

## IRISH NATIVE WOODLAND PLANT COMMUNITIES

Dr. Daniel L. Kelly  
Department of Botany, Trinity College, Dublin 2  
Tel: 01 6081809  
Email: dkelly@tcd.ie

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### Abstract

The flora of Irish native woodlands is poor in flowering plant species by European standards, but rich in bryophytes.

Plant communities are difficult to define and classify, and there has been a lack of consensus concerning both methodology and nomenclature. I present an overview of Irish native woodland communities, bringing together the main systems currently in use. These woodlands show two principal gradients of variation: from strongly acid soils to base-rich soils, and from well-drained sites to sites prone to waterlogging and even flooding. The salient features of each community are briefly outlined. Four are priority type habitats under European legislation; a fifth, the *Alnus glutinosa*-*Carex paniculata* community, is known from only two or three sites and also deserves special recognition.

The shrinkage and fragmentation of the area of native woodland has apparently led to the loss of some species and the future of others is in the balance. The threats to our woodland communities are briefly outlined.

### The woodland flora

The Irish woodland flora is poor in flowering plant species compared to Continental or even British woodlands. At canopy level, we have no native species of beech (*Fagus*), lime (*Tilia*), maple (*Acer*) or hornbeam (*Carpinus*). The impoverishment is equally striking in the shrub and field layers (Webb, 1952).

Our woodland flora does contain elements that would not be predicted by a simple model of floristic attenuation. Irish whitebeam (*Sorbus hibernica*)<sup>1</sup> retains its status as our only endemic tree, though the distinctions between it and its relatives are by no means obvious. The Mediterranean-Atlantic element (Preston & Hill, 1997) includes several species which find in Ireland the northern limit of their world distribution. Strawberry tree (*Arbutus unedo*) is a highly distinctive plant that attracted the comment of English newcomers in the 16<sup>th</sup> century (Watts, 1984). The species has a strongly disjunct distribution, its headquarters being in the Mediterranean region. Its Irish distribution has apparently contracted over the centuries (Mitchell, F.J.G. 1993) but it is still plentiful around the Lakes of Killarney. Irish spurge (*Euphorbia hiberna*), classified in the Suboceanic Southern-Temperate element, is plentiful in woodland glades in Cos. Kerry & Cork; it is also found in the south-west of England but only at a handful of sites (Preston & Hill, 1997; Preston *et al.*, 2002).

The Oceanic (or Atlantic) category consists of species that are more or less restricted to the western fringes of Europe (Preston & Hill, 1997), i.e. to a belt characterised by mild winters, cool summers and ample rainfall at all seasons. Many species in this category are characteristic of humid and shaded microclimates. Oceanic species are well represented in the Irish woodland flora, especially in the west. Several woodland ferns are strongly oceanic, notably hay-scented buckler fern (*Dryopteris aemula*) and the three filmy ferns (Tunbridge filmy fern (*Hymenophyllum tunbrigense*), Wilson's filmy fern (*Hymenophyllum wilsonii*) and Killarney fern (*Trichomanes speciosum*)). The distribution of Wilson's filmy fern in Ireland corresponds nicely to the regions where the mean number of rain days per annum exceeds 200 (Preston *et al.*, 2002; Haughton *et al.*, 1979). The

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<sup>1</sup> Nomenclature follows Stace (1997) for vascular plants, Smith (2004a) for mosses and Paton (1999) for liverworts.

Oceanic category also includes substantial numbers of moss, liverwort and lichen species (cf. Ratcliffe, 1968). Several Oceanic species find in Ireland their European headquarters, e.g. Killarney fern and the moss *Daltonia splachnoides*. Farther afield, the same or related species are often found in the montane rain forests of tropical regions. An instructive case is that of a liverwort that was described from a specimen from Torc Waterfall near Killarney, under the name *Plagiochila killarniensis*. Until recently, this was considered to be a species of the Atlantic fringes of Europe, extending from Sutherland south to Madeira and the Azores. However, comparative studies have found that our taxon is indistinguishable from a previously-described species, *Plagiochila bifaria* (Sw.) Lindenb., that is widespread in the New World Tropics (Heinrichs *et al.*, 1998). These authors conclude that "*P. killarniensis*" is merely a temperate-zone extension of the range of *P. bifaria*. Its spores were presumably carried across the Atlantic on the prevailing south-westerly air flow.

Our bryophyte flora deserves celebration. To quote a recent review, "Ireland has one of the richest bryofloras in Europe and a wealth of Atlantic bryophytes that is shared only with western Scotland. It is no exaggeration to claim that Ireland's bryophytes are among the most important elements of the island's flora, since about 51% of European liverworts occur (compared to less than 10% of European flowering plants) and the moss flora is almost as rich" (Holyoak, 2003). These are good reasons for bryophytes to be important to Irish ecologists and environmentalists. Additional reasons are that they tend to occupy relatively clearly-defined ecological niches – and can be identified at any time of year!

### The woodland community

A biological **community** may be defined as "any grouping of populations of different organisms found living together in a particular environment" (Allaby, 1998). The assemblage of plant species that one finds at a particular location constitutes a single **stand** of vegetation. By considering together similar stands from a range of locations we build up a generalised picture of the community. Some species will occur across a range of communities; others will be more restricted ecologically and may be more or less diagnostic for a particular community. However, a species is seldom strictly confined to a single community, so identification of a community should always be based on a combination of species, not just a single one.

Why do we need to classify and name plant communities? As David Webb (1954) commented, "One cannot think coherently about a large number of objects without classifying them mentally". We need to classify Irish woodlands into categories in order to assess the range of diversity present; to assess the degree to which Irish woods differ from those of other regions; to determine the distribution and frequency of different woodland types; and to develop management strategies appropriate to different woodland types.

One might think that the poverty of the Irish flora would simplify the task of classifying the vegetation, but that is questionable. We lack many ecological specialists – species that are more or less restricted to a particular community, and hence constitute good diagnostic species. Conversely, some species occupy a broader niche in Ireland than they do elsewhere; they show 'unusually wide ecological and synecological amplitudes' (Mooney & O'Connell, 1990), i.e. they are found across a broad spectrum of communities. The result is that the distinction between one community and the next may be more blurred than in other regions.

There is currently a lack of consensus on the nomenclature to use in describing Irish plant communities. Use of the phytosociological system of Braun-Blanquet was pioneered in Ireland by Braun-Blanquet & Tüxen (1952); an outline of the system, together with a conspectus of Irish plant communities, is presented by White & Doyle (1982). The basic unit of vegetation in this system is the **association**, a "plant community, of a definite floristic composition, distinguished by the presence of a certain characteristic combination of species".

A simpler, habitat-based classification of vegetation is presented in the Heritage Council's 'A guide to habitats in Ireland' (Fossitt, 2000). The 'Native Woodland Manual' (Forest Service 2002, unpublished) is based on Fossitt's system but subdivides some of her categories. Recent accounts of the potential natural vegetation of Ireland (Cross, 1998 & this volume) and of Europe (Bohn *et al.*, 2004) describe and map a range of forest types that show varying degrees of correspondence to the communities described below. In this review, I present these systems alongside one another, as far as possible (Table 1). The British National Vegetation Classification (Rodwell, 1991), based on data from Great Britain and the Isle of Man, is also highly relevant to Irish vegetation studies.

## Irish woodland communities: A brief review

Irish woodlands are distributed across two principal environmental gradients. The first is a gradient in soil pH and fertility levels, from strongly acid and base-poor to base- and nutrient-rich soils. The second is a gradient in soil moisture, from well-drained sites to sites subject to waterlogging or even flooding. Native woodland survives mainly at the ecological extremes: on infertile, acid podsols, on rocky limestone outcrops or in swampy hollows.

### Acidophilous woodlands

Probably the most extensive category of native woodland is the Blechno-Quercetum association (Braun-Blanquet & Tüxen, 1952; Kelly & Moore, 1975), which equates with Oak-holly-birch woodland, habitat code WNI of Fossitt (2000). These are woods of acid soils over siliceous rocks such as Old Red Sandstone or granite. There is usually a deciduous canopy dominated by sessile oak (*Quercus petraea*) and a shiny evergreen understorey of holly (*Ilex aquifolium*). Diagnostic species in the field layer include frochan (*Vaccinium myrtillus*), hard fern (*Blechnum spicant*) and great woodrush (*Luzula sylvatica*).

The Blechno-Quercetum scapanietosum (Moss- and lichen-rich oak woodland) is a subdivision distinguished by its rich cryptogamic flora. Boulders and tree trunks are swathed in a luxuriant growth of mosses, liverworts and filmy ferns *Hymenophyllum* spp. Most of the diagnostic species belong to the Oceanic element in the flora. This community is found mainly in the west and clearly develops in response to year-round high rainfall and high humidity. In parts of Ireland with similar substrata but lower rainfall, a relatively drab counterpart develops, distinguished as the Blechno-Quercetum typicum (Species-poor oak woodland on drier sites). This lacks the Oceanic diagnostic species of the preceding community. Wavy hair-grass (*Deschampsia flexuosa*) is often abundant.

A third subdivision, the Blechno-Quercetum coryletosum (Oak woodland with hazel and ash) is distinguished by the presence of hazel (*Corylus avellana*) in the understorey and by a richer herb flora, with species such as wood sanicle (*Sanicula europaea*) and wood sedge (*Carex sylvatica*). Where grazing levels permit, a lush growth of ferns develops, commonly including scaly male fern (*Dryopteris affinis*). This is normally a community of somewhat better soils. As its name suggests, this represents a transition between the Blechno-Quercetum and Corylo-Fraxinetum associations; it may be very rich in species, especially in higher-rainfall areas (cf. Kelly & Moore, 1975; Coroi *et al.* 2004). A species-poor variant was recorded on strongly acid soil in the dry and sunny south-east (Poole *et al.*, 2003).

### Woodlands of base-rich soil

Native woodlands on base-rich soils tend to be less evergreen and more flowery. Most can be classified within the Corylo-Fraxinetum association (Braun-Blanquet & Tüxen, 1952; Kelly & Kirby, 1982), which largely corresponds to the Oak-ash-hazel woodland (WN2) of Fossitt (2000). There is commonly a canopy dominated by ash (*Fraxinus excelsior*) and/or pedunculate oak (*Quercus robur*) and an understorey dominated by hazel. Alternatively, hazel may be the dominant species, forming scrub with or without a scattering of larger trees. Well-developed ashwood is rare in Ireland; a fine example is found on the scree slopes below the limestone escarpment of Hanging Rock, near Belcoo, Co. Fermanagh. The field layer in the Corylo-Fraxinetum is commonly rich in broadleaved herbs. Most of these flower in spring or early summer, availing of that 'window of opportunity' before the expanding canopy foliage cuts off most of the light. The **geophyte** life form is characteristic: plants with bulbs, tubers or rhizomes that release their pent-up energy into a burst of spring growth, followed by early senescence and decay (e.g. pignut (*Conopodium majus*), bluebell (*Hyacinthoides non-scripta*)).

The Corylo-Fraxinetum is a broad grouping which has proved difficult to subdivide satisfactorily (cf. Kelly & Kirby, 1982; Cross, 1992; Coroi *et al.*, 2004). One variant, the Corylo-Fraxinetum veronicetosum, occurs on

moist, somewhat leached soils and is distinguished by the presence of a combination of wood speedwell (*Veronica montana*), bluebell, golden saxifrage (*Chrysosplenium oppositifolium*) and/or lady fern (*Athyrium filix-femina*). Woodland on deep, well-drained, base-rich soils tends to be fragmentary or heavily managed, or both. The few examples studied appear to lack distinctive species; they are classified as Corylo-Fraxinetum typicum.

At the far extreme of the pH spectrum, the Corylo-Fraxinetum neckeretosum (Oak-ash-hazel woodland on shallow, often rocky soils over limestone) is distinguished by the abundance of bryophytes, including calcicolous species such as *Tortella tortuosa*, *Fissidens dubius* and *Neckera crispa*. The ash-hazel woods of the Burren belong here; the characteristic mosses are also found on open limestone pavement.

Limestone pavement is also the habitat for native yew woodland (WