4 Improving woodland habitat for wildlife

4.1 Woodland edge and open space

Internal rides, glades and other open spaces are very important structural elements within woodland, providing valuable habitat for a wide range of wildlife, much of which differs from the high forest areas. A diverse range of sun-loving plants and insects benefit from sunny open areas, often reminiscent of communities in unimproved grassland, heathland or other open habitats. In contrast, other insects, plants, birds and mammals benefit from the woodland edge, which is essentially the interface between the high forest and open ground (Figure 4.1). In many conifer plantations on ancient woodland sites, the only native shrubs and trees remaining might be found along the margins of rides and glades.

In some woods, well-developed rides and glades will already exist, and just require continued management. In others, these open areas may have closed over and require some management intervention such as coppicing or clearing. If you own a wood with little or no open space, or one in which there are legal restrictions on widening existing 'narrow' rides, there may also be opportunities to create a new glade.

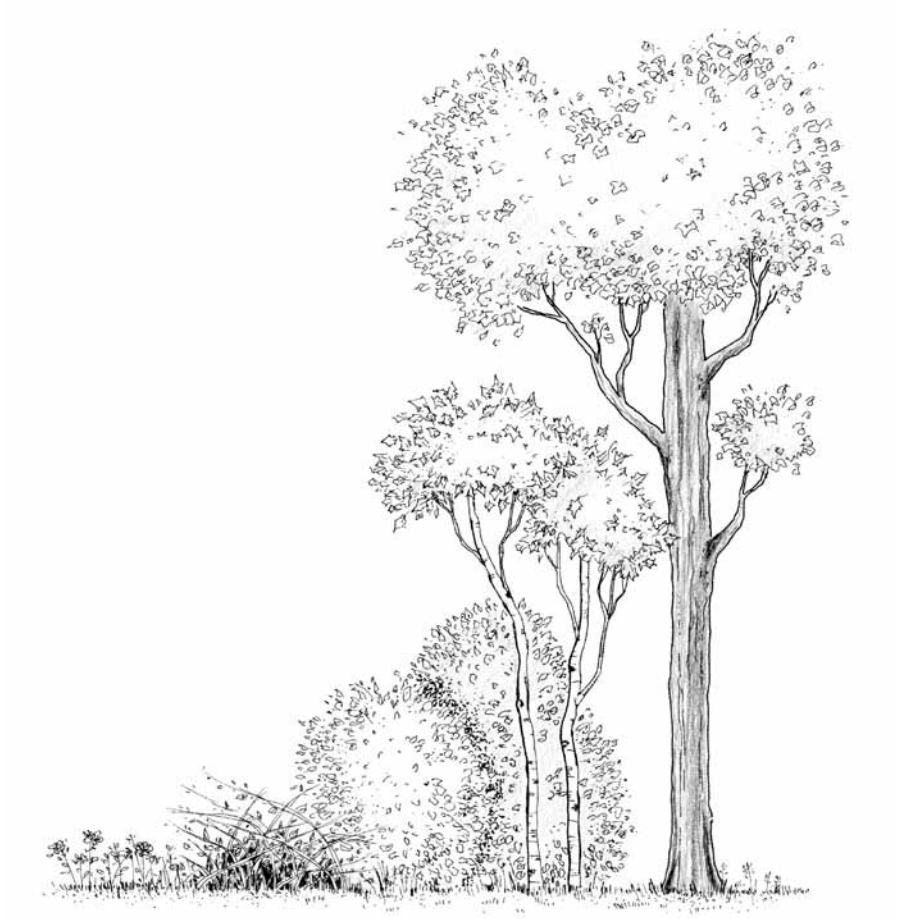


Figure 4.1 Profile of a structurally diverse, graduated woodland edge found along glades and rides.

Layout of rides and glades

Rides are tracks or corridors of open space, which include all the area between the trees on either side. They provide access to the woodland on foot or with vehicles, and are extremely valuable for wildlife. They are not bridle paths. Rides which meander through a wood, rather like a river, are good for wildlife because of the variety of sunny aspects they contain, and the shelter they afford. This is preferable to the straight corridors found in some forestry plantations, which tend to act as a wind tunnel. With existing straight rides, wind funnelling may be reduced by creating 'pinch points' to baffle the wind, or by angling the start and finish of the ride, close to the edge of the wood. Occasional standard trees retained in the centre of a ride will also baffle wind flows. Creating a series of bays or scallops along a ride will also have a similar effect, both disrupting wind flow and providing shelter (Figure 4.2). Scallops will increase the length of the ride edge, the foliage available to insects, and hence the insect biomass for foraging birds and bats. Scallops also enhance habitat diversity by increasing the area of tall herbs and providing more extensive areas of scrub along the woodland edge, particularly bramble and blackthorn thickets. They may be 30–50 m long and 10–20 m deep, but these dimensions can vary.

Glades can also provide excellent habitat for wildlife, and may include more open ground habitat than rides. These are non-linear, permanently open areas, with few or no trees. One advantage of glades is that larger patches of habitat can be maintained, including more substantial areas of scrub along the woodland edge. Glades are usually incorporated into the ride network, for example at the intersection of two rides (Figure 4.3) but may also be isolated (Figure 4.4). Felling one or more corners around a ride intersection is probably the easiest way of creating and maintaining glades, whilst also enabling wildlife to disperse along the ride network to reach the glade.

