14 *Special cases*

14.1 Churchyards

14.1.1 Introduction

Grassland within old churchyards may have been relatively undisturbed for hundreds of years. With the increasing loss of traditionally managed meadows and pastures, they are practically the last remnants of unimproved semi-natural grasslands in some parts of the country, especially in intensively farmed lowland districts.

The type of ground flora to be found will depend on soil pH, aspect and past management but are likely to include the following:

- MG1 false oat-grass *Arrhenatherum elatius*, coarse grassland occurring throughout the UK lowlands on road verges and railway embankments and in neglected agricultural and industrial habitats.

- MG6 *Lolium perenne-Cynosurus cristatus*: improved permanent grassland (particularly in well manicured churchyards).

- MG5 *Cynosurus cristatus-Centaurea nigra*: lowland hay meadow and pasture (the community with the highest botanical importance).

Trees and shrubs are also important features in churchyards. Both church and churchyard may be of value for lichens.

If managed carefully, churchyards provide valuable wildlife refuges for invertebrates, small mammals, and birds, as well as plant communities. They not only produce an aesthetically pleasing landscape for visitors and mourners, but also may be an important focus for community action, and can be of great educational value.

14.1.2 Churchyard management

The techniques for managing grasslands in churchyards are similar to those outlined in Chapter 5 on grazing and Chapter 6 on mowing. There are, however, a range of practical issues that are pertinent to the management of churchyards. These will vary from site to site.

Getting permission for conservation work

In the church hierarchy, the overseeing and ecclesiastical jurisdiction of churches and churchyards lies with the Chancellors and Diocesan Advisory Committees. The Diocesan Advisory Committees are responsible for advising on the care of churches and churchyards and can be influential in promoting

conservation, by providing guidelines and by support of churchyard conservation projects. It is most important to get their approval for any project at the beginning.

In the Church of England each parish has an 'incumbent' (Reverend) who may be a vicar or rector. He owns the rights to certain aspects of the churchyard (eg products such as timber or hay). He is also the Chairman of the Parochial Church Council (PCC) which is responsible for managing the churchyard.

The parish minister should always be the first point of contact to discuss conservation work along with the PCC. It is important to show them any survey information you may have about the wildlife of the churchyard and to try to arrange a site visit with the parish members.

The ecological importance of churchyards is recognised in the new Care of Churches and Ecclesiastical Jurisdiction Measure (1993). Its Code of Practice gives emphasis to wildlife as does *The Churchyards Handbook* published in association with the Council for the Care of Churches (Burman & Stapleton 1986).

Getting a consensus on churchyard management for conservation

The church is often the focal point for rural communities. It is important to get a consensus of opinion early so that the community is united in its effort.

The most frequent concern is that managing the churchyard for wildlife will mean letting it become overgrown, untidy and neglected. It is important to stress to parishioners that this is not the case.

A compromise can usually be reached whereby the vegetation at the front of the church, pathways around new graves and other areas where easy access is needed can be kept short. Elsewhere, areas can be mown less frequently.

An important objective is to manage the site sensitively both to avoid concern to visitors and to benefit wildlife.

14.1.3 Management guidelines

" **Begin with a survey**

Find out details of the history of past management; this will have a bearing on current vegetation and fauna. Map vegetation types (including any areas of scrub) and areas of long/short grass. Note down any important or rare plant species and old trees and map their positions. Conduct a survey of fauna such as birds, mammals and reptiles if possible.

Survey work is an important pre-requisite to the setting of management objectives. It is also important to research any regulations and restrictions that may apply to the churchyard. If it has been designated as an SSSI/ASSI it is necessary to contact the relevant Country Agency before any change in management takes place (see Annex 5).

Trees now come under the new jurisdiction measure and are the responsibility of the Archdeacons for felling and planting.

" **Prepare a management plan**

First of all find out what resources are available to the parish and draw up a plan within those resources (it is important to take into account the availability of grants). The preparation of a management plan (using survey data) and work schedule might be the best way to proceed. A copy of this could be pinned on the church notice board to inform parishioners about the conservation plan (and that the presence of defined areas of longer grass is a deliberate policy to benefit wildlife and not the result of neglect).

" **Setting up conservation areas**

Prepare a map which shows which part of the churchyard is to have grass kept short. This is likely to include the front of the church, paths and around tended graves. Try and include both sunny and shady areas to get a good range of habitats and spring, summer and autumn flowering areas. Put up signs near conservation areas to inform visitors of what is going on.

Mowing management

Once the basic survey has been completed it is a relatively simple matter to draw up a chart indicating the flowering periods of the component species (Table 14.1). From this it is possible to decide what pattern of flowering you want in a particular area of the churchyard and to accommodate the mowing/cutting regime accordingly (Dennis 1993).

A high proportion of grassland species are perennials and some are known to be long lived (ie it is not always necessary for them to set seed or finish flowering for them to survive). However, it may be important, for aesthetic reasons to let the plants flower. In addition, they provide a valuable food source for invertebrates.

" If a hay meadow regime is to be adopted, aim to create a range of structures including long, medium and short grass to provide a variety of habitats for wildlife. This is an ideal to aim for but will not be possible to achieve at all sites. In practice, management will vary according to the characteristics of each site.

" Create a fringe of longer grass, 1m-2m wide around the edge of the churchyard or conservation area - no shorter than 10cm. Cut once every four years in late August, preferably alternate sides or stretches to maintain cover for invertebrates and small mammals.

" Cut the next 1m-2m to a height of about 4cm-10cm twice a year. If spring flowering species are present the cut should be undertaken in the last two weeks of June. If June/July flowering species predominate, delay the first cut until early or mid-July (mid-August in Scotland). August flowering species such as lady's bedstraw *Galium verum* will flower after the first cut. Alternatively, cut in early April with the blades set high.

