive correlation, indicating that a site with a high number of AWVPs will support a high number of woodland plants, and vice versa. Hence, our chosen indicators seem to work very well as a measure of species diversity. The best sites in South Region contain between 50 and 70 combined ancient and rare woodland species (Table 3). Perhaps not surprisingly, most are large woods of more than 100ha. The best 'sites' are Ebernoe Common, Sussex, Roydon

Table 1 The 52 woodland species listed below occur in fewer than ten sites in the former NCC's South-west (SW), South (S) or South-east (SE) Regions, or are confined to sites in a very restricted geographical area.

R = rare species in the Region, not included on the regional list of AWVPs.

* = species is included as an AWVP for that Region.

– = species does not occur in the Region.

		SW	S	SE			SW	S	SE
<i>Aconitum napellus</i>	Monk's-hood	*	R	–	<i>Hordelymus europaeus</i>	Wood Barley	–	*	R
<i>Arum italicum neglectum</i>	Italian Lord's-and-Ladies	R	R	R	<i>Hymenophyllum tunbrigense</i>	Tunbridge Filmy-fern	*	–	R
<i>Bromopsis benekenii</i>	Lesser Hairy-brome	–	R	R	<i>Hymenophyllum wilsonii</i>	Wilson's Filmy-fern	R	–	–
<i>Buxus sempervirens</i>	Box	–	R	R	<i>Hypericum montanum</i>	Pale St John's-wort	R	R	R
<i>Campanula latifolia</i>	Giant Bellflower	–	R	–	<i>Leucojum aestivum</i>	Summer Snowflake	–	R	–
<i>Cardamine bulbifera</i>	Coralroot	–	R	R	<i>Lilium martagon</i>	Martagon Lily	R	R	R
<i>Cardamine impatiens</i>	Narrow-leaved Bitter-cress	R	R	R	<i>Lithospermum</i>				
<i>Carex depauperata</i>	Starved Wood-sedge	R	–	R	<i>purpureocaeruleum</i>	Purple Gromwell	R	–	–
<i>Carex digitata</i>	Fingered Sedge	R	R	–	<i>Melittis melissophyllum</i>	Bastard Balm	*	R	R
<i>Carex elongata</i>	Elongated Sedge	R	R	R	<i>Monotropa hypopitys</i>	Yellow Bird's-nest	R	R	R
<i>Cephalanthera longifolia</i>	Sword-leaved Helleborine	–	*	R	<i>Myosotis sylvatica</i>	Wood Forget-me-not	R	R	R
<i>Cephalanthera rubra</i>	Red Helleborine	–	R	–	<i>Ornithogalum pyrenaicum</i>	Spiked Star-of-Bethlehem	R	R	–
<i>Chrysosplenium alternifolium</i>	Alternate-leaved				<i>Orobancha hederæ</i>	Ivy Broomrape	R	R	R
	Golden-Saxifrage	R	R	R	<i>Osmunda regalis</i>	Royal Fern	R	R	R
<i>Cynoglossum germanicum</i>	Green Hound's-tongue	–	R	R	<i>Phlegopteris connectilis</i>	Beech Fern	*	R	R
<i>Daphne mezereum</i>	Mezereum	–	R	R	<i>Physopermum cornubiense</i>	Bladderseed	R	R	–
<i>Dryopteris aemula</i>	Hay-scented Buckler-fern	*	R	*	<i>Phyteuma spicatum</i>	Spiked Rampion	–	–	R
<i>Epipactis leptochila</i>	Narrow-lipped Helleborine	R	*	R	<i>Platanthera bifolia</i>	Lesser Butterfly-orchid	R	R	R
<i>Epipactis phyllanthus</i>	Green-flowered Helleborine	–	R	R	<i>Polygonatum odoratum</i>	Angular Solomon's-seal	R	R	–
<i>Epipogium aphyllum</i>	Ghost Orchid	–	R	–	<i>Primula elatior</i>	Oxlip	–	R	–
<i>Equisetum hyemale</i>	Rough Horsetail	–	R	–	<i>Pyrola minor</i>	Common Wintergreen	R	R	R
<i>Euphorbia hyberna</i>	Irish Spurge	R	–	–	<i>Pyrola rotundifolia</i>	Round-leaved Wintergreen	–	–	R
<i>Fallopia dumetorum</i>	Copse-bindweed	R	R	R	<i>Sibthorpia europaea</i>	Cornish Moneywort	*	–	R
<i>Festuca altissima</i>	Wood Fescue	–	–	R	<i>Stellaria neglecta</i>	Greater Chickweed	R	R	R
<i>Gagea lutea</i>	Yellow Star-of-Bethlehem	R	R	–	<i>Tilia platyphyllos</i>	Large-leaved Lime	R	R	R†
<i>Geum rivale</i>	Water Avens	*	*	R	<i>Wahlenbergia hederacea</i>	Ivy-leaved Bellflower	*	R	*
<i>Gnaphalium sylvaticum</i>	Heath Cudweed	R	R	R					
<i>Helleborus foetidus</i>	Green Hellebore	–	R	R					

† Now known in many ancient coppices along the West Sussex chalk escarpment.

Woods, south Hampshire and Langley Wood, Wiltshire. Also very rich are the Wealden Edge Hangers of eastern Hampshire, really a string of connected small woods along 12 miles of an east-facing chalk escarpment (Gilbert White's Selborne lies in the midst of some of the richest woodland in the British Isles). More surprisingly, the Ancient and Ornamental Woods of the New Forest also score highly, despite their long history of grazing; their size and habitat diversity ensure that there are many pockets where grazing-sensitive ferns and flowers can survive.

Interestingly, the top sites are divided roughly equally between acid and calcareous soils, defying the naturalist's preconception that woods on the chalk are always richer. In fact, many of the chalk woods are rather uniform, particularly those on flat sites. Acid-clay woods, on the other hand, often contain flushes and pockets of waterlogged soil which support many additional plant species. Many AWVPs, such as Hard Fern *Blechnum spicant*, Bitter-vetch *Lathyrus linifolius* or Opposite-leaved Golden-saxifrage *Chrysosplenium*

oppositifolium, are rare on chalk or limestone. The richest woods are usually those on varied topography, often on inclines, which combine acid and lime-rich soils, with moist, heavy soils on the lower ground. Without this necessary diversity, even the most historically stable, undisturbed wood is unlikely to have a AWVP score exceeding 30.

On the other hand, chalk and limestone woods do form refugia for nationally rare plants, and it is interesting to speculate why this is so. Many of the AWVPs of acid soils are commoner in areas of high rainfall, where they are capable of growing in non-wooded habitats, and this must have assisted their survival. Those associated with the chalk, however, lack this ability to survive on wet ground outside woods, and are probably, therefore, more vulnerable to local extinction as a result of unfavourable management. That so many rare species survive in woods in the Chilterns and Cotswolds must be due at least partly to the greater density of ancient woods in those areas.

Our data from outside the South Region are

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Table 2 Ancient Woodland Vascular Plants in four regions of southern Britain. **SW** = south-west England (Cornwall, Devon, Somerset, Avon and Dorset); **S** = central-southern England (NCC 'South Region' – Hampshire, Wiltshire, Buckinghamshire, Berkshire and Oxfordshire); **SE** = south-east England (Kent, Surrey, Sussex, London and Hertfordshire); **EA** = East Anglia (Essex, Suffolk, Norfolk, Cambridgeshire).

Scientific name	Common name	SW	S	SE	EA
<i>Acer campestre</i> *	Field Maple	■	■	■	■
<i>Aconitum napellus</i>	Monk's-hood	■			
<i>Adoxa moschatellina</i>	Moschatel	■	■	■	■
<i>Allium ursinum</i>	Ramsons	■	■	■	■
<i>Anagallis minima</i>	Chaffweed			■	
<i>Anemone nemorosa</i>	Wood Anemone	■	■	■	■
<i>Aquilegia vulgaris</i> *	Columbine	■	■	■	
<i>Blechnum spicant</i>	Hard Fern	■	■	■	■
<i>Bromopsis ramosa</i>	Hairy-brome	■	■	■	■
<i>Calamagrostis canescens</i>	Purple Small-reed				■
<i>Calamagrostis epigejos</i>	Wood Small-reed	■	■	■	■
<i>Campanula latifolia</i>	Giant Bellflower				■
<i>Campanula trachelium</i>	Nettle-leaved Bellflower	■	■	■	■
<i>Cardamine amara</i>	Large Bitter-cress		■	■	■
<i>Carex laevigata</i>	Smooth-stalked Sedge	■	■	■	
<i>Carex pallescens</i>	Pale Sedge	■	■	■	■
<i>Carex pendula</i> *	Pendulous Sedge	■	■	■	■
<i>Carex remota</i>	Remote Sedge	■	■	■	■
<i>Carex strigosa</i>	Thin-spiked Wood-sedge	■	■	■	■
<i>Carex sylvatica</i>	Wood-sedge	■	■	■	■
<i>Carpinus betulus</i> *	Hornbeam		■	■	■
<i>Cephalanthera longifolia</i>	Sword-leaved Helleborine		■		
<i>Ceratocarpus claviculata</i>	Climbing Corydalis	■	■		■
<i>Chrysosplenium alternifolium</i>	Alternate-leaved Golden-saxifrage				■
<i>Chrysosplenium oppositifolium</i>	Opposite-leaved Golden-saxifrage	■	■	■	■
<i>Colchicum autumnale</i>	Meadow Saffron	■	■		
<i>Conopodium majus</i>	Pignut	■	■	■	■
<i>Convallaria majalis</i> *	Lily-of-the-valley	■	■	■	■
<i>Crataegus laevigata</i>	Midland Hawthorn		■	■	■
<i>Daphne laureola</i> *	Spurge-laurel		■	■	■
<i>Dipsacus pilosus</i>	Small Teasel	■	■	■	■
<i>Dryopteris aemula</i>	Hay-scented Buckler-fern	■		■	
<i>Dryopteris affinis</i>	Scaly Male-fern	■	■	■	■
<i>Dryopteris carthusiana</i>	Narrow Buckler-fern	■	■	■	■
<i>Elymus caninus</i>	Bearded Couch	■	■		
<i>Epipactis helleborine</i>	Broad-leaved Helleborine	■	■	■	■
<i>Epipactis leptochila</i>	Narrow-lipped Helleborine		■		
<i>Epipactis purpurata</i>	Violet Helleborine		■	■	■
<i>Equisetum sylvaticum</i>	Wood Horsetail	■	■	■	
<i>Euonymus europaeus</i>	Spindle	■			■
<i>Euphorbia amygdaloides</i>	Wood Spurge	■	■	■	■
<i>Festuca gigantea</i>	Giant Fescue	■	■	■	■
<i>Frangula alnus</i>	Alder Buckthorn	■	■	■	■
<i>Gagea lutea</i>	Yellow Star-of-Bethlehem				■
<i>Galium odoratum</i>	Sweet Woodruff	■	■	■	■
<i>Geum rivale</i>	Water Avens	■	■		■
<i>Gnaphalium sylvaticum</i>	Heath Cudweed				■
<i>Helleborus viridis</i> *	Green Hellebore	■	■	■	■
<i>Holcus mollis</i>	Creeping Soft-grass	■	■	■	
<i>Hordelymus europaeus</i>	Wood Barley		■		
<i>Hyacinthoides non-scripta</i>	Bluebell	■	■	■	■
<i>Hymenophyllum tunbrigense</i>	Tunbridge Filmy-fern	■			
<i>Hypericum androsaemum</i>	Tutsan	■	■	■	■
<i>Hypericum pulchrum</i>	Slender St John's-wort	■	■	■	■
<i>Ilex aquifolium</i>	Holly	■	■	■	■
<i>Iris foetidissima</i>	Stinking Iris	■	■	■	■
<i>Lamium galeobdolon</i>	Yellow Archangel	■	■	■	■
<i>Lathraea squamaria</i>	Toothwort	■	■	■	
<i>Lathyrus linifolius</i>	Bitter-vetch	■	■	■	■ (Ex only)
<i>Lathyrus sylvestris</i>	Narrow-leaved Everlasting-pea	■	■	■	
<i>Luzula forsteri</i>	Southern Wood-rush	■	■	■	
<i>Luzula pilosa</i>	Hairy Wood-rush	■	■	■	■
<i>Luzula sylvatica</i>	Great Wood-rush	■	■	■	■

<i>Lysimachia nemorum</i>	Yellow Pimpernel	■	■	■	■
<i>Maianthemum bifolium</i>	May Lily				■ (Nf only)
<i>Malus sylvestris</i> *	Crab Apple	■	■	■	■
<i>Melampyrum cristatum</i>	Crested Cow-wheat				■
<i>Melampyrum pratense</i>	Common Cow-wheat	■	■	■	■
<i>Melica uniflora</i>	Wood Melick	■	■	■	■
<i>Melittis melissophyllum</i>	Bastard Balm	■			
<i>Milium effusum</i>	Wood Millet	■	■	■	■
<i>Moehringia trinervia</i>	Three-veined Sandwort	■	■	■	■
<i>Myosotis sylvatica</i> *	Wood Forget-me-not				■
<i>Narcissus pseudonarcissus</i> *	Wild Daffodil	■	■	■	■
<i>Neottia nidus-avis</i>	Bird's-nest Orchid	■	■	■	■
<i>Ophrys insectifera</i>	Fly Orchid				■
<i>Orchis mascula</i>	Early Purple Orchid	■	■	■	■
<i>Orchis purpurea</i>	Lady Orchid			■	
<i>Oreopteris limbosperma</i>	Lemon-scented Fern	■	■	■	■
<i>Oxalis acetosella</i>	Wood-sorrel	■	■	■	■
<i>Paris quadrifolia</i>	Herb-Paris	■	■	■	■
<i>Phegopteris connectilis</i>	Beech Fern	■			
<i>Phyllitis scolopendrium</i> *	Hart's-tongue	■	■	■	■
<i>Pimpinella major</i>	Greater Burnet-saxifrage			■	■
<i>Platanthera chlorantha</i>	Greater Butterfly-orchid	■	■	■	■
<i>Poa nemoralis</i>	Wood Meadow-grass	■	■	■	■
<i>Polygonatum multiflorum</i>	Solomon's-seal	■	■	■	
<i>Polypodium vulgare (sensu lato)</i>	Polypody (all species)	■	■	■	■
<i>Polystichum aculeatum</i>	Hard Shield-fern	■	■	■	■
<i>Polystichum setiferum</i>	Soft Shield-fern	■	■	■	■
<i>Populus tremula</i>	Aspen	■	■	■	■
<i>Potentilla sterilis</i>	Barren Strawberry	■	■	■	■
<i>Primula elatior</i>	Oxlip				■
<i>Primula vulgaris</i> *	Primrose	■	■	■	■
<i>Prunus avium</i>	Wild Cherry	■	■	■	■
<i>Prunus padus</i>	Bird Cherry				■
<i>Pulmonaria longifolia</i>	Narrow-leaved Lungwort	■	■		
<i>Pulmonaria obscura</i> †	Suffolk Lungwort				■ (Sf only)
<i>Quercus petraea</i> *	Sessile Oak	■	■	■	■
<i>Radiola linoides</i>	Allseed			■	
<i>Ranunculus auricomus</i>	Goldilocks Buttercup	■	■	■	■
<i>Ribes nigrum</i> *	Black Currant		■	■	■
<i>Ribes rubrum</i> *	Red Currant	■	■	■	■
<i>Rosa arvensis</i>	Field-rose	■	■	■	
<i>Ruscus aculeatus</i>	Butcher's Broom	■	■	■	■
<i>Sanicula europaea</i>	Sanicle	■	■	■	■
<i>Scirpus sylvaticus</i>	Wood Club-rush	■	■	■	
<i>Scutellaria minor</i>	Lesser Skullcap			■	
<i>Sedum telephium</i>	Orpine	■	■	■	■
<i>Serratula tinctoria</i>	Saw-wort		■	■	
<i>Sibthorpia europaea</i>	Cornish Moneywort	■			
<i>Solidago virgaurea</i>	Golden-rod	■	■	■	
<i>Sorbus (microspecies)</i>	whitebeam (microspecies)	■			
<i>Sorbus aucuparia</i>	Rowan				■
<i>Sorbus torminalis</i>	Wild Service Tree	■	■	■	■
<i>Stachys officinalis</i>	Betony	■	■	■	■
<i>Stellaria neglecta</i>	Greater Chickweed				■
<i>Tamus communis</i>	Black Bryony	■	■	■	■
<i>Tilia cordata</i> *	Small-leaved Lime	■	■	■	■
<i>Ulmus glabra</i>	Wych Elm	■	■	■	■
<i>Vaccinium myrtillus</i>	Bilberry	■	■	■	
<i>Veronica montana</i>	Wood Speedwell	■	■	■	■
<i>Viburnum lantana</i>	Wayfaring-tree				■
<i>Viburnum opulus</i> *	Gelder Rose	■	■	■	■
<i>Vicia sepium</i>	Bush Vetch	■	■	■	■
<i>Vicia sylvatica</i>	Wood Vetch	■	■	■	
<i>Viloa odorata</i>	Sweet Violet				■
<i>Viola palustris</i>	Marsh Violet	■	■	■	
<i>Viola reichenbachiana</i>	Early Dog-violet	■	■	■	■
<i>Wahlenbergia hederacea</i>	Ivy-leaved Bellflower	■		■	