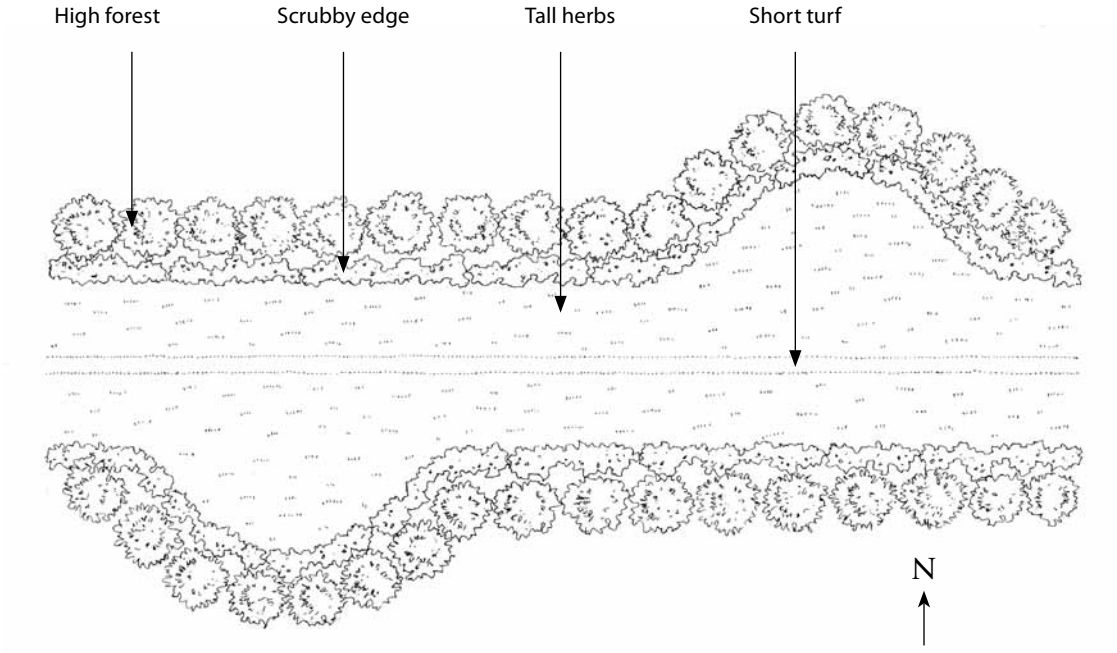


Figure 4.2 Aerial view of a linear ride to show how scallops may be positioned.

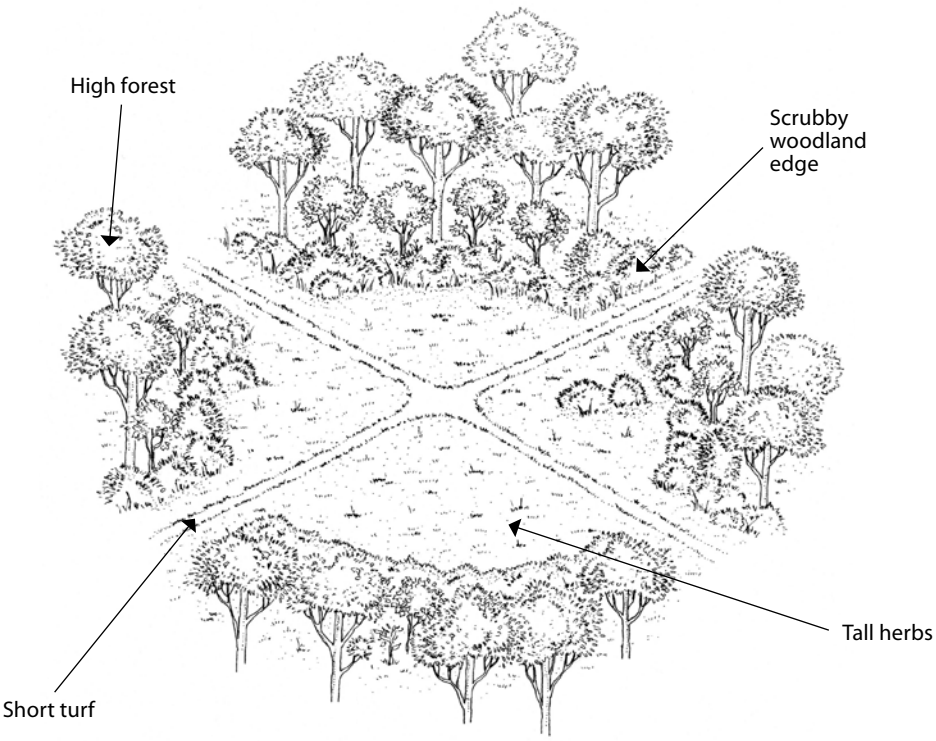


Figure 4.3 A large glade created at the intersection of two rides.

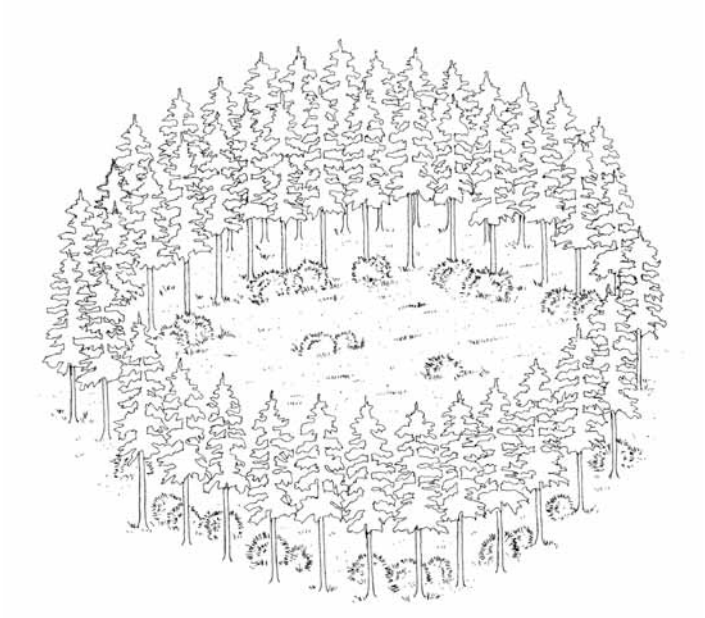


Figure 4.4 Isolated glade in a conifer plantation.