Table 14.1 Flowering periods of some typical churchyard grassland flowering plants

Species	March	April	May	June	July	August	Sept	Oct
Lesser celandine *Ranunculus ficaria*	----			----				
Primrose *Primula vulgaris*			----					
Field wood-rush *Luzula campestris*	----			----				
Cowslip *Primula veris*		----						
Meadow saxifrage *Saxifraga granulata*		----						
Greater stitchwort *Stellaria holostea*		----						
Germander speedwell *Veronica chamaedrys*	----	----			----			
Bulbous buttercup *Ranunculus bulbosus*	----	----						
Bugle *Ajuga reptans*		----			----			
Pignut *Conopodium majus*								
Meadow vetchling *Lathyrus pratensis*			----			----		
Bush vetch *Vicia sepium*			----			----		
Sorrel *Rumex acetosa*			----		----			
Hoary plantain *Plantago media*			----			----		
Oxeye daisy *Leucanthemum vulgare*				----		----		
Hedge bedstraw *Galium mollugo*				----				----
Lesser stitchwort *Stellaria graminea*			----			----		
Lady's bedstraw *Galium verum*					----			
Common knapweed *Centaurea nigra*				----			----	
Dark mullein *Verbascum nigrum*				----			----	----
Burnet saxifrage *Pimpinella saxifraga*								
Common toadflax *Linaria vulgaris*					----			----

- Another cut should be carried out as late as possible after grass growth has more or less ceased, usually at the end of September or October. Late flowering species such as devil's-bit scabious *Succisa pratensis* will be over by then.

- Shorter grass areas can be created where public access is more of a priority , for example at the front of the church and around tended graves. These areas could be cut four times a year. Paths could be cut more often.

- A path system should be created to allow easy access to graves in conservation areas.

Disposal of cuttings

Cuttings should be raked up (except from close mown areas). If the cut grass is left to dry for two or three days this will give the seeds a chance to drop.

If cuttings are not raked up they are likely to smother new growth and, as they decompose, nutrients released may encourage coarse competitive grasses.

If grass raking proves a problem, due to lack of manpower, it is best to concentrate efforts on cutting and removing the June/July clippings which contain the maximum amount of nutrients. Hay can be sold or given away, for example for horses. It is important to ensure the hay does not contain any plants which are poisonous to domestic stock such as common ragwort *Senecio jacobaea*. If an outlet cannot be found or the hay is unsuitable for domestic animals, a compost heap could be constructed. This will provide a habitat for reptiles, amphibians and small mammals.

Method of cutting

(See Chapter 6)

On a small scale, hay can be cut by volunteers using hand scythes. On larger sites a reciprocal cutter (eg Allen scythe) is suitable for making hay.

Power strimmers are useful for small scale cutting around headstones and trees. Use a heavy-duty nylon cord in preference to a metal blade. The latter can damage (and be damaged by) concealed gravestones etc.

Rotary mowers are suitable only for medium and close cut swards. Longer swards may need to be cut first with a strimmer or brush cutter. Rotary mowers with a grass-bar are better as they prevent the grass being chewed up, along with the insect life.

Beware of cutting too low (never below 5cm in conservation areas) as this can 'scalp' the turf and may lead to the invasion of weed species (see Chapter 7). Take care to avoid damage to anthills with mowing machinery.

NB:

- For some equipment (eg brushcutter) safety training is strongly advisable.
- Always check for the presence of other people and animals in the churchyard before using machinery.
- Maintain safe working distances.
- Ensure that machinery is well maintained and use approved safety clothing eg helmets (with ear defenders), visors, gloves and steel-toed boots.

Grazing

The alternative to mowing is grazing. At one time many churchyards would have been grazed occasionally but today this is often not a practical option. Generally, the only practical grazers for churchyards are sheep and goats.

The grazing rights belong to the incumbent who may let his rights to others. See Chapter 5 for details of grazing management.

Practical issues include the following:

- Graziers are likely to be difficult to find for such small sites.
- Animal droppings - these might be considered as unsightly by visitors.
- Stock will need access to drinking water and to be fenced in to prevent them wandering. If an electric fence is used warning signs need to be erected.
- Stock should be kept away from the current burial ground and poisonous yew trees.
- Goats need to be tethered to prevent them eating shrubs. However, if scrub and coarse herbage is a problem, goats can be a useful management tool, eating vegetation that sheep will avoid (see Chapter 5, sub-section 5.4.3).

14.1.4 Restoring a neglected churchyard

The aim of management is likely to include the following:

- Increase botanical and structural diversity by reducing the dominance of coarse competitive species.
- Check the growth of scrub/remove established scrub.

Before commencing work, headstones should be marked to avoid damaging equipment and to prevent accidents. Cut round them with a strimmer so they can be easily seen.

Do not be tempted to tackle the whole churchyard at once. Starting with a few small areas will ensure that scrub and longer grass can be tackled with the machinery and manpower available and will leave refuges for animals. Where appropriate some patches of nettles *Urtica dioica* should be left uncut for butterflies. If resources allow, nettle patches could be cut on a rotation to ensure new growth for caterpillars throughout summer.

It will almost certainly be necessary to cut the grass more than once a year to reduce the vigour of coarse aggressive species such as false oat-grass, cow parsley *Anthriscus sylvestris*, and hogweed *Heracleum sphondylium* before starting a maintenance programme.

Cutting in spring will help to reduce the dominance of such species. Some patches should be left uncut as food and shelter for animals. It is essential to rake off cuttings to prevent them smothering new growth and adding nutrients to the soil. (See Chapter 10 for further information on grassland restoration.)

References and further reading

BARKER, G.M.A. 1977. *Wildlife Conservation in the care of churches and churchyards*. London: Council for Places of Worship of the General Synod of the Church of England.

BURMAN, P. & STAPLETON, H. 1986 *The Churchyards Handbook* (3rd Edition). Church House Publishing and Council for the Care of Churches. +

CARE OF CHURCHES AND ECCLESIASTICAL JURISDICTION MEASURE. 1993. Code of Practice. London: Church House Publishing.

COOPER, N.S. 1995. *Wildlife in churchyards: plants, animals and their management*. London: Church House Publishing.

COOPER, N.S. 1997. A sanctuary for wildlife. *Biologist*, **44(4):** 417-419.

DENNIS, E. 1993. The Living Churchyard - sanctuaries for wildlife. *British Wildlife*, **4:** 230-241.

GEORGE, B. 1976. *English Churchyard Flora*. An introduction to wild flowers. Burton on Trent: Curlew Countryside Publications. *

GREENOAK,F. 1993. *Wildlife in the Churchyard - The Plants and Flowers of God's Acre*. London: Little, Brown & Co.

HILL, F. 1988. *Wildlife Gardening: a practical handbook*. Derby: Derbyshire Wildlife Trust.

