1 Identifying woodland types

1.1 Woodland origins in Britain

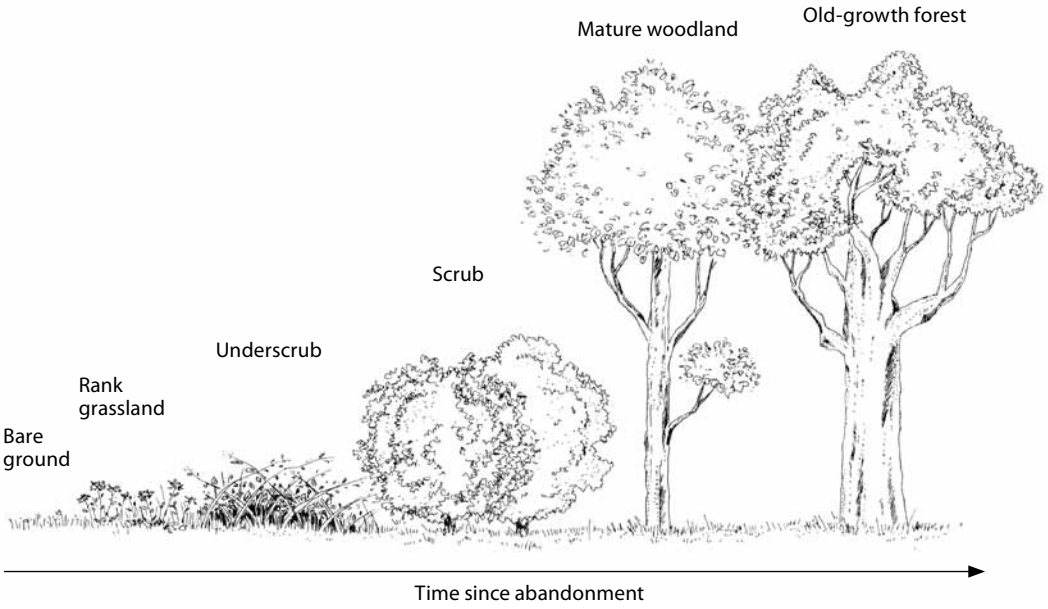
Over much of Britain woodland is the final, stable ecosystem, which is known as the 'climax' ecosystem. Following the last ice age, as the climate improved, trees migrated northwards from the parts of Southern Europe which escaped the ice, crossing the land bridge in what is now the southern North Sea, into Britain. Aspen, birch and sallow were followed by Scots pine, oaks, alder, limes and elms. Immigration continued until Britain was cut off by the flooding of the English Channel, around 8,000 years ago. Primary forest, the so-called 'wildwood' covered most of Britain at that time. Lime woods dominated southern Britain, with ash and elm dominating woods in the west where soils were rich enough. Further north in Scotland, pine dominated the higher ground to the east, with Atlantic oak forests along the west coast. Major forest clearance began during the Neolithic period, as the wildwood was opened up by coppicing, the extraction of timber and clearances for agriculture. It is not known exactly when the wildwood disappeared, although by the early Iron Age probably about half had already been cleared in England, and little was left by the time of the Norman invasion.