Creating new open space

If your woodland lacks good quality open space and edge habitat, some clearance work can be undertaken in both broadleaved and coniferous woodland, including areas of high forest and coppice. However, you should not clear significant areas of woodland, particularly on ancient woodland sites without asking several important questions, including:

- Is the wood a compartment of a larger block of woodland which already has good quality open space? In which case, though it may be an attractive option to create rides and glades, this would not necessarily add to the overall quality of the larger woodland habitat, and might possibly be detrimental to wildlife.
- Was the wood formerly wood pasture, maintained by grazing? If so, some clearance for grazing might be considered (see Section 4.2 and the '*Management of ancient wood pasture*' (Forestry Commission Scotland, 2009).
- Would any clearance work disturb or destroy existing high forest habitat of high biodiversity value? For example, could this disturb rare woodland plants, old canopy trees, rare insect communities of damp, shady conditions or destroy areas of dense understorey supporting rare woodland specialists such as Bechstein's bat.

If the answer to these questions is no, then it may be possible to open the canopy to enhance the woodland habitat.

Managing rides and glades

The key to managing rides and glades for wildlife is to maintain open, sunny conditions and a structurally diverse, shrubby woodland edge. A ride or glade needs to be wide enough to allow sunlight to reach the central area as well as the south-facing shrubby edge. For this reason, east-west rides should be at least one and a half times wider than the height of the trees on the south side, which is likely to be at least 30 m in deciduous high forest, less in coppice. The south-facing woodland edge of a ride orientated east-west will be warm in the summer sunshine, whilst the north facing edge will be cooler and damper. Both aspects are important for insects; the sunny edge supporting basking insects and the shady edge more attractive to feeding insect larvae. The width can be proportionally less in coppiced or younger woodland that has not achieved its full height, but will need widening as the trees grow taller. If an existing ride or glade is not wide enough, it may be extended slowly over a period of several years. It is important not to lose valuable habitat such as a scrubby woodland edge, rare species or older trees which support species of conservation concern, such as rare insects. Some rides therefore may not be suitable for widening. North-south rides receive less sunlight, and host a flora and fauna more characteristic of light woodland shade, thus providing important habitat in their own right.

Rides are typically managed as a two- or three-zone system. The three-zone system (Figure 4.5), which gives more variety for wildlife, includes:

- a central zone of short turf
- swards of tall herbs and grasses bordering the central zone
- an outer zone of scrub, allowed to develop into dense thickets in places, grading into the high forest.

You can manage glades in a similar way. Trees along the woodland edge may be thinned to create a more graduated edge, and to allow light to penetrate further into the canopy (Figure 4.1). In the high forest ride illustrated (Figure 4.5), the central zone should be a minimum of 2 m wide to allow access to farm machinery for ride maintenance. In smaller woods where space is more limiting, you can reduce rides to two zones, comprising the central area of short turf and an outer zone of predominantly tall herbs and grasses, with

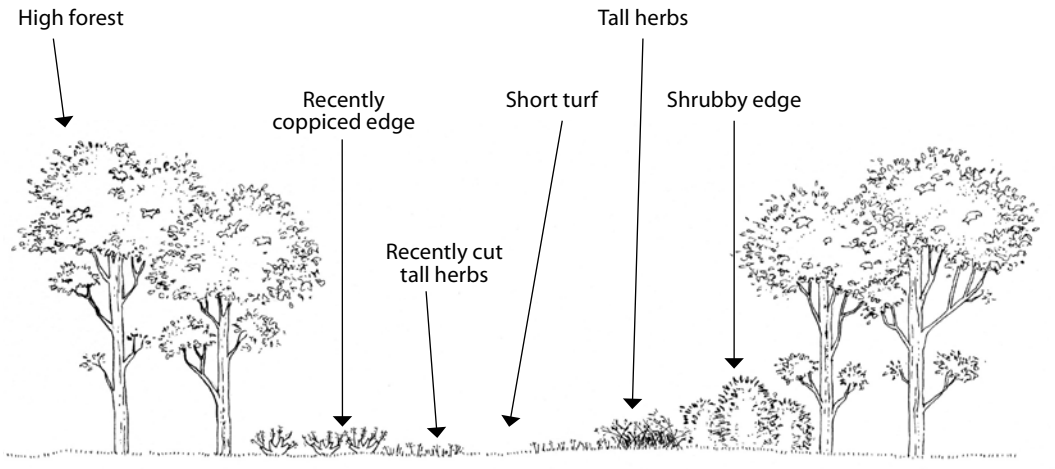


Figure 4.5 Profile of a three-zone ride management system.

small patches of light scrub. These rides can still be beneficial, but the lack of a good scrubby woodland edge makes them less attractive than wider, three-zone rides.

Rides and glades must be actively managed to prevent the edges advancing and scrub growth developing into woodland, and to maintain the diversity and quality of the habitat mosaic. This involves mowing herbaceous vegetation and coppicing or clearing scrub. You should vary the timing and frequency of cutting of different sections of a ride, and the zones within rides and glades, to increase their value for wildlife, but this may depend to some extent on practical and economic considerations. The central zone of a ride for example should be mown at least once, or possibly twice a year to maintain the short turf. Any areas of bare ground caused by machinery will add to the value of this habitat. Cut up to 25% of the tall herb zone on rotation each year, to create a mosaic of tall herbs of at least four different ages. Ideally, you should undertake this in late July or August to maintain a species-rich sward. In some cases, the results of surveys of the plants and butterflies of woodland rides and glades (see Chapter 2) might be essential to help you get the timing right. Providing the rides are mown in rotation, and only a small area is cut each year, then insect populations in the area as a whole should not be harmed. The cuttings from this will rot down if left, effectively creating a nutrient-rich compost which would encourage rank and weedy vegetation, such as nettles and grasses, while suppressing more desirable species. You should remove these, or at least stack them in one place.