LUTON AND DUNSTABLE WILDLIFE PROJECT. 1993. Graveyards - Living for Wildlife - Teachers' Resource Pack. Luton: Luton and Dunstable Wildlife Project. ,

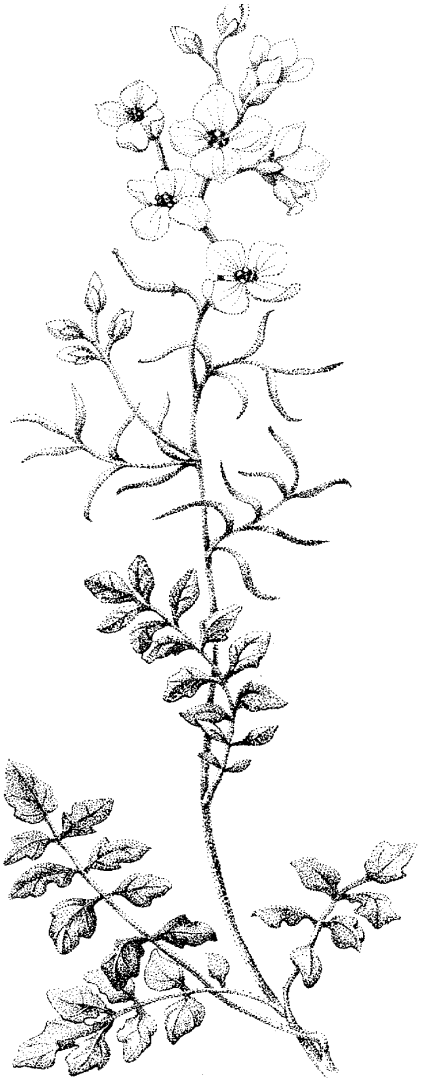
NORFOLK NATURALISTS' TRUST (Undated). *Wildlife Conservation in Churchyards*. Norwich: Norfolk Naturalists' Trust.

PARKER, M. 1989. *The Living Churchyard: A DIY Information pack*. London: Community Service volunteers.

+ Available from Church House Publishing, 83 London Wall, London EC2M 5NA.

* Available from Curlew Countryside Publications, 22 Bond Ends, Yoxall, Burton-on-Trent, Staffordshire.

, Available from The Old Methodist Chapel, 47 High Town Road, Luton LU2 0BW.



14.2 Roadside verges

14.2.1 Introduction

Roadside verges occupy a significant area of the UK, some 212,200 ha.

Old, undisturbed roadside verges are often the only remnant of unimproved semi-natural grassland in intensively farmed surroundings. By contrast, verges on modern roads, largely made in the last 30 years, do not have this historic link with semi-natural vegetation and its associated wildlife. They do, however, represent a large area with considerable potential for encouraging wildlife. In the past, the road verge had its own special place in the rural economy. The herbage was often harvested by taking one or two hay crops, or by grazing, sometimes including `geese-lettings'. Nowadays this is far less common.

Verges can support a range of grassland types including calcicolous, neutral and acid grassland (see Chapter 2). This depends on factors such as geology, soils, land-use history etc.

The majority of verges tend to conform to the NVC neutral grassland type MG1 false oat-grass *Arrhenatherum elatius* grassland. This is a community dominated by coarse grasses and tall herbs, typical of ungrazed situations. In roadside verges it is maintained by regular but infrequent cutting. This community is largely anthropogenic following disturbance on circumneutral soils. Different sub-communities reflect differences in management, soil type, nutrient status and disturbance levels. (See also Chapter 2 and Rodwell 1992.) Such communities can be moderately species-rich, have local conservation value, and can be a visually attractive feature if managed carefully.

In addition to plants, roadside verges have been recorded as a breeding habitat for 20 of the 50 species of mammal found in the United Kingdom, all six reptiles, 40 of the 200 species of birds, 25 of the 60 species of butterfly, eight of the 17 species of bumble bee and five of the six species of amphibian (Parr and Way 1988).

In addition to providing food and refuge for wildlife, verges link together many habitats which might otherwise be isolated, potentially allowing species to migrate and colonise.

14.2.2 Reasons for the decline in the nature conservation value of roadside verges

Until the 1960s, the traditional method of hand cutting verges by scythe was widespread. This form of management helped to maintain the rich flora of many verges and kept scrub and coarse grasses in check. This process has been largely overtaken by machine cutting and the use of herbicides, which are quicker and more economic.

- Flail mowers have become the chief management tool of the highway authorities. The flails often 'scalp' the turf, digging into the soil and destroying the roots of plants.

- Cuttings are rarely removed, leaving a thick layer of mulch which smothers flora underneath and can increase the nutrient status of the soil.

- The blanket use of herbicides and growth retardants on verge vegetation has had a detrimental impact on plants and animals. This practice is now much less common.

Today, the main threats of chemical damage to roadside verges include:

- herbicide spray drift from adjacent farmland;
- leaching of fertilisers from adjacent farmland leading to eutrophication of ditches, and an increase in dominance of nutrient-demanding plants;
- pollution of terrestrial and aquatic roadside habitats from road run-off and exhaust emissions;
- salt spray from roads, which is toxic to many plants and can result in vegetation changes (see Davison 1971, Scott & Davison 1982);
- high levels of nitrogen deposition on road verges derived from exhaust emissions have been linked to heightened productivity of soils particularly near the road edge. This could conceivably lead to increased dominance by competitive grasses;

In urban areas the emphasis is on 'tidiness', and roadside verges are frequently mown every few weeks. Under this regime, resilient rosette-forming species such as daisy *Bellis perennis* predominate. These green 'blocks' separating concrete and tarmac are frequently sown with perennial rye-grass and are of little conservation value.

In rural areas there has been a gradual change from intensive management to fewer cuts per year and, in many cases, no mowing at all. This is largely due to economic factors. As a result, many herb-rich areas have been swamped by unchecked growth of coarser and more aggressive species and the development of scrub.

Other threats to verges include:

- disturbance by installation of services such as water, electricity or gas;
- improvements to the road such as kerbing or widening;
- dumping of road grit and salt;
- car parking and over-riding;
- ploughing of verges in the mistaken belief that this controls spread of agricultural weeds.

14.2.3 Managing roadside verges

Management techniques for verges are similar to those outlined in Chapter 6 on mowing. The main difference is that verges are now seldom cut to provide a forage crop. Management is normally

undertaken primarily for road safety and 'amenity' reasons, and cutting times have nothing to do with agricultural production.

There are a number of practical issues pertinent to the management of roadside verges and these are outlined below.

Ownership

Most verges form part of the highway and as such are the responsibility of the County Council Highways Department (highway authority) or Metropolitan Borough Council (district/regional authority in Scotland). The management of verges is usually contracted out. The highway authorities have legal rights over the verge and have wide powers to enable them to provide drainage, lay-bys, signposts, footpaths etc. The subsoil is usually owned by the adjacent landowner but use is restricted, due to 'public rights of passage'. NB: The highway authority should be approached before any surveys are undertaken or management plans drawn up. It decides whether to manage the verges in its area in a way that will benefit wildlife.

The owner of a verge may not enclose any part of it or place any obstruction upon it without the consent of the highway authority.

Some highways are registered as common land and governed by the laws relating to commons.

Some county councils operate protected roadside verge schemes. This usually involves marking high quality verges and introducing management which may differ from the normal maintenance to create/maintain wildlife habitats (see Case Study sub-section, 14.2.7).

Safety

Safety aspects of roadside verge management are overriding and the maintenance of sightlines and signs takes priority. It is possible to mow the 1m strip adjacent to the road as often as is necessary for road safety with little adverse affect on wildlife. This zone is often of little nature conservation interest due to the effects of chemical pollution from car exhaust fumes, the salting of roads in winter and physical disturbance from traffic.

Economics

The management of roadside verges by highway authorities is closely linked to local authority spending.

It is unlikely that the highway authority will be prepared to undertake specially timed cutting on all verges so it is important not to waste effort on impossible demands.

Management should be targeted on verges of special wildlife importance. These may include verges with uncommon flora or good examples of a moderately species-rich grassland community. Verges which have a good ditch or hedge habitat next to them are also valuable. (Hedges and ditches are usually the responsibility of the adjacent landowner and out of public control.)

From a conservation point of view, it is desirable to remove cuttings, particularly of long grass, to prevent the return of nutrients and smothering effect on the vegetation underneath. Local authorities are often reluctant to do this because of the costs involved. Parish councils (or voluntary groups/Wildlife Trusts etc) might be willing to act as agents for grass cutting and raking, or local farmers may be persuaded to take a hay crop from the verge as occurs in Lincolnshire. (See Case Study sub-section 14.2.7.)

It may be possible for volunteers to cut and rake grass. However, there are important safety implications. Permission must be sought from the local highway authority.

14.2.4 Management objectives

Management objectives may include:

- a greater diversity of plants/maintenance of existing grassland communities;
- the maintenance of populations of uncommon plants;
- improved habitats for invertebrates, birds and small mammals.

Achievement will depend on the characteristics of the verge eg:

- soil type, depth etc;
- verge width;
- the nature conservation interest of the site itself.

Management objectives will also need to be balanced against constraints such as:

- financial resources;
- manpower;
- road safety.

14.2.5 Management guidelines: achieving objectives

Figure 14.1 represents an 'idealised' cross-section through a roadside verge. Obviously not all verges have ditches and hedges adjacent to them or are wide enough to allow for three different mowing regimes. However, to increase the nature conservation value it can be important to create a range of different habitats across the width of the verge. This can best be achieved by dividing the verge into 'zones' and mowing each zone in a different way. This idealised system will not be appropriate in all circumstances. It is important to identify the key nature conservation features of a verge (plant communities, priority species etc) and then develop appropriate management objectives and prescriptions. For example, for a verge supporting short-turf species-rich calcareous grassland across

the whole width of the verge it may not be appropriate to instigate a 'zone C' management scheme on part of the area as detailed in Figure 14.1

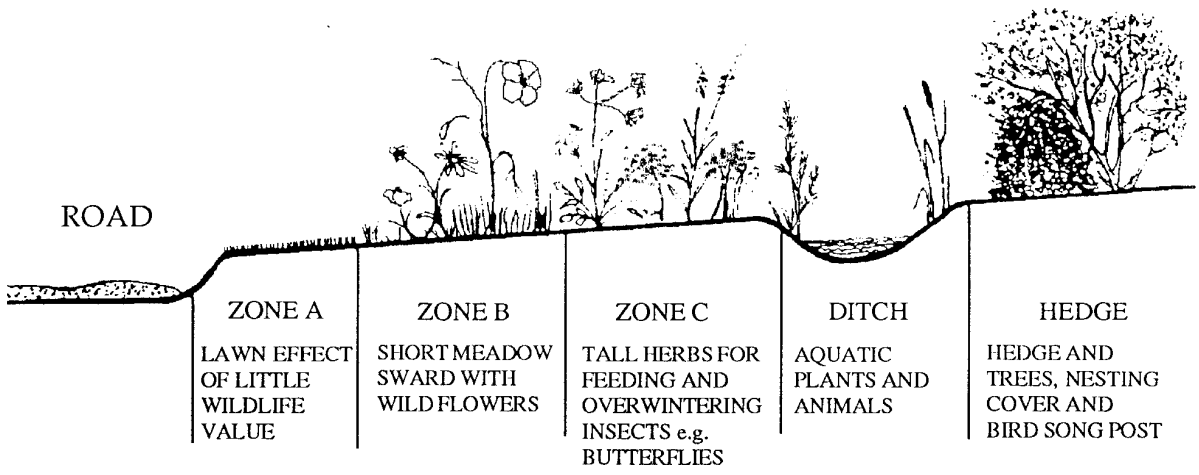


Figure 14.1 Idealised management zones across the width of a roadside verge
(from Royal Society for Nature Conservation 1986)

Zone A

It is rarely possible to manage this strip in an ideal way for wildlife because of the need to create good visibility. This zone is often mown up to six times a year by highways authorities.

Delaying the first cut until the end of May, and setting the cutter bar no lower than 10cm, will allow small plants to flower and set seed.

Zone B

The next 1m-2m should be cut twice a year if possible, especially in years of particularly luxuriant growth: the aim is to produce a succession of attractive fairly low growing species. If the main species are spring flowering, cutting should be undertaken in the last two weeks of June. If June/July flowering species predominate, the first cut should be delayed until early or mid-July (mid-August in Scotland) by which time most of the plants will have had a chance to flower and set seed. This is not necessary every year as most grassland herbs are perennial and can survive in a vegetative form for a number of years. However, from an aesthetic point of view, it is important to let the plants flower. Flowers are also a valuable food source for invertebrates.

Another cut should be carried out in September or October and the cuttings removed, if practicable.

Two cuts per year will keep the vegetation at a height consistent with good road visibility.

Where swards grow slowly, eg chalk and limestone grassland, only one cut per year may be necessary. This should be undertaken in late August.

Zone C

Where appropriate, this zone can be cut less regularly (once a year or once every two years) to provide an undisturbed habitat for small mammals, reptiles and invertebrates. On nutrient-rich soils this zone will need cutting every year to prevent scrub invasion.

14.2.6 Control of weeds

Under the Weeds Act 1959, MAFF has powers to require a landowner/occupier to prevent the spread of 'injurious weeds'.

Thistles on verges can often be perceived to be the biggest problem to farmers, particularly where the verges have been disturbed by spreading spoil/grit or by vehicular use. It is better to try and prevent these weeds occurring in the first place by avoiding disturbance to the soil or the creation of bare ground. Council employees/contractors need to be made aware of this.

More detailed information on the control of grassland weed species is given in Chapter 7.

14.2.7 Case study: roadside verge management

In 1993, The Lincolnshire Trust for Nature Conservation concluded an agreement with Lincolnshire County Council for the management of the protected verges in the county.

The present Protected Roadside Verge Scheme in Lincolnshire covers about 50 sites, totalling some 68 km. Each verge is marked by marker posts. They are managed according to prescriptions agreed between the County Council and the Trust, with the help of Voluntary Wayside Wardens appointed by the Trust for each site. In all cases, owners of adjoining land have been consulted about management.

In addition, relevant parish councils and local county councillors are kept informed of the scheme and their involvement is encouraged.

The Lincolnshire Trust aims to use some of the verges to demonstrate management techniques to local authorities and landowners who may wish to manage other verges for their natural interest. Hay harvested from a protected roadside verge has also been used to attempt to re-create an area of calcareous grassland on ex-forestry plantation land (see Chapter 11).

References and further reading

DAVISON, A.W. 1971. The effects of de-icing salt on roadside verges. I. Soil and plant analysis. *Journal of Applied Ecology*, **8:** 555-561.

FARMING AND WILDLIFE ADVISORY GROUP (FWAG). 1985. *Roadside Verges - A Guide for Users and Managers*. Information leaflet no. 20. Stoneleigh: FWAG.

KENT TRUST FOR NATURE CONSERVATION, 1992. *Roadside Verges in Kent*. Maidstone: Kent Wildlife Trust.

LANCASHIRE WILDLIFE TRUST. Undated. *Roadside Verge Management*. Bamber Bridge: Lancashire Wildlife Trust.

PARR, T.W. & WAY, J.M. 1988. Management of roadside vegetation: the long-term effects of cutting. *Journal of Applied Ecology*, **25:** 1073-1087.

RODWELL, J.S. ed. 1992. British Plant Communities 3: *Grassland and Montane Communities*. Cambridge: Cambridge University Press.

SCOTT, N.E. & DAVISON, A.W. 1982. De-icing salt and the invasion of road verges by maritime plants. *Watsonia*, **14:** 41-52.

SPENCER, H.J. & PORT, G.R. 1988. Effects of roadside conditions on plants and insects. II. Soil conditions. *Journal of Applied Ecology*, **25:** 709-714.

THE ROYAL SOCIETY FOR NATURE CONSERVATION. 1986. *Wildflowers on the Verges*. Lincoln: Royal Society for Nature Conservation.

THE SOIL ASSOCIATION. 1991. *Britain's Largest Nature Reserve?* Bristol: Soil Association.

WAY, J.M. 1977. Roadside verges and conservation in Britain: a review. *Biological Conservation*, **12:** 65-74.

14.3 Grassland management in wood-pasture and parkland

14.3.1 Value of wood-pasture and parkland in conserving biodiversity and landscape

The value of wood-pasture in conserving biodiversity more often lies with the flora and fauna associated with the trees and timber than with the floristic composition of the underlying grassland or heath, although this can also sometimes be of considerable significance (see Chapter 2, Section 2.2, sub-section 2.2.2).

Very old trees and fallen wood support a diverse fungus flora of mycorrhizal, endophytic and saproxylic species and saproxylic invertebrate fauna, often supporting large numbers of Red Data Book and other very scarce species that are completely dependent on this habitat. The old trees are also important for hole-nesting birds and certain species of bats. In areas with clean air they support significant assemblages, again including Red Data Book species, of epiphytic lichens. Old trees may also be important for epiphytic bryophytes.

Appropriate management of the swards between the trees in this habitat may be critical to the survival of both the trees themselves and the other dependent assemblages of organisms.

Wood-pasture and parklands and the trees within them are also of considerable cultural, historic and landscape importance. They represent living connections with former land-management processes and may descend from medieval deer enclosures or planned landscapes from more recent periods. It is important that appropriate consideration is made of this landscape and cultural importance in management planning in this habitat.

14.3.2 Definition of wood-pasture

General definition

In recent decades the value of wood-pasture as a critical habitat in the conservation of British biodiversity has become increasingly recognised by nature conservationists. Concepts of wood-pasture, however, can vary from the classic English lowland landscape park, ie scattered open grown trees in grassland to near natural high forests (Kirby *et al* 1995). An inclusive definition of wood-pasture is suggested below:

Wood-pasture: semi-natural woodland or parkland managed by a sustainable grazing regime using domestic stock or wild animals which has a significant effect on the habitat's ecology and is usually, but not necessarily, combined with some form of exploitation of the trees and shrubs by felling, pollarding or coppicing.

It must be emphasized that the defining factor for wood-pasture is an ecologically significant level of grazing. Former wood-pastures which are no longer grazed are probably best described as 'relic wood-pastures'.

Types of wood-pasture

In defining wood-pasture types, two factors are most important: structural type and stand age.

The following classification of wood-pasture stands is suggested:

Grazed high forest: wood-pastures where the canopy is complete enough to allow the survival of a ground flora composed primarily of woodland species. Pollards may, or may not be present. A variant of this in the far north and west of Scotland is grazed dwarf woodlands of hazel and birch.

Park-like stands: wood-pasture where the trees are spaced so far apart that the ground flora has little or no woodland element[1] and is basically grassland or heath. These can occur as an integral component with grazed high forest in unenclosed wood-pasture or as the usually dominant stand type in deer and landscape parks.

Grazed coppices: stands where grazing and coppicing were combined by temporarily excluding grazing animals while the regrowth was vulnerable to browsing. This protection could either be based on fixed banks, on temporary fences or herding. Now very rare as a planned system.

These three definitions embrace most grazed land with a significant managed tree component. There are, of course, many intermediates with woodlands containing several types in a variety of forms and over time one type may evolve into another.

It is also known that old fruit trees in orchards can be important for rare and scarce invertebrates, particularly beetles (Coleoptera) (Whitehead 1992). Thus, the advice contained within this chapter is likely to be relevant to orchards with ancient fruit trees.