Today, native woodland is often categorised as ancient or recent (secondary). Land which has remained wooded since medieval times at the latest (1600 AD), and possibly much earlier than this is termed ancient woodland. Some of these woods are likely to be direct descendents of the original wildwood. In contrast, woods which developed on previously open ground from the start of the 17th century are termed recent or secondary woodland. Much of this recent woodland resulted from natural succession on abandoned heaths, moors and grassland. Ancient, and some recent woodland is often referred to as semi-natural, as it has been shaped by both man and nature. A third category refers to the deliberate planting of trees to create artificial plantations, usually for economic reasons. Plantations may be traced back to the 17th century, when they were predominantly broadleaved: sweet chestnut plantings in southern England arrived somewhat later, mostly during the 19th century (Rackham, 2003), replacing the previous coppice crops on former woodland sites. It was not until the end of the First World War that major planting programmes with conifers started. Some open habitats which would be protected today as UK Biodiversity Action Plan (BAP) priority habitats, including heaths, moors, grassland, bogs and sand dunes were systematically planted with a range of conifers, including Corsican pine, larch, Western hemlock, spruce and Scots pine. Even ancient woodland was felled to make way for plantations of conifers and sometimes broadleaved species, though as a policy this ceased by the mid-1980s. Thus, by the end of the 20th century conifers were the dominant forest type, accounting for more than half of British woodland. In the early 21st century policies have changed considerably, with most new planting being of broadleaves, and some plantations on ancient woodland sites (PAWS) now being replaced with native broadleaves or allowed to regenerate naturally. Woodland creation schemes now take into account habitat networks and the linking of ancient woods, and focus on issues such as the selection of trees and shrubs to accelerate the development of semi-natural ancient woodland types and their associated wildlife (Blakesley and Buckley, 2010).

1.2 Woodland succession and regeneration

Succession is essentially a series of more or less predictable changes in vegetation over time, which results in a relatively stable, mature ecosystem, or 'climax' vegetation. Succession

from bare rocks or sand dunes which have not previously supported plant communities is known as primary succession. Recent woodland regenerating on land which has previously supported plant communities, such as farmland, is known as secondary succession. Britain's temperate climate usually leads to deciduous woodland, except in the Scottish Highlands, where Scots pine and juniper woodland can develop. Although the exact sequence of succession may vary with site, and in time, typical stages on ex-arable land in lowland Britain are summarised below:



Example of a typical sequence of plant communities on ex-arable land, from bare ground through to old-growth forest.

Saplings of trees such as beech and ash may be found in the underscrub and scrub communities which develop dense thickets with closed canopies. The transition to oak woodland may follow, or on more base-rich brown earths, to ash woodland. Recognisable stages in the succession of the high forest include:

- maturing woodland with gaps in the canopy, allowing light to reach the woodland floor and trees and shrubs to regenerate
- mature woodland with little deadwood
- old-growth woodland with large trees, standing and fallen deadwood and younger, regenerating trees.

Each of these stages is distinct, both in terms of the structure of the wood, and the community of plants and animals which inhabit it. The timescale for secondary succession depends on factors such as the proximity of seed sources, soil conditions and competition from grasses and herbs. It can take many hundreds of years for recent woodland to closely resemble ancient woodland. Nevertheless, as a wood ages it becomes more diverse in many ways, and richer in wildlife. You may be able to recognise the stage of succession in your wood from the brief descriptions above.

Natural regeneration in mature woodland occurs when a gap is created by a falling tree, or rarely when a large number of trees are brought down by severe storms, such as occurred

in the 1968 storm in Scotland and the 1987 storm in southern England. Regeneration in a tree fall gap may be compared to that in a newly coppiced or felled area. If a single tree falls, it creates opportunities for seedlings or root-suckers to develop from surrounding trees, particularly those which thrive in partial shade such as beech. The fallen tree itself may sprout from the base and along the trunk, developing into a coppice-like thicket. When a larger gap is created by the collapse of several trees, more light reaches the woodland floor, enabling a wider range of trees and shrubs to establish themselves. The amount of regeneration will vary, depending on distance from the 'new' woodland edge and the dispersal characteristics of seed from the mature trees present. Within the gap, some saplings and suppressed trees may already be present, ready to capitalise on the opening of the canopy. Others, such as pioneer willows and birch, with their light seeds will be early colonists; followed by the heavier seeds of trees such as oaks and hazel. This dynamic process often results in considerable structural diversity in the tree and shrub layer. Initially, the sudden increase in light will also have dramatic effects on the field layer, which may have been impoverished under the previous heavy shade. In ancient woodland, in the second season, the woodland floor may be carpeted with woodland flowers, augmented with herbs, grasses and rushes germinating from the soil seed bank. These include some light-demanding species whose seeds can survive for long periods in the soil, responding to the sudden increase in light. Eventually regenerating saplings close canopy, and the ground vegetation adjusts to the shady conditions once again.

When conifer plantations on ancient woodland sites (PAWS) are felled with the intention of allowing the site to regenerate naturally, the outcome is far more uncertain. Regeneration may follow a similar sequence of events, depending on the damage caused to the site during felling, and the extent to which the original flora and fauna survived in remnant patches of ancient woodland, often found along the margins of rides and forest roads, or the woodland perimeter. It is quite possible, however, that the tree cover will be provided by seedlings of the conifers, especially in the case of Scots pine or Western hemlock.

1.3 **Identifying semi-natural woodland types**

A greater understanding of your wood and its ecology will add to the pleasures of ownership and management. One of the first steps should be to identify the woodland vegetation type and, if possible, something of the underlying soils in your wood. This information would also guide the choice of species for any new planting within the boundaries of the wood, or on adjacent land. And if seed is sourced locally, from which woodland types it should be collected.

Woodland types are influenced by a range of factors, including climate, soils, geology and past management. In the uplands of Scotland, Wales and South West England, mild oceanic airstreams strongly influence the composition of woodland communities, the humid conditions particularly favouring rich woodland communities of ferns, mosses and lichens. In the central Highlands of Scotland, where winters are coldest, the pinewoods have some affinity with the forests of Scandinavia. Further south and east, English lowland woods experience wide temperature ranges, lower rainfall and winter frosts. Oaks and ash dominate the canopy, with other trees and shrubs more frequent. In South East England, woods take on a more continental character, with beech and hornbeam being important components of the canopy.

Over the years, different authors have adopted different classification systems for British woodland. One of these, the National Vegetation Classification (NVC) (Rodwell, 1991), which deals with trees, shrubs and ground flora together, has become the most widely used system. A user-friendly key for identifying woodland NVC communities can be found in the '*National Vegetation Classification: Field guide to woodland*' (Hall *et al.*, 2004). More detailed information can be found in '*British Plant Communities – Woodlands and scrub*' (Rodwell, 1991).

If you are competent at identifying trees, shrubs and prominent ground vegetation, and know the broad soil types, then the simplified key in Table 1.1 may help you to identify NVC types in your wood. The descriptions of different woodland types in Section 1.4 may also be helpful. You should initially divide your wood into visually different community types, with homogeneous areas within each type selected for identification purposes. Carry out surveys in the spring, from April to June, when most of the field layer plants are in flower.

Shrubby woodland edges, with a varied field layer and good structural diversity should also be surveyed, especially as such habitat is valuable for wildlife. A simple method is to survey 30 m lengths of woodland edge, identifying all the species present, if possible, assigning to each a visual cover percentage.

More detailed assessments of each community type can be undertaken based on the methods described in Hall *et al.* (2004), with reference to keys given in Rodwell (1991).

1.4 **Semi-natural woodland types**

The following accounts are based on woodland habitats recognised by the UK Biodiversity Action Plan (BAP), showing their constituent woodland types described in the NVC (see Table 1.1).

Lowland mixed deciduous woodland

This broad category includes ash and field maple woods (NVC W8) and oak woods (NVC W10, W16), which are associated with fertile soils, forming a continuum from base-rich to more acid soils. They tend to form mosaics with other types of woodland, particularly

A woodland owner examines the ground flora in an area of coppice to help identify the woodland type.

lowland beech and yew. Many have been converted to conifer plantations, or replaced with sweet chestnut or hornbeam coppice.

Ash-field maple woods tend to occur on soils that are not too acid (i.e. base-rich, neutral and even calcareous (limey) soils), although species other than ash, field maple and hazel may dominate, depending on the soil conditions. These include lime, hornbeam and oak in the canopy and blackthorn, elder, dogwood and spindle in the understorey. Identification of the dominant field layer species is usually necessary to identify the sub-community.