*Consider these species only if they occur well within the wood and do not appear to have been planted. † Found in only a small area at present but may have been overlooked.

Table 3 The richest sites for Ancient Woodland Vascular Plants in NCC South Region plus Sussex and Kent (based mostly on data collected for Hornby & Rose 1987).

	Area (ha)	Status	AWVPs	Rare VVPs	Total	Broad geological type
Upper Greensand Hangers, Hants	200+	pSSSI	74	1	75	Upper Greensand
Roydon Woods, Hants	299	SSSI/CWT	74	0	74	Clay/gravels/sands
Ebernoe Common + adj. woods, Sussex	c.100	SSSI/CWT	73	0	73	Weald Clay
Wealden Edge Hangers, Hants	238	NNR/CWT	64	6	70	Chalk
Langley Wood, Wilts	200	SSSI/NNR	69	1	70	Clay/gravels
Bix Bottom (Warburg Res), Oxon	105	CWT	62	6	68	Chalk
Butter Wood, Hants	135	SSSI	68	0	68	Clay/Reading Beds/Chalk
Covert Wood, Kent	350	SSSI	66	1	67	Chalk/Clay with flints
Pamber Forest, Hants	500	CWT	65	1	66	Clay/Bagshot Beds
Boulsbury Wood, Hants	212	S.25	65	0	65	Chalk/Reading Beds
New Forest A&O, Hants	3640	SSSI	59	4	63	Clay/gravels/sands
Wytham Wood, Oxon	426	SSSI	61	1	62	Limestone
The Mens, Sussex	c.150	SSSI/CWT	61	0	61	Weald Clay
Scords Wood, Kent	c.70	SSSI/NT	58	2	60	Lower Greensand
Cranborne Chase, Wilts	680	SSSI	57	2	59	Chalk
Bisham Woods, Berks	134	SSSI	53	5	58	Chalk
Challock Woods, Kent	c.600	SSSI	56	2	58	Chalk plateau/ clay
Bredhurst Hurst, Kent	c.200	SSSI	55	2	57	Chalk plateau/ clay
Ham Street, Kent	97	NNR	57	0	57	Weald Clay
Darenth Wood, Kent	c.126	SSSI	55	1	56	Chalk/Tertiary sands/gravels
Bradley Woods, Wilts	50	SSSI	53	2	55	Gault clay
Great Ridge Wood, Wilts	c.500	SSSI	52	2	54	Chalk
Bowdown and Chamberhouse Woods, Berks	67	CWT	52	2	54	Clay/Bagshot Beds
Denge Woods, Kent	c.600	SSSI/CWT	52	1	53	Chalk plateau and valley
Alkham Valley, Kent	145	SSSI	50	2	52	Chalk valley
Farmingham Wood, Kent	71	SSSI	51	1	52	Tertiary sands/clays/gravels
Pitt-Ileden Wood, Kent	100	SSSI	49	2	51	Chalk plateau
Sheephouse Copse, Hants	40	SINC	50	1	51	Chalk
Great Crabbles Wood, Kent	c.33	SSSI	50	0	50	Chalk/Tertiary sands
Brasenose Wood, Oxon	46	SSSI	49	0	49	Clay
Idehurst Copse, Sussex	c.40	SSSI	48	0	48	Weald Clay
Bridlesford and Firestone Copses, IoW	160	SSSI	48	0	48	Clay
Longleat High Wood, Wilts	c.20	pSSSI	48	0	48	Gault clay
Catland, Foster's and Dock Copses, Hants	36	pSSSI/LNR	48	0	48	Clay
Wychwood, Oxon	521	NNR	46	1	47	Limestone
Catmore and Winterley Copses, Berks	25	SSSI	47	0	47	Clay
Bradenham Woods, Bucks	195	NT	45	2	47	Chalk
Lynsore Bottom, Kent	50	SSSI	47	0	47	Chalk valley
Swingfield Valley, Kent	200	SSSI	46	0	46	Chalk valley
Westerham Wood, Kent	c.50	SSSI	46	0	46	Gault clay
Sydlings Copse, Oxon	2	CWT	45	1	46	Limestone
Colerne Park, Wilts	48	WT	43	2	45	Limestone
Greenham Common, Berks	286	SSSI	44	1	45	Clay/plateau gravel
Wollage Wood*, Kent	18	—	44	1	45	Chalk plateau
Coombe Vale, Dover, Kent	c.50	SSSI	43	1	44	Chalk valley
Dallington Forest, Sussex	c.25	SSSI	42	2	44	Ashdown Sands
Redhill Wood, Berks	29	SSSI	44	0	44	Clay
Marline Wood, Sussex	20	SSSI	42	0	42	Ashdown Sands
Wicks and Hammer Woods, Chilhurst, Sussex	c.25	—	41	1	42	Lower Greensand
Wakehurst Woods, Sussex	c.100	SSSI/NT	39	1	40	T. Wells Sandstone, etc.
Fairlight Glen, Sussex	25	SSSI	39	0	39	Ashdown Sands
Maplehurst Wood N of Hastings, Sussex	32	SSSI	37	0	37	Clays/Ashdown Sand
Saxonbury – Eridge, Sussex	c.120	SSSI	36	1	37	T. Wells Sand/Whurst Clay