If a ride represents a 'legal boundary', separating ownerships within a larger block of woodland, then some discussion with other woodland owners should result in a joint management plan which enables the ride to be managed appropriately.

The shrubby woodland edge should also be cut, but at less regular intervals, or it will grow up into high forest. Lengths should be cut or coppiced every 8–20 years, to create a mosaic of structural diversity along the edge with panels of different aged shrubs and coppiced trees. Ideally the rotation period should match the point at which an area of scrub has reached the maximum size and density required. You should undertake this work outside the bird nesting season, i.e. between August and early March. Some brash may be retained in localised piles along the woodland edge in the cut areas, as a source of deadwood.

To offer maximum variety to the organisms making use of them, large blocks of even-aged vegetation greater than 50 m or so in length should be avoided in the scrub and tall herb zones; cut areas should be evenly spread out along the ride network, alternating from one side of the ride to the other.

Control of bracken and bramble along the woodland edge

A major problem, when clearing open space for ride widening and glade creation, is invasion by unwanted vegetation such as bracken and bramble. Both of these species are shade-tolerant and thrive at the woodland edge as well as in open conditions, and are only eventually defeated by dense and continuous overhead canopies. They are also extremely effective competitors with grasses, herbs and young trees, taking up water and nutrients, and reducing overall plant diversity. Both can be virtually impenetrable to access: bracken in some parts of Britain may also harbour native ticks which can transmit Lyme disease to humans. Many websites carry information on this disease, including the National Health Service site.

Bracken is a particular problem because its extensive rhizome system stores large quantities of carbohydrate, making it resilient to damage or clearance of the above-ground fronds. It is not palatable to livestock, making it harder to control. Traditionally, trampling by winter-fed cattle on pastures was considered to give some control by weakening the rhizome, but equally overgrazing can encourage bracken by removing its herbaceous competitors. Cutting, hand-pulling, rolling, ploughing and rooting by pigs can all be effective, but none is a comprehensive treatment and all need constant re-application. Cutting or rolling twice a year for at least five years in late June and August, for example, is needed to achieve any useful level of control (Willoughby *et al.*, 2004). Alternatively, if you are not averse to using chemicals, you can achieve complete clearance chemically, using either selective or broad-range herbicides. Asulam is preferable as it is reasonably selective and is not hazardous to mammals, most trees, insects or aquatic life, although it will damage other ferns and some grass species. One application may last for up to two growing seasons, after which the regrowth can be dealt with by spot applications. Broad-spectrum herbicides such as dichlobenil and glyphosate can also be effective, but will of course cause damage to other vegetation: neither is hazardous to animals and insects, although the former is acutely toxic to aquatic life.

Bramble is another versatile species that thrives on disturbance, germinating from a large, viable soil seed bank, the established plants spreading rapidly outwards on rooting stems to form clonal patches. The seeds are readily dispersed by birds and small mammals. Bramble is palatable to grazing and browsing animals and, where deer are abundant, it can be almost entirely stripped from the field layer. Where there is little browsing pressure, however, it can develop into thickets in open or half-shaded conditions and is only temporarily suppressed by cutting or flailing. You can achieve longer-term control of bramble and other woody plants such as gorse and rhododendron where they are suppressing other scrub layer vegetation using robust herbicides such as glyphosate and trichlopyr. The usual technique is to first cut back the vegetation, allow recovery and then spray the young regrowth, repeating as necessary on any recovering patches.

Before waging a war of attrition on bracken and bramble, however, it is worth remembering their considerable conservation benefits (see also Chapter 2). Both bracken and bramble provide cover and shelter for nesting birds and protection for small mammals from their predators, as well as a food supply in late summer and autumn. Areas of bracken and scrub, particularly in the uplands, are important breeding and feeding sites for twite, whinchat, stonechat and ring ouzel, where woodland edges may hold common redstart, pied flycatcher and tree pipit. In lowland deciduous woodland, bramble is important for some of the woodland birds in serious decline, such as nightingale and warblers, as well as more common species such as robin and wren. Mechanical clearance of either species during the nesting season should therefore be avoided.

Both bramble and bracken also have strong claims to supporting a variety of insect life. Bracken cover hosts over 40 species of invertebrates. Bramble is the food plant of 61 moths such as buff arches, peach blossom and fox moth and three butterflies; but its overriding importance is the source of nectar provided by the flowers for butterflies, moths, hoverflies, bees, wasps, lacewings and flies.

Bracken provides a substitute woodland canopy for many shade-loving plants, such as bluebells and violets, where the frond density is not too high, and may protect rarer plants from grazing, including autumn crocus, lesser butterfly orchid and chickweed-wintergreen (English Nature 2001). However both bracken and bramble, at high densities, will shade out other species, especially the latter as it retains a leafy cover for much of the year. Young regenerating trees are in danger of being smothered as the fronds collapse, but can be saved by protecting them in tree shelters: weeding around the base is still necessary to prevent competition for water and nutrients. Research has shown that young trees such as oak and beech are susceptible to bramble competition, contrary to the common perception that bramble protects young trees from grazing by deer and domestic stock, although this may hold true for faster growing birches and willows that can quickly penetrate the thicket.

After weighing the arguments, you are likely to conclude that some bracken and bramble cover is good for wildlife, but that very dense patches are best broken up, particularly where they are encroaching on rides and glades. If you use chemicals, bear in mind that broad-spectrum herbicides are unselective and will damage other vegetation. In ancient woodland the best technique is to use localised treatments, for example spot-spraying individual clumps as and when necessary, and in combination with mechanical methods.

Open space for species of conservation concern

Where rides or glades are being created for species of conservation concern, such as fritillary butterflies which have precise microhabitat requirements, then it would be advisable to seek advice from local experts. Factsheets on woodland management for habitat specialist butterflies are also available on the Butterfly Conservation website. More detailed information on the ecology and management of rides and glades can be found in the Forestry Commission's '*Managing rides, roadsides and edge habitats in lowland forests*' (Ferris and Carter, 2000).