The lime-demanding species become less frequent on more acid soils, where pedunculate oak and birch are more prominent, although both species of oak may be present in oak-hornbeam woods (NVC W10). Other prominent species include hornbeam, small-leaved lime and sweet chestnut, while ash is less frequent, particularly in South East England. Sub-communities characterised by wood anemone are frequent in South East England, while those with abundant ivy have a distinctly western bias.

On the impoverished acid soils of South East England, particularly on free-draining sandy plains, pedunculate oak and birch dominate (NVC W16), other species are rarer, but may include rowan, alder, aspen and holly. The field layer is often dominated by bracken, wavy hair-grass and ericaceous species such as heather and bilberry, but is generally species-poor.

Lowland beech and yew woodland

Yew woodland (NVC W13) occurs on steep, often south-facing chalk escarpments in southern England, and on the limestones of northern England, where it is usually associated with upland ash woods. Yew is the dominant canopy species, but may be accompanied by occasional ash, sycamore, pedunculate oak, whitebeam and beech.

The constant presence of beech in the canopy distinguishes three community types, which can tolerate soil conditions ranging from calcareous, neutral-basic to acid. Calcareous beech and yew woodland (NVC W12) occurs mainly on chalk or limestone soils in South East England, within the natural range of beech, but also has a more restricted distribution in North West England. These woods are dominated by beech, whilst ash and sycamore are often present. Yew, holly and whitebeam are also characteristic, with pedunculate oak less common than in other beech wood types. The understorey may be sparse, but include a wide range of species.

Stands on neutral to slightly acidic and usually heavier soils can also be dominated by beech, with oaks being the most common associate (NVC W14). The dense canopy results in a sparse field layer, with bramble the most common species. These beech woods often form mosaics or merge into typical oakwood communities (NVC W10).

Acidic beech-wavy hair-grass woodland (NVC W15) occurs on well drained sands and gravels. It has a much wider distribution than other beechwood types, but covers a smaller area. Oaks are the most common associate, with birches regenerating in gaps. Sycamore, wild cherry and whitebeam are scarce; and the shrub layer is usually poor or absent.

Wet woodlands

Wet woodlands occur on the seasonally waterlogged soils of floodplains, river valleys, and on fens, mires and bogs. Alder, birch and willows dominate, merging into oak, ash or beech communities in drier conditions, such as valley slopes. Willows dominate communities on the wettest sites, colonising the edges of standing open water, or in mires where succession is checked by a permanently high water table. In conservation terms, wet woods are important for their floristic variety and relict plant species of formerly open wetlands such as marsh fern; the deadwood habitats on wet substrates also support many localised invertebrates.

Grey willow with marsh bedstraw woodland (NVC W1) occurs mainly on mineral soils along the margins of water, often as a narrow fringe, and has a somewhat western, coastal distribution. Grey willow with downy birch woodland (NVC W2) develops on fen peat and terraces of river valley mires, especially in East Anglia. Common reed is usually present, as

Table 1.1
NVC key to woodland types, based on the key canopy species, ground flora component and broad soil types (source: Forestry Commission, 2008; © Crown copyright, reproduced with the kind permission of the Forestry Commission).