Stand age in wood-pasture

An important characteristic of many wood-pasture and parkland sites is the presence of ancient trees which are typically absent from other types of habitat. Where old trees are abundant in grazed high forest these have many of the characteristics used to define old growth woodland in North America (Peterken, 1996).

A basic definition of old growth woodland is stands of more than 200 years old (Peterken, 1996). The following classification is suggested (Sanderson, 1996a):

Ancient old growth: stands with a long continuity of old trees of 400 years or more.

Recent old growth: where stand continuity has been interrupted between 200 and 400 years ago. Can have extensive recolonization by specialist species where close to ancient old growth stands.

Young growth: stands where continuity has been interrupted within the last 200 years.

Parkland can be brought into this system by using the term 'old growth stand' rather than 'old growth woodland'.

[1] The extent to which wood pasture supports a woodland ground flora will depend on factors such as extent of canopy closure (light intensity), topography, grazing intensity and degree of agricultural improvement.

Grassland and heathland within wood-pastures

All functioning wood-pasture systems contain open grazing land but it can be lost or greatly reduced in relic wood-pastures. The open grazing land may be heath or grassland.

" **Role of grassland and heaths in wood-pasture ecosystems**

Where not agriculturally improved, grasslands play an important role in increasing the biodiversity of a site and they are a vital component of a sustainable grazing regime. Grassland areas in parklands are more productive and less fly-infested than in grazed high forest and can provide much of the summer grazing in an extensive wood-pasture system.

" **Types of grassland and heath**

Historically any type of extensive semi-natural grassland or heath could be found in wood-pastures, including calcareous grassland. Examples of the latter are now rare and most surviving semi-natural grasslands in wood-pasture systems are found on neutral or acidic soils. Examples of such semi-natural swards include parched acid grasslands (U1), heaths (H2, H3, M16 & M25a), acid fen meadows (M23a, M25b & M24c) and neutral grassland (MG5). Most of these more interesting communities are found on commons and Royal Forest.

In landscaped parkland (often known as 'designed parkland') and ancient deer parks converted to landscape parks, swards of intrinsic conservation interest are less common. A few have extensive unimproved parched acid grassland (U1) swards (eg Hatch Park, Kent) but the majority have been at least partly improved with at best species-poor permanent pasture (MG6) and, at worst, ryegrass leys or arable crops. There may be a mosaic of grassland types, with improved swards leading from a stately house down to an ornamental lake, but with pockets of unimproved swards on the periphery, out of view and adjacent to surrounding woodland, depending on the agricultural role of the remainder of the park. In many deer parks the presence of dense thick bracken stands is characteristic.

In all functioning wood-pastures the grassland will be pasture, rather than hay meadow and heavy grazing levels with short swards are usual. In some formal landscaped/designed parklands, particularly those with amenity access, the management may be entirely by frequent mowing of an amenity sward which may or may not be of intrinsic conservation interest.

14.3.3 Management

Planning for the future of a wood-pasture ecosystem

" **Nature or artifice?**

In any wood-pasture long-term planning is essential; the trees can live for more than 500 years. A long-term view of how the ecosystem should evolve is needed. This is complicated by the past history of a site. A typical lowland landscape park may have started as an area of near-natural grazed high forest on a common which was enclosed as a deer park in medieval times and developed into a semi-natural parkland, to then be converted to a landscape park in the 18th century. It may now have lost most semi-natural features and become an ornamental arboretum but with floristic and fauna links back to the wildwood.

The challenge is to integrate conservation of the aesthetic and cultural values of evolved historic landscapes with the long-term conservation of biological features which have survived from the semi-natural deer park. This usually depends on maintaining existing veteran trees and ensuring their eventual replacement with overlapping cohorts of future veterans capable of supporting the important flora and fauna. There may be conflict of interest between the conservation objectives for biodiversity and for the cultural landscape, for example the need to replace a ragged avenue of elderly trees for landscape reasons and the need to keep them to conserve their dependent flora and fauna. Such conflicts need to be overcome by liaison between all interests and joint management planning.

" **Semi-natural wood-pastures**

With the exception of the New Forest there are now few functioning semi-natural wood-pasture ecosystems in the lowlands, but relic wood-pastures with old growth features are a major conservation resource. These areas have different problems from those found in landscaped parks and generally there is too little grazing and too many trees. The woodland areas become dense and shaded and open grass swards may become rank or overgrown or lost altogether; veteran trees can be threatened by overtopping and shading by regenerated woodland. In such circumstances management should aim for a mosaic of grazed high forest, parkland, parkland scrub and grassland. Pollarding could be integrated as appropriate to prolong the lives of the remaining ancient trees.

In the long-term such landscapes can also be created on low interest sites, adjacent to old broadleaved plantations and abandoned farmland. Such changes have been features of wood-pasture complexes in the past.

" **Landscape parks**

Landscaped parks are very different; usually they have too much grazing or mowing and too few trees and often can no longer be described as semi-natural. Where there are strong biological links to the wildwood or a medieval deer park and no well-preserved planned landscaping then the case for returning to a semi-natural ecosystem and a landscape closer to a medieval deer park or near natural woodland should be given serious consideration. In most cases a careful balance between maintaining nature and artifice will need to be planned.

Habitat management in parks and wood-pastures

General

Tree management

This section briefly reviews tree management in wood-pastures to provide a context for the advice on grassland management. For further detailed information on this subject the reader is referred to the literature listed in sub-section 14.3.5.

" **Pollarding** is where tree branches are cut at 1.8-3 metres above the ground every 10 to 50 years. It is a very useful form of tree management in both parkland and wood-pasture, in that it produces trees with an "open grown" structure and enables many trees to reach a far greater age than they otherwise might under a high forest management system. Age-gaps in the population structure of old trees in parks and wood-pastures are so frequent that re-initiating a traditional pollarding cycle is beneficial in the majority of cases.

Very early pollarding (at 15cm dbh or less) is a valuable conservation tool - even if done only once and then not continued with.

Pollarding may be considered on sites where it may be beneficial in addressing tree age-gap problems, but where it is not a traditional form of management. In such instances, especially on sites of historic landscape importance, it is vital that there is consultation with landscape architects to avoid conflicts of interest.

" **Restoration pollarding** or other forms of crown reduction management of neglected, top-heavy old trees may be an essential part of management to prolong the life of trees that would otherwise collapse under their own weight.

" **Bundle-planting** (planting two or more saplings in the same planting pit) is another method by which large girth trees more rapidly achieve a large size than single stem planting and can produce trees very similar to pollards.