4.2 **Grazing**

In the past, grazing was very much more widespread in our native woodland than it is today. As recently as the mid 18th century, many British woods were grazed to some extent by both wild and domestic animals, but this has declined dramatically since that time. In some parts of Britain, and especially in the uplands, domestic animals still have indiscriminate access to woodlands, but this can lead to considerable damage to ecosystems, for example where high stocking densities of sheep use woodland for shelter. It has even been suggested that the New Forest more closely resembles the 'wildwood' which developed after the last ice age than much of the high forest we see today (Vera, 2000). Despite a widespread reduction in woodland management, principally through the decline in coppicing, some conservationists have suggested that nature conservation is becoming too 'managed'. The restoration of 'naturalistic' grazing and browsing by wild herbivores (Hodder and Bullock, 2009) has been advocated as one means of allowing natural development to take its course, but in many woods this would be prevented by large deer populations. This is also known as 're-wilding', and its popularity as a concept is growing. However, for most small woodland owners, the limited amounts of grazing available under a woodland canopy will probably be insufficient to support high densities of animals. If your wood is large enough, managed or 'conservation' grazing is one possible option.

Deer

Before any additional conservation grazing management is considered, it is first necessary to establish whether deer are present in the woodland, and if so, the impact which these animals are having on woodland structure and species diversity. Deer can severely limit natural regeneration in any wood by eating the self-seeded saplings, and prevent

development of upland birchwoods into native pine or oak woods. Recent evidence from studies in an Essex woodland supports the notion that increased deer browsing has contributed to the decline of populations of woodland birds such as nightingale (Holt *et al.*, 2010). In this study, plots were cut to produce young coppice regrowth, with deer excluded by fencing from half of these. Nightingales showed a strong preference for the fenced sections in comparison to the grazed controls, spending 69% of their time in the 6% of the study areas protected from deer.

In many cases, deer densities may already be too high – numbers of muntjac and roe deer exceeding one animal per 1–2 ha have been recorded in some British woods – so grazing by domestic animals may not be necessary or desirable. You may not know how abundant deer are in your wood, or which species are present. Estimates can be made by counting faecal pellets in sample plots, either at a single visit (the standing crop method) or by clearing the plots at repeat intervals and measuring accumulation over time (the accumulation rate method). A recent Forestry Commission Bulletin describes a useful, but rather involved combination plot technique, combining both methods, to estimate deer numbers (Swanson *et al.*, 2008). For identification purposes, deer faecal pellets are usually dark brown/black, cylindrical and pointed at one end. Roe deer pellets are approximately 18 mm long and 14 mm wide; fallow deer pellets are 15–16 mm long and 8–12 mm wide, indented at the blunt end; and muntjac deer pellets are 10–13 mm long and 5–11 mm wide, sometimes pointed at both ends. The results of monitoring should also indicate whether any control measures such as fencing might be necessary, and whether a deer management plan should be undertaken separately from a conservation grazing plan. The *Woodland Grazing Toolkit* (Sumsion and Pollock, 2005) provides useful guidance on preparing a deer management plan, and is available on the Argyll and Bute Council website.

Introducing conservation grazing

Whilst grazing may not be appropriate for many woodland owners, especially those where fencing is not an option, there are woods where it might be seriously considered. Carefully controlled grazing by small numbers of animals can be used to achieve conservation targets such as the maintenance or creation of structural diversity in the understorey and the management of glades. Animals are likely to influence both species and structural diversity in the field layer, understorey and canopy trees, and hence the populations of insects and their predators. The exact outcome depends on many variables, including the type of animal, stocking density (Table 4.1), feeding preference (Table 4.2), and the effects of dunging and trampling. An accumulation of dung in areas where cattle lie up can lead to tall herb vegetation. Trampling can have beneficial effects on coarse grasses, but may adversely affect soil structure in damper areas.

The high structural variability of different woodland sites, the types of forage present and its palatability, makes it difficult to be precise about what stocking levels can be maintained. In open woods, such as lowland wood pasture, it may be possible to graze one cow or pony

Table 4.1
Effects of differing grazing levels on woodland habitat (after Mitchell and Kirby, 1990).

Level	Effects on woodland habitat
Low	Saplings present; well developed understorey, no browse line; grazing sensitive species such as honeysuckle and bramble present
Moderate	Saplings scarce, signs of grazing and browsing, patches of bare soil
High	Saplings <20 cm tall; distinct browse line, no shrubs; field layer dominated by less palatable species; palatable species inaccessible to herbivores
Excessive	No regeneration; barking; no shrub layer; loss of structural diversity; extensive bare ground and soil disturbance; invasive species colonising

Fallow deer (up to 1 m at shoulder)

Roe deer (up to 75 cm at shoulder)

Muntjac deer (up to 50 cm at shoulder)

Table 4.2
Feeding behaviour of domestic stock (after Mayle, 1999).

	Feeding method	Species selectivity
Cattle	Bulk grazer, tears off vegetation; ruminant	Low – prefer grasses and forbs, sometimes browse trees and shrubs
Horses and ponies	Bulk grazer, nips vegetation close to ground; also browse trees and shrubs; non-ruminant	High – prefer grasses, but also graze forbs and browse range of trees and shrubs
Sheep	Selectively grazes vegetation close to ground; also browse trees and shrubs; non-ruminant	High – frequently browse trees and shrubs
Goats	Selective browsers; ruminant	High – frequently browse trees and shrubs
Pigs	Omnivorous; non-ruminant	Low

per 1–2 ha for ten months of the year without any negative impact; the equivalent of 4–5 sheep per ha. These levels reduce considerably in closed-canopy woods where there is less available ground vegetation and browse material. For example, the range of annual dry matter of ground vegetation for oak woodland is 0.1–1 tonnes per ha, whereas for acid grassland it is 3–5 tonnes per ha (Sumsion and Pollack, 2005). In these circumstances more realistic stocking levels are of the order of one cow per 10–20 ha or one sheep per 2 ha. This highlights the point that most small woods are simply unable to provide enough forage for any number of animals except, perhaps, for very short intervals of the year. If the stocking levels are too high, conservation aims will be heavily compromised because natural regeneration will cease, scrub layers will start to disappear and bark-stripping of coppice stools and trees will become more prevalent.