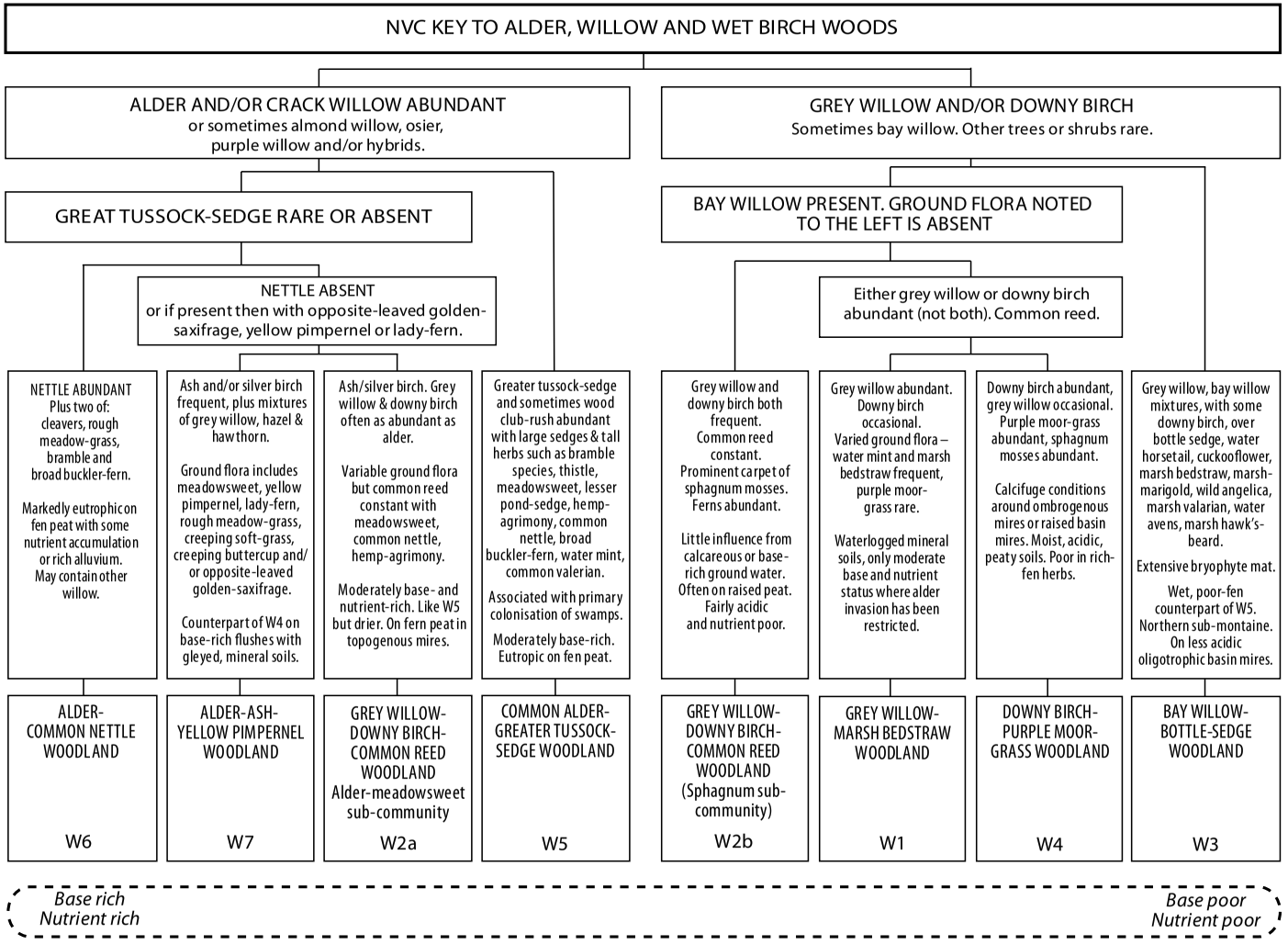