Key SSSI = Site of Special Scientific Interest; NNR = National Nature Reserve; CWT = County Wildlife Trust reserve; WT = Woodland Trust reserve; NT = National Trust property; SINC = Site of Interest for Nature Conservation (county level designation)

*About 80% of Wollage Wood was destroyed to make way for development c.1965-66, but the numbers of species given above were still to be found in the remaining area in 1985. However, there were 59 AWVPs in 1965 and 64 in 1956.

more limited. In the South-west, they do, however, demonstrate the exceptional richness of the woods in and around the Avon Gorge, which have one of the highest recorded scores of 69 (65 AWVPs plus four rare woodland species – and this certainly underestimates the number of microspecies of *Sorbus* present). Woods in North Somerset seem to be generally rich, whilst data from Cornwall suggest that the average number of AWVPs per wood is considerably lower. The top sites known to us, with their present AWVP scores, are as follows:

Somerset

Neroche Forest (Ruttersleigh Farm)	41
Horner Combe	40
Withial Combe, Pennard	33 (+1 rare sp.)
Haddeo Valley	33
Holford Glen	33

Cornwall

Millook Woods, Tregranor	34
The Dizzard, nr Crackington	33
Draynes Wood, Liskeard	23
Boconnoc Park, Lostwithiel	21

In the mild, wet south-western counties, some species which elsewhere are rare and restricted to woodland become much more common and widespread, for example, Hay-scented Buckler-fern, Cornish Moneywort *Sibthorpia europaea* and Ivy-leaved Bellflower *Wahlenbergia hederacea*. Contrariwise, some which are ecologically tolerant further east become much more strongly associated with ancient woodland in the south-west, especially in Cornwall, where Twayblade *Listera ovata* and Spindle *Euonymus europaeus* seem to be good indicator species, but only the latter is used on the South-west AWVP list.