" **Branches and twigs cut from pollards or shreds as fodder instead of, or as supplement to, hay.** This is now very rare in Britain but is still quite common in parts of Europe (Spain, Greece, Brittany, Normandy). It may be worth reviving for its cultural/historical interest and as a way of using pollard products.

" **Fallen trees** and other dead wood are a vital part of the dynamics of semi-natural wood-pastures for allowing scrub and tree regeneration and are an important resource for wood-feeding invertebrates and fungi in both parks and wood-pastures. Fallen wood should not be removed and certainly not destroyed, but some may need making safe, to avoid stock being caught in narrow 'Vs'.

In parks it may be necessary to move such timber to nearby "timber graveyards", at most a few hundred metres away, for aesthetic or safety purposes. Moved timber should not be sawn-up if at all possible as the increase in surface area/volume ratio makes it more prone to damaging

fluctuations in temperature and humidity. Timber is most useful in shady areas. It should be kept in contact with soil to maintain humidity. Moved timber should not stacked - the material on top dries out and is of little value. If left *in situ*, then allowing bracken or bramble to grow over the wood is beneficial - it provides shade and the latter provides nectar. The timber also becomes less visually obtrusive.

- **Ivy** on trees is very valuable in providing roost sites and sometimes hibernation sites for birds, bats and invertebrates. It also provides valuable late nectar and berry sources and is a specialised dead wood resource in its own right. It should be tolerated wherever possible. Beware of ivy, however, on important lichen/bryophyte sites - it can be very damaging to other epiphyte communities.

The value of ancient orchard trees is largely in the decaying wood of very old fruit trees which support dead-wood feeding (saproxylic) invertebrate species.. It is therefore important that old decaying trees are not replaced with younger specimens, even if they are of the same fruit variety. It is important to plan for the future and ensure new fruit trees are planted as these will ultimately become the veterans of the future. One species listed on the Biodiversity Action Plan, the noble chafer *Gnorimus nobilis*, seems to be restricted to decaying wood of fruit trees.

It is also important that ancient fruit trees are not sprayed with pesticides targeted at aphids, blossom weevil and other pests, especially during the months of April to July.

Pasture management for sustaining veteran tree interest

- **Fertilizer.** Ideally no fertilizer should be applied. If treatment is unavoidable, pelleted and not powdered artificial fertilizers should be used and slurry and manure should not be plastered onto trees. All can seriously damage epiphytic communities.

- **Soil compaction under trees**. This leads to lower soil permeability, loss of water and nutrients to the tree and to die-back and death. It also contributes to safety problems. It is caused by human and livestock congregating under trees and the siting of car parking under trees in amenity sites such as parks. Grasscrete (concrete lattice with interstitial grass) is not the answer. It may preserve a sward but still compacts the soil.

- **Livestock under trees**. Related to above. Often caused by animals simply sheltering under old trees, but often supplementary feeds or water sources are sited under trees. It leads to soil compaction, accumulation of too many nutrients, nettle domination, bark browsing, bark rubbing, ammonia buildup (the last two are both disastrous for epiphytes). The best solution is to reduce stocking, and not to provide supplementary feed or at least keep it and water sources well away from trees and provide alternative shelter in the form of hedges etc.

- **Bark browsing.** Grazing animals naturally browse on tree bark, particularly where there is a sward poor in herb species and roughage. In semi-natural woodlands this is not a problem, in fact it helps create important niches on damaged trees. In heavily stocked parks with few trees and a herb-poor sward, or where there is commercial farming of venison, it can be a serious problem. Reducing stocking levels and restoring scrub will produce a more balanced habitat in which the threat to old trees is removed.

- **Bracken and coarse grasses** can be a problem. Some cattle and or pony grazing is required to graze coarse sward species and keep bracken stands open as well as direct bracken control. Dense and tall bracken is a problem in some sites, adding wildfire problems and it is also very efficient at suppressing tree regeneration by smothering and allelopathy. Bracken does have advantages in providing a moist and shaded microclimate for fallen timber, as does cover by brambles, which is essential for some types of fungi and invertebrates to function in fallen wood.

- **Herbicides & pesticides.** Try not to use these at all. Do not spray close to trees and use spot weeding/brushing for noxious weeds if necessary, but keep them well away from trees, especially where there are epiphytes. If insecticides have to be used for any reason, avoid May-July, keep well away from trees and nectar sources, including pest weed species in pasture if in flower. Spray when overcast/cool/cold or early in morning when there is little or no insect activity on flowers. Avoid roost sites such as ivy and hedgerows. Keep fungicides well away from trees - not only saproxylic species and lichens but also grassland/mycorrhizal associates may be at risk.

- **Veterinary products** - notably Avermectins. These are potentially very damaging in parks and wood-pastures. There are dung-feeding insects that are specific to deer dung in such sites, the dung fauna is a very important food source for bats and birds that live in the old trees. The toxicity of these chemicals to fungi is unknown but may be problematic. This is a very important consideration in the New Forest, where four BAP listed species of invertebrate and one BAP listed fungus are associated with animal dung in wood-pasture. Basically - avoid using such chemicals if at all possible.

- **Nectar sources** - These may be critical for saproxylic species from the trees. In grassland, it is provided by umbellifers (especially hogweed *Heracleum sphondylium* and angelica *Angelica sylvestris*), composites (especially yarrow *Achillea millefolium*, various thistle species, *Senecio* species) and, in particular, by flowering shrubs. Hawthorn *Crataegus* spp. in surrounding hedgerows, open scrub and isolated bushes is the best. Also useful (through the year) are cherry plum *Prunus cerasifera* (where this is geographically appropriate) blackthorn *Prunus spinosa*., sallow *Salix* spp., holly *Ilex aquifolium*, rowan *Sorbus aucuparia* and ivy *Hedera helix*. Elder *Sambucus nigra* is surprisingly poor as a nectar source.

- **Land drainage/nearby water abstraction**. This can lead to extensive crown die-back and (in extreme cases) tree death. Avoid and remove/ block existing drainage if possible. Where this is not possible, mulching of soil under canopy of trees may be beneficial (using wood mulch but not using valuable decayed wood). This technique is still experimental.

- **Management of footpaths and desire lines and visitor management.** The proximity of footpaths to old trees increases the need for, tree surgery to ensure public safety. It is better to redirect the footpaths and impede desire lines under old trees than to do tree work for safety reasons. Whereas it may take an hour or two to lop or cut the veteran tree down, an or just afternoon to move a footpath, it takes 500 years to grow a new veteran tree!