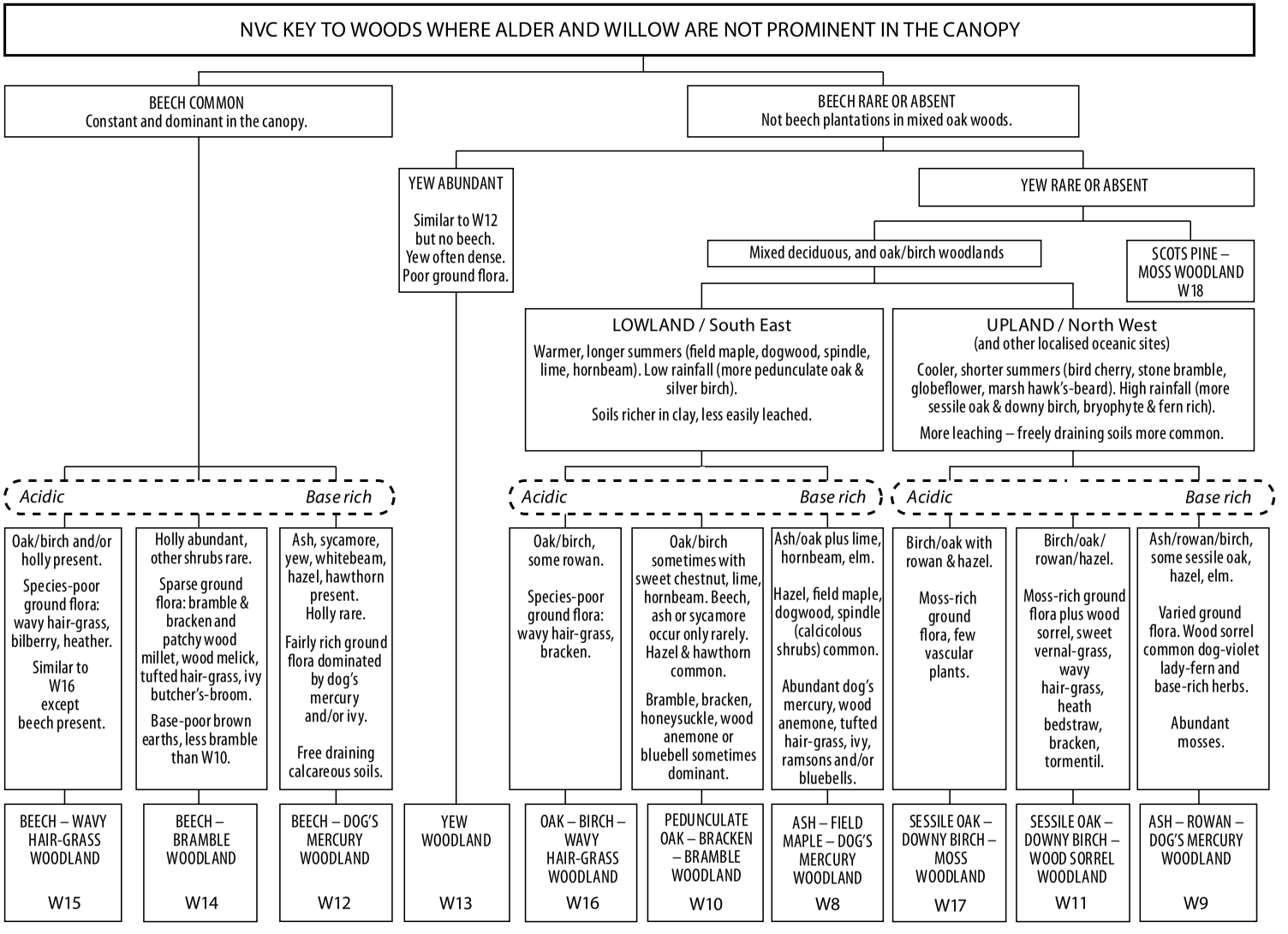