Levels of stocking that will maintain natural regeneration of trees and shrubs are also subject to great variability, depending on canopy closure, tree species, woodland structure and composition. Historic reconstructions of the grazing regime in the New Forest indicate that natural regeneration could be sustained at quite high combined stocking levels of one cow per 4.5–5 ha, one horse per 9–15 ha and one red or fallow deer per 3–3.5 ha (Flower 1980, Putman 1986). In the uplands, red deer densities up to 7 animals per square kilometre has allowed sufficient regeneration of native pinewoods (Gill, 2000). For roe deer, impacts on broadleaved regeneration have been reported at densities varying between 4–12 animals per ha. In general, considering that other grazers may be present, very conservative stocking levels (e.g. of less than one cow or 10 sheep per 10 ha of summer grazing) are probably appropriate for conservation grazing, until monitoring confirms any positive or negative impact.

Before any animals are introduced into your woodland, write a management plan which includes a grazing regime. A useful guide to writing a detailed grazing plan is the *Woodland Grazing Toolkit* (Sumsion and Pollock, 2005), which also provides guidance and background on using woodland (rather than wood pasture) for livestock grazing. In small woods, seasonal grazing is likely to be most appropriate. Grazing in spring and summer is generally avoided, because animals may graze on wild flowers, leading to a reduction in species diversity. Insects and their predators are also likely to be adversely affected. Late summer and autumn is often the best time for seasonal grazing, with maximum biomass and the least likelihood of damaging insect populations. Winter grazing can also be considered, particularly where bracken needs to be controlled, but livestock can cause considerable damage to soils in winter, particularly if the ground is wet. Further information and advice on woodland grazing can be obtained from the Grazing Advice Partnership website.

Grazing ancient wood pastures
Ancient woodland pasture was traditionally managed as areas of grassland or heathland with open-grown veteran trees (Section 4.3), providing grazing, fodder and shelter for livestock. If you own a former wood pasture, you have an opportunity to care for an historic landscape, and the veteran trees themselves, which support rare and specialised wildlife. A long-term commitment to carefully managed grazing regimes is essential to maintain and protect wood pasture. Without this, the site would return to native woodland, but the veteran trees could still be protected. Managing and restoring traditional wood pasture is outside the scope of this book, but detailed guidance can be found in a number of publications such as *'Ancient wood pasture in Scotland: classification and management principles'* (Holl and Smith, 2002).

4.3 **Conserving veteran trees**

The terms veteran and ancient trees have become almost synonymous, but an ancient tree should strictly be defined by its age, and classed as old for its species. A veteran tree by definition has 'veteran features' such as a hollow, rotting limb, but is not necessarily extremely old. Here we have adopted the term veteran tree, to include all trees with veteran features, irrespective of their age. A veteran tree will provide an almost continuous supply of deadwood in all stages of decay, which is essential for the survival of the rich assemblages of specialist wildlife which reside in them. Even the roots can develop complex fungal communities. The biological, cultural and historical importance of veteran trees has begun to be recognised in recent years, helped by a Woodland Trust initiative called the 'Ancient Tree Hunt' which is designed to identify and map all veteran trees in the British Isles.

Veteran trees are typical of old wood pasture and parkland, where as trees age, their growth rate slows and the crown starts to die back. It is quite possible that you may have one or more veteran trees in your wood, particularly if it includes an ancient woodbank. The aging process in wood pasture trees can take many years, in the absence of competing trees. Veteran trees may also be found in other habitat, such as high forest, hedgerows and riparian woodland along rivers and streams, where old willows still survive as both managed and lapsed pollards. Many veteran trees were once pollarded to avoid browsing damage, by repeatedly cutting back the shoots on short rotations at 2–3 m above ground. Pollards are often found along edges of woodland and wood banks, marking the boundaries of historic ownership. Veteran maidens and coppice stools are also frequently encountered.

Age can be used to compare trees of the same species, but not as a universal guide to identifying veteran trees, as different trees age at different rates. For example birches tend to rot and collapse relatively quickly, so a veteran tree may only be 100 years old, whereas oaks rot from the centre, so veteran trees with hollow trunks may be many hundreds of years old. Some veteran yews are over a thousand years old. Girth offers a good clue to the age of a tree, but this may be strongly influenced by the environment for a given species, so it usually a combination of size and other characters which confirms its status (Table 4.3). Essentially, the more of these features which a tree possess, the greater the confidence that the tree is a veteran, although care is required because some features might be present on a younger tree, resulting from environmental or human action rather than the aging process.

Managing veteran trees
Veteran trees are found in a wide range of habitats, and differing conditions. Some may have a long history of management, and others may have been managed at one time, but neglected for many years. For these reasons alone, every individual veteran tree is in some way unique. Ideally, the aim of any management intervention such as pollarding should be to prolong the life of the tree, unless tree surgery is required because the tree has become a hazard to people. Veteran trees can also be protected by managing the forest around them. For example,

Table 4.3
Summary of the key characteristics of veteran trees.

Characteristic	
Girth	Large for the species concerned
Hollowing	Progressive hollowing in trunk or major limbs important; hollow trunk indicates a tree of great age
Crevices	Under bark and branches
Exposed wood	Caused by bark loss resulting from damage such as loss of a limb
Rot sites	Exposed wood colonised by 'deadwood specialist' fungi and other deadwood species
Rot holes	Rotting creates holes which may be used by insects, birds and bats
Water pockets	Rot holes may naturally fill with water
Deadwood	Large quantity attached in the canopy, or fallen beneath the tree, usually hosting range of specialist deadwood fungi
Fractured stems	Active shoots associated with fractured trunk or limbs, which are decaying
Sap runs	From wound tissue
Fungi	Fruiting bodies of 'deadwood specialist' species
Lichens	Some lichens specialise on veteran trees

tree roots near the surface are vulnerable to damage from compaction, caused by people, machinery and livestock, if animals are congregating under a tree for any reason. Younger trees are important because they will eventually reach old age and replace the veterans, but any trees which are adversely affecting the veteran trees by shading could be removed; gradually if several are involved.

Many veteran trees were once pollarded, but if this practice ceased some time ago, the decision to repollard is one which requires careful consideration (Figure 4.6). The crowns of such trees can become unstable, requiring some action to be taken. However, restarting pollarding after a long gap can actually accelerate the decline of a veteran tree in some circumstances. Old, neglected pollards may fail if severely cut back, but some species seem to recover well: in one study at Knebworth Park, 93% of old hornbeam pollards that had

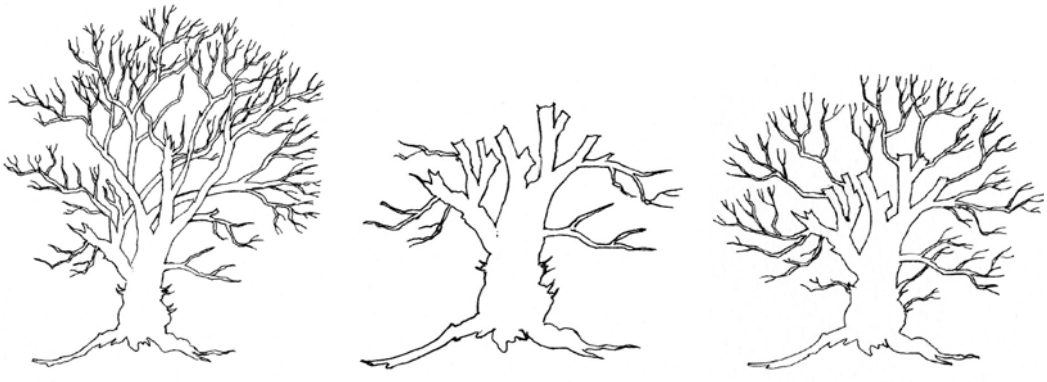


Figure 4.6 Repollarding an old pollard, neglected for 100 years.

not been cut for more than 55 years survived the treatment. Wych elm, willow and lime are also good subjects; variable results have been found with ash, oak and poplar, while veteran beeches often die after severe re-pollarding. More details can be found in '*Veteran trees: a guide to good management*' (Read, 2000) which can be freely downloaded from Natural England's website. The chances of success can be increased by a number of measures, such as leaving branch stubs above the branch collar, choosing rough-barked trees, and leaving some branches intact for 3–5 years until new shoots become established after cutting (Mitchell,

Veteran oaks support rich assemblages of specialist wildlife.

1989). In the case of beech, this appears to be essential and the initial retention of 25–50% of the crown is recommended.

Clues to how a tree might respond to repollarding can be found by carefully examining the growth of the tree, or specimens of the same species, of a similar age nearby. If a tree has been damaged and lost a limb, new shoot growth might suggest that the tree will respond well to pollarding. Similarly, active shoot growth from the trunk or a good depth to the canopy are often indicators of a latent capacity to be re-shoot successfully. If you are in doubt, a single limb could be removed, and the response of the tree monitored: if there is good regrowth, then pollarding may proceed.

In addition, it is also important to consider the age of the tree, the number of limbs (and hence how much crown) and how the balance of the tree would be affected by pollarding. The number of stages over which the pollarding will be carried out must be decided, what limbs will be left, and the length of snags. Timing is also critical, to avoid periods of bud break and leaf fall in particular: mid to late winter is generally the best time to carry out work on veteran trees. You may also undertake sensitive and gradual thinning around veteran trees to reduce competition from younger trees which might otherwise shade them out.

Managing veteran trees is a specialised undertaking; each tree or population of trees deserves its own management plan, for which it might be advisable to seek professional advice. Before any work is carried out, you should consider the affect on the wildlife using the tree. Any work should be undertaken by fully certified chainsaw operators, with certificates for working at heights and for tree climbing.

4.4 **Deadwood**

As we have seen in Section 4.3, deadwood plays a vital role in the life cycle of many woodland organisms, and is therefore a very important component of woodland ecosystems. Deadwood habitats may be found in a variety of different places in woodland, including:

- fallen trees
- accumulations of smaller material such as logs, branches and twigs
- material present below the ground
- living trees of any age, e.g. rot holes and decaying limbs or as dead snags (Table 4.3).

In the very recent past, people often saw this material as a sign of neglect, and were tempted to collect and burn it. Even today, new owners may consider 'tidying' their wood by disposing of the deadwood. However, it is essential to realise that deadwood provides important habitat for small mammals such as bats, voles and hedgehogs, cavity nesting birds such as willow tit, a diverse range of insects, lichens, fungi and mosses; and the species which feed on them. Colonisation of deadwood depends on the tree species, the stage of decay, the size and volume of deadwood (colonists have differing micro-habitat requirements) and so on. The fungi which colonise deadwood are absolutely critical, as they predigest wood, allowing other organisms such as insect larvae to move in. Oak deadwood for example decays very slowly, providing long-term continuity; this is particularly apparent in upland oak woods, here there is often a high biomass of fallen branches. In contrast, birch is relatively short-lived, but its rotting hollow stems are good for roosting bats, nesting birds, pine marten and range of insects and fungi. In deciduous woodland, the diversity of species that depend on deadwood is particularly high in wood pasture with pollards, and to some extent in neglected coppice with large, decaying stools. Species diversity is lower in managed coppice and high forest, but storm damage in the late 20th century has increased the deadwood resource.

Some insects such as the wasp beetle whose larvae develop in deadwood, or leaf litter require flowers for the adults to feed on. Flowering plants in nearby woodland rides and glades are therefore critical to the successful lifecycle of these species. For example, the adults

of many insects appear to emerge at the time of peak flowering of hawthorn, which appears to be particularly important.

Native pinewoods and old Scottish pine plantations traditionally lost much of their deadwood through management, but pine stumps left *in situ* support rich assemblages, including rare beetles, hoverflies and lichens. Decayed pine snags support nesting crested tit and pin-head lichens and large dead branches may be used by roosting osprey and capercaillie.

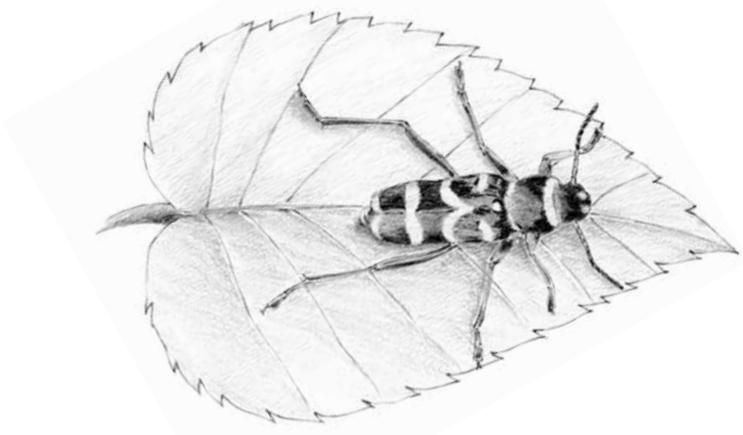
In rivers, standing water and wet woodland, deadwood which appears to be polluting or choking can actually be important for healthy freshwater ecosystems. For example, 'debris dams' provide shelter for fish and trap organic matter; wet rotting logs are important for insects; and veteran trees by water provide nest holes for birds and burrows for fish.

If your wood has mature native broadleaf trees, and has had little intervention for a long time, the deadwood may have a rich assemblage of species (Table 4.4). Conifer plantations, particularly those over 100 years old, can also contain valuable deadwood resources.

Managing deadwood

There are various opportunities to create or enhance deadwood habitats in most woodland types, irrespective of their past history and management. Many of the key management priorities are generic to a range of deciduous woodland types, and are described below.

- preserve some areas for 'old-growth' conditions
- retain veteran trees
- leave dead limbs *in situ* (which requires consideration of health and safety issues)
- leave all deadwood if possible, but some small logs can be lashed together as a 'Waterhouse' pile and placed in dappled shade
- pollarding will increase the value of standing trees for deadwood specialists and provides fallen deadwood
- artificially increasing deadwood in some (especially young and coppice) woods could benefit biodiversity
- set aside some areas of minimal intervention to allow natural build up of deadwood (particularly relevant in some upland woods)
- along some waterways, public access requires consideration of health and safety issues
- non-intervention minimises damage to streamside banks
- allowing dieback of exotic poplars provides nest holes for willow tit.



Wasp beetle larvae feed on dead wood, but adults seek flowers along the woodland edge to feed.

In Scottish pinewoods and old-growth plantations, the following guidelines also apply:

- lowering management intensity should ensure a supply of deadwood through natural processes
- target ≥20–40 m^3 per ha deadwood
- preserve standing dead and dying pines (up to 80 years)
- leave fallen deadwood and stumps
- create some high stumps (1–3 m) for hole-nesting birds.

Table 4.4
Strategies for managing deadwood in woodland (adapted from Hodge and Peterken, 1998; Humphrey *et al.*, 2002).

Woodland type	Characteristics	Management strategy	Management guidance
Ancient woodland, including coppice and wood pasture supporting rich 'deadwood specialist' fauna and flora	• Mature timber habitat over long time period • History of pollarding • Low intensity management with natural disturbance	• Conserve and enhance veteran trees and deadwood • Allow natural process to replenish deadwood	• Minimum intervention, small scale thinning to mimic natural processes • Retain veteran trees and trees with decaying wood • Target typically 40–50 m^3 per ha deadwood >20 cm • Retain middle-aged trees to form future veteran trees • Consider injuring trees to provide future deadwood • Retain cut wood *in situ* • Leave fallen deadwood *in situ*
Ancient woodland and old secondary woodland with little deadwood and/or 'deadwood specialist' species	• Low deadwood due to management • Lacks large mature deadwood habitat • May lack local source of colonists	• Allow natural process to expand deadwood • Retain sufficient mature timber to attract colonists and provide future deadwood	• Allow some coppice to develop into high forest if this does not adversely affect other species • Improve structural diversity • Target typically 20–40 m^3 per ha deadwood >20 cm • Retain veteran trees and trees with decaying wood • Retain 20–40% of cut wood on site • Leave fallen deadwood *in situ*
PAWS (typically exotic, even-aged stands)	• Deadwood volume from previous stand may be high • Shade from conifers threatens deadwood habitat	• Consider restoration of native woodland whilst protecting deadwood resource	• If undertaking restoration, maintain some semi-shaded conditions to conserve deadwood habitats

Health and safety

There are potential risks associated with any work related to veteran trees and deadwood, for example from falling branches. In all cases, a Site Risk Assessment should be undertaken to identify any hazards posed by individuals, or groups of trees, or before any work is undertaken. Health and safety is also a concern where trees are close to public roads or footpaths; and deadwood issues need to be taken into account, for example where dead limbs are close to recreational areas. Several guides are freely available on the internet, such as the English Nature's '*Veteran trees: guide to risk and responsibility*' (Davies *et al.*, 2000) and the Forestry Commission's '*Hazards from trees: a general guide*' (Lonsdale, 2000), but there is no substitute for professional advice.