From our more limited data from south-east England, Kent has a large number of high-scoring woods. As in South Region, most of them are large woods on mixed soils, many on the dip slopes of the North Downs with areas of acidic clays or even sandy 'clay-with-flints'. The scarp woods, on the other hand, seem relatively impoverished, especially when compared with the Wealden Edge Hangers in Hampshire. In the central Weald of Kent and Sussex, AWVP scores are also relatively low, probably because the exceptionally acidic sands and clays encountered here limit the diversity of the ground flora. The woods we sampled on the South Downs were also surprisingly poor in AWVPs, consistent with historical surveys which suggest that many are secondary woods of rela-



The ancient woodland at Dizzard on the north Cornwall coast is only chest high in places, but the low, windblown canopy conceals a wealth of vascular plants and epiphytes. Bob Gibbons

tively recent origin. However, the quite recently discovered old coppice woods on the South Downs (with Large-leaved Lime *Tilia platyphyllos*, clearly native here) have much richer floras. Nevertheless, the richest woods in Sussex are in the Western Weald, especially on ancient wooded commons such as Ebernoe Common and The Mens, or where the local Paladina limestone outcrops.

Limitations of the AWVP lists

Ancient Woodland Vascular Plants have been widely used in conservation work for more than ten years, and are routinely mentioned in local floras and survey reports. The new *Flora of Oxfordshire* (Killick *et al.* 1998), for example,

The extensive woodlands at Ebernoe Common in West Sussex have one of the highest AWVP lists in Britain. Bob Gibbons





Many ancient woodlands in East Anglia, such as Bradfield Woods shown here, have a long history of coppice management, which means that while they may have impressive lists of AWVPs the number of ancient woodland epiphytes is much lower. Peter Loughran

notes that some of the ash-maple woods there contain over 30 AWVPs, while the older, mainly oak-hazel woods on Ditchley estate scored 51, despite much replanting. Some of the investigators have refined our regional lists for local use, quite properly, so that the revised list is based on improved field data. Interestingly, from a very different part of Britain, in the recently published *Flora of Montgomeryshire* (1995), the authors have drawn up an AWVP list of 23 species, all of which are also in Table 2, and whose distribution shows a close correlation with the distribution of ancient woodlands in the county as mapped from data from the NCC Inventory of Ancient Woodland.

While the wide use of AWVP lists as a surveyor's tool is obviously gratifying to its originators, their sometimes apparently uncritical use leads us to remind users that they should be regarded only as a tool, and not as an infallible guide. The lists should be used intelligently and in combination with other information. In the 1980s, they were used in combination with the semi-natural woodland stand-types described by George Peterken, to help define the best examples. They sit less easily with the broader descriptive classification of the National Vegetation Classifi-

cation.

We do not claim that all, or indeed any, of the AWVPs are strictly faithful to ancient woodland. Where secondary woodland abuts directly onto older woodland, it will acquire species much more rapidly than do isolated woods. Many ecologically widespread plants behave differently from one soil type to another; for example, Wood Spurge *Euphorbia amygdaloides* may be faithful to ancient woods on acid clays in central-southern England, but is certainly not so on the chalk, where it commonly occurs in secondary woods (also in western Britain and on the the Folkestone to Dover cliffs in Kent, it can occur outside woods). The Oxlip is confined to woodland – mostly ancient woodland – but

that may be because most of its sites on wet meadows have been ploughed up. In an earlier issue of *British Wildlife*, Spencer (1990) properly warned that few, if any, plant species oblige us by acting as living ancient monuments. They all have their individual ecology and reproductive biology, and no doubt still have the capacity to surprise us. We need in addition to be careful of wild flowers which are also grown in gardened landscapes, such as Spurge-laurel *Daphne laureola* or Wild Daffodil *Narcissus pseudonarcissus*. Although these species have poor powers of natural dispersal, they should be treated with suspicion unless they occur well within the wood. Hence, the sum of the lists of AWVPs is more valid than their constituent species.

As we have seen, a high AWVP score is a reliable indication of natural diversity. A high score is also indicative of ancient, possibly primary woodland, but it does not on its own constitute proof. One of the richest woods in Oxfordshire, Sidlings Copse, with 46 AWVPs in only 2ha, has been shown by Day (1993) to be an ancient secondary wood, of post-Norman origin. From its woodland flora, one would have expected this small wood to be *primary* woodland. It has, presumably, acquired an unusually rich flora quickly through

its exceptional diversity and proximity to a historically well-wooded district. But it makes a case-study in caution against using the lists uncritically.

Alternatively, some woods which attract only a relatively low AWVP score are certainly ancient. Grazed wooded commons are often poor in AWVPs, though their flora of epiphytic lichens or fauna of saproxylic insects often tells a very different story. I (Rose 1976) have produced an index based on epiphytic lichens that seems to be a reliable method of identifying ancient woodland areas, at least within the limits of clean air and suitably large trees, especially in sites that are, or have been, pasture woodland with open glades. The old woods of East Anglia, such as Bradfield Woods NNR, because of their history of extensive coppice management, are usually very poor in lichen indicators but often rich in AWVPs. Quite often lowland sites that are rich in lichens or saproxylic invertebrates are poor in AWVPs, and vice versa. On the other hand, many of the best woods in the South Region, such as Wytham Wood, Pamber Forest, Wychwood and Chamberhouse Woods, are rich in both AWVPs and invertebrates, though not always in old woodland lichens (see Rose 1992 & 1993 for further details; bryophyte indicators are also discussed there, but present their own problems).

Notwithstanding these limitations, which need to be understood when evaluating sites for nature-conservation purposes, we believe that the regional lists of AWVPs do provide a broad framework in which one can place individual sites. For the identification and evaluation of diverse woods, rich in vascular plants, they should be perfectly adequate. To establish a wood's probable age and origin, however, they should be used with due care, and preferably in combination with historical information.

Our basic thesis is that any one (or even several) AWVP species may have little or no significance. The whole concept is concerned with statistical probability. We believe that as the number of AWVP species that occurs in a site increases so the statistical probability of the wood being ancient also increases. Our AWVP species form a continuum from the very rare (too rare to use in the tables) that are certainly characteristic of, and faithful to, ancient woods, to those that are widespread in old woods, but not always confined to such woods. Finally, whether or not one considers

that the antiquity of a wood is linked to its floristic diversity, a high score in a site is a very practical guide to its conservation value.

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References

- Day, S 1993 Woodland origin and 'ancient woodland indicators': a case-study from Sidlings Copse, Oxfordshire, UK. *The Holocene* 3: 45-53
- Game, M, & Peterken, G F 1981 Nature Reserve Selection in Central Lincolnshire Woodlands. 'CST Notes' No 30. Nature Conservancy Council, Peterborough
- Goodfellow, S, & Peterken, G F 1980 A method for survey and assessment of woodlands for nature conservation using maps and species lists: the example of Norfolk woodlands. 'CST Notes' No 26. Nature Conservancy Council, Peterborough
- Hornby R J, & Rose F 1987 *The Use of Vascular Plants in Evaluation of Ancient Woodlands for Nature Conservation in Southern England*. NCC Report
- Killick, J, Perry, R, & Woodell, S 1998 *The Flora of Oxfordshire*. Pisces Publications, Newbury
- Kirby, K J 1986 Woodland and forest evaluation. In: *Wildlife Conservation Evaluation*, ed. M B Usher. Chapman & Hall, London
- Peterken, G F 1974 A method of assessing woodland flora for conservation using Indicator Species. *Biological Conservation* 6: 239-245
- Peterken, G F 1981 *Woodland Conservation and Management*. Chapman & Hall, London
- Peterken, G F, & Game, M 1981 Historical factors affecting the number and distribution of vascular plant species in the woodlands of central Lincolnshire. *Journal of Ecology* 2: 155-182
- Rose, F 1976 Lichenological indicators of age and environmental continuity in woodlands. In: *Lichenology: Progress and Problems*, ed. Brown, D H, Hawksworth, D L, & Bailey, R H. Academic Press, London
- Rose, F 1992 Temperate forest management, its effect on bryophyte and lichen floras and habitats. In *Bryophytes and Lichens in a Changing Environment* (Eds. Bates & Farmer) Clarendon Press
- Rose F 1993 Ancient British Woodlands and their Epiphytes. *British Wildlife* 5:83-93
- Spencer, J 1990 Indications of antiquity. Some observations of the nature of plants associated with ancient woodland. *British Wildlife* 2: 90-102
- Trueman, I, Morton A, & Wainwright, M 1995 *The Flora of Montgomeryshire*. Montgomeryshire Field Society and Montgomeryshire Wildlife Trust

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