Table 1.1 continued



a relic of preceding fen communities. A third type, bay willow with bottle sedge woodland (NVC W3) is a community of peat soils, restricted to northern Britain. Grey willow may also dominate this woodland, with occasional downy birch, but alder is rare.

On more fertile, base-rich soils, alder dominates wet woodland communities. Alder with greater tussock-sedge woodland (NVC W5) predominates on organic fen peats, but where there is an accumulation of alluvium a nettle understorey (NVC W6) can develop, with associates in its various sub-communities of grey or crack willow and downy birch. On less fertile, predominantly mineral soils where there is little peat accumulation, the characteristic community changes to alder with ash and yellow pimpernel woodland (NVC W7). This community is most extensive in the wetter parts of Britain. Alder is often dominant, but ash can be frequent, together with sycamore and sessile oak.

A further type of wet or bog woodland, downy birch with purple moor-grass (NVC W4c) can develop in moderately acidic conditions on deep peats from wet heath and mires. Grey willow and alder occasionally occur in woodland dominated by downy birch. Sphagnum mosses are prominent in the field layer, which tends to be species poor,

Upland birch woods

Communities of downy birch and purple moor-grass (NVC W4) are also known as upland birch woods, which form part of the continuum between upland oak woods and open moorland. On the poorer, moderately acidic peaty soils, birches become dominant at the expense of oak with occasional rowan, willows, juniper and aspen. The understorey is generally sparse. Sub-communities of this type on drier sites are characterised by species such as broad buckler-fern and bramble (NVC W4a), with soft rush (NVC W4b) and sphagnum mosses (NVC W4c) becoming progressively frequent on wetter and peaty sites. At the interface with the upland oak communities, the field layers often consist of heather and bilberry, giving way to bracken and wavy hair-grass on richer soils.

Upland oak woods

Upland oak wood communities have a western, Atlantic distribution from the South West peninsula to northern Scotland. The oceanic influence is responsible for the prominence of sub-Atlantic species such as holly, honeysuckle, climbing fumitory and heath bedstraw, as well as a very rich flora of mosses, ferns and lichens. Most upland oak woods occur on relatively poor, acid soils, where high rainfall often leads to strong leaching. Both pedunculate and sessile oak may be present, with downy and silver birch, and less frequent rowan and hazel. The shrub layer is often poorly developed. Grasses are frequent in the field layer, and herbs such as bluebell and wood anemone are present, the latter being commoner in more 'continental' sub-communities in North East Scotland. On the thinnest soils and most exposed sites, birch predominates over a heathy vegetation.

Three related communities have ground floras characterised by wood sorrel (NVC W11), wavy hair-grass (sub-community NVC W16b) and greater fork-moss (NVC W17). The upland fringe of a variant of lowland oak-bracken-bramble woods (W10e), can be difficult to distinguish from sessile oak woodland (NVC W11) as sessile oak tends to dominate, usually accompanied by sycamore, ash and wych elm. Hornbeam is absent or very rare. The field layer can be relatively rich, with wood sorrel and common dog-violet.

Upland mixed ash woods

The main community, ash with rowan and dog's-mercury (NVC W9) replaces the lowland ash woods (W8) in this situation in northern Britain, upland Wales and Scotland where suitable calcareous substrates occur. Three W8 sub-communities, containing abundant herb Robert, ramsons and wood sage respectively, are also upland types. The cooler, wetter conditions allow a greater development and variety of ferns and bryophytes in the field layer, but under heavy grazing a grassy sward develops. Ash and hazel are the dominant canopy species, with frequent rowan, downy birch and occasional oak, elm and sycamore, and a

distinct shrub layer. The field layer can be very species-rich if grazing pressures are low, with characteristic species such as wood sorrel, violets, dog's-mercury, bluebell and herb Robert.

Native pinewoods

The Caledonian pinewoods (NVC W18) of the central and north western Highlands of Scotland and are best developed on acidic, strongly leached soils, usually with thick organic surface layers. Scots pine is the dominant tree, although its distribution is often discontinuous and patchy in older or damaged stands. It is accompanied by occasional birches, rowan and juniper. Field layers are rich in mosses and ericaceous species such as heather, bilberry and cowberry, with the proportion of mosses and purple moor-grass increasing in the wetter, western stands. In very wet areas, pine tends to grow poorly and is replaced by downy birch, creating a mosaic of the wetter upland birch wood sub-communities (NVC W4b and W4c) among pine stands. Wavy hair-grass is abundant in stands heavily grazed by deer and sheep. Impoverished versions of the main vegetation type may also be found in plantations of conifers in south western Scotland and Cumbria.

Wood pasture and parkland

Wood pasture and parkland is the final woodland habitat recognised by the UK BAP, found in managed medieval wood pastures or commons, or as pre-19th century landscape parks. Most are found in the lowlands, but wood pasture is also widely distributed in the Scottish uplands. They are characterised by large, open-grown and often pollarded trees, scattered over a matrix of unimproved, grazed grasslands or heathlands. These veteran trees provide valuable habitats in their own right, often supporting distinctive epiphytic lichens and mosses, together with fungi and invertebrates which live in rotten wood, water-filled cavities on live trees, and sap runs. A range of woodland communities may be represented, typically those of lowland beech and yew (NVC W14, W15) and mixed deciduous woodland (NVC W10, W16); together with the corresponding open ground habitats.

Wood pasture has undergone many changes in recent centuries, which can hinder its recognition. Precious habitat has been lost to afforestation with exotic conifers; some has been converted to pasture with veteran trees restricted to field margins, or incorporated into parkland and golf courses; whilst other wood pasture has been underplanted with trees, or allowed to develop into closed canopy woodland. If you are unsure whether a wood was formerly wood pasture, the presence of veteran, open grown trees in a wood is a strong clue to suggest it was formerly managed as open, grazed woodland, particularly if the trees have been pollarded. Further evidence might be found by checking first edition Ordnance Survey maps from the mid 19th century, as these recorded open woodland with distinct scattered tree symbols.

Scrub communities

Some types of scrub represent stages in succession from open ground to woodland, whilst others are more stable, representing an important habitat in their own right. If you have areas of scrub, it is important to remember that the conservation value of scrub is very high, and hence it should be protected if possible. The NVC recognises five scrub types and two under-scrub communities. The most common types in lowland Britain are hawthorn with ivy (NVC W21), blackthorn with bramble (NVC W22) and bramble with Yorkshire-fog (NVC W24); the latter often develops into hawthorn-ivy scrub on neutral or base-rich soils, and to gorse-bramble scrub (NVC W23) on acid soils. Blackthorn scrub tends to dominate deeper, moist and richer neutral soils. A mosaic may develop with patches of hawthorn and blackthorn scrub, interspersed with bramble-Yorkshire-fog. In the mountains of northern Britain, juniper heath (NVC W19) occurs in the eastern and central Scottish Highlands and in more isolated stands on hills south to the Lake District; while high-altitude stands of dwarf willows, such as downy willow (NVC W20), are located mainly in the southern and central Highlands of Scotland.

Ancient hornbeam pollard.

Plantations on ancient woodland sites

If you own an area of ancient woodland which has been replanted with conifers, or broadleaves such as sweet chestnut or beech, you may wish to know more about the woodland which formerly occupied the site. Some of the original vegetation may remain along the margins of conifer plantations, whilst woodland herbs may thrive in broadleaved woodland plantations. Together with information on soils, this vegetation may give strong clues to the original woodland types. Local 'reference sites' on similar soil types could be visited to establish what ancient woodland communities naturally occur, and if woodland restoration is being considered, these sites can inform species choice.

Recent woodland

The majority of woodland in Britain is 'recent' in origin (i.e post 1600), resulting from secondary succession on cleared land such as lowland arable farmland, or deliberate planting. Some of the older woods which have come about through the scrubbing over of abandoned moors, heaths and grassland are classified as semi-natural, because they have assumed a mature woodland character, with some of the features of interest found in ancient woods. In contrast, younger regenerated woods do not usually match the species richness of ancient woodland. Small woodlands planted on less productive farmland in lowland England in the past fifty years or so also frequently fail to match any NVC type. They may suffer from poor structural diversity and possess a ground flora characterised by common shade-tolerant plants with efficient dispersal mechanisms (see Section 2.1). If your wood falls into these categories, methods for enriching their structural diversity, and their tree, shrub and ground flora communities are discussed in Chapters 3 and 4.