Semi-natural wood-pastures

Grazing

Grazing restoration is required in most lowland wood-pastures. Mowing is not normally a practical option. The following require considering:

- The level of grazing should reduce, but not permanently suppress, natural regeneration. This requires extensive low intensity grazing. Restoration schemes commonly misunderstand this and attempt to 'experimentally' restore grazing in small paddocks at too high intensities. Such trials are not recommended.

- Grazing restoration should start at low levels in very large areas (ideally more than 100ha but areas as small as 30ha could be grazed) and work up to the final stocking rates.

- Grazing levels will need to be set by practical measurements of the effects of grazing, such as sward height, flowering and regeneration suppression and will vary widely between different sites. Reference should be made to the requirements of individual types of grassland in this volume (see Chapter 5).

- A natural mix of grazers is recommended, ie including cattle/ponies, deer and pigs. Wild equivalents such as wild boar, wild horses or European bison could be used in appropriate situations.

- Pigs are required in autumn to reduce the chance of green acorn poisoning of cattle and especially ponies[2]. Alternatively the stock will need to be removed.

Tree management

In relict wood-pastures the treatment of the existing trees and scrub will determine the future structure of the woodland. The following require consideration:

- Restoration efforts should concentrate mostly on restoring grassland and grassland scrub mosaics.

- Developing high forest is best left to develop as grazed high forest although valuable timber could be thinned out. The application of 'natural forestry' is possible while maintaining old growth features (Sanderson, 1996a) but is not recommended on nature reserves and undisturbed old growth.

- It may be desirable to remove regeneration from around ancient trees that are obviously originally open grown and are threatened by overtopping and shading which could kill the trees.

[2] This is relevant really only to the New Forest. There is no recent tradition of pannage in most other wood-pasture system, nor is the tradition likely to be revived except perhaps in a small number of areas.

Such opening out may need to be undertaken slowly, over a number of years, to prevent the trauma of rapid increases in insolation and reductions in humidity having the same effect.

- Scrub is a valuable feature and needs to be maintained in a range of ages.

Landscape parks

Grazing and sward management

Landscape parks were status symbols; the need not to intensively cultivate a whole estate was a measure of wealth. With historically falling returns from agriculture, pressure to cultivate parks intensively has become a major problem.

- If at all possible reduce the intensity of management and restore semi-natural swards.

Tree management

Tree management in landscape parks is mostly constrained by landscape conservation and heavy grazing to wholly artificial methods such as planting. If at all possible some scrub and natural regeneration should be reintroduced. The management of old trees in landscape parks is well documented (Read 1991 & 1996).

14.3.4 Summary

- Grasslands are an important component of wood-pasture.

- In semi-natural wood-pastures these are often unimproved swards of conservation importance in their own right but are typically ungrazed and threatened by scrub invasion.

- In landscape parklands the grasslands are typically improved and intensification may be a major problem.

- Semi-natural wood-pastures offer considerable potential for creative habitat restoration and creation with grassland management an important factor.

- In landscape parks conservation management is likely to be much more constrained by landscape conservation considerations but there is a general need to reduce the intensity of sward management.

References and further reading

ALEXANDER, K.N.A. & GREEN, E.E. 1993. Dead Wood: Eyesore or Ecosystem? *Enact*, **1(1):** 11-14.

ALEXANDER, K.N.A. GREEN, E.E. & KEY, R.S. 1998. Managing our ancient trees. *Tree News*. Spring 1998.

HARDING, P.T. & ROSE, F. 1986. *Pasture-woodlands in lowland Britain. A review of their importance for wildlife conservation.* Huntingdon: Institute of Terrestrial Ecology.

KEY, R.S. 1994. The 1987 and 1990 storms - threat or opportunity for woodland invertebrates? *In:* A. FEIST & J. SPENCER, eds. *The Rehabilitation of Storm-damaged woods*. Bristol: University of Bristol. pp 45-58.

KIRBY, K.J. & DRAKE, C.M. 1993. *Dead Wood Matters: the ecology and conservation of saproxylic invertebrates in Britain*. (English Nature Science No. 7.) Peterborough: English Nature.

KIRBY, K.J., THOMAS, R.C., KEY, R.S., McLEAN, I.F.G. & HODGETTS, N. 1995. Pasture-woodland and its conservation in Britain. *Biological Journal of the Linnean Society*, **56:** 135-153.

KIRBY, K.J. & WATKINS, C. eds. 1998. *The Ecological History of European Forests*. Wallingford: CAB International.

MITCHELL, P.L. 1989. Repollarding large neglected pollards: a review of current practice and results. *Arboricultural Journal,* **13:** 125-142.

RACKHAM, O. 1986. *The history of the countryside*. London: J.M. Dent.

READ, H.J. ed. 1991. *Pollard and Veteran Tree Management*. Proceedings of the meeting hosted by the Corporation of London at Burnham Beeches, Bucks., on 6 March 1991. Corporation of London.

READ, H.J. ed. 1996. *Pollard and Veteran Tree Management* II. London: Richmond Publishing Co. on behalf of the Corporation of London.

PETERKEN G. F. 1996. *Natural Woodland Ecology and Conservation in Northern Temperate Regions*. Cambridge: Cambridge University Press.

SANDERSON, N. A. 1996a. *Lichen Conservation within the New Forest Timber Inclosures*. Romsey: Hampshire Wildlife Trust.

SANDERSON, N.A. 1996b. The role of grazing in the ecology of lowland pasture woodland with special reference to the New Forest. *In:* H.J. READ, ed. *Pollard and Veteran Tree Management II: Incorporating the proceedings of the meeting at Epping Forest in 1993.* London: Richmond Publishing Co. On Behalf of the Corporation of London. pp 111-118.

*STROUTS. R.G. & WINTER, T.G. 1994. Diagnosis of ill-health in trees. *Research for Amenity Trees No 2.* Forestry Commission. HMSO.

*Although directed towards the identification and remedial treatment of pests and diseases of amenity trees, there are two excellent sections at the end:
Section 4. *Control of amenity tree pests, diseases and disorders.* This poses the all important question "should control measures be instituted?" and stresses the importance of "ancient and decrepit" trees for saproxylic insects and fungi.
Section 5. Decay and Safety. This outlines the legal liabilities of tree owners, failure-risk assessment and hazard reduction.
It is very welcome that such considerations are now being included in what is, in effect, a pest control manual.

WHITEHEAD, P.F. 1992. Fruit trees, orchards and their rare invertebrates. *Entomologist's Gazette,* **43:** 303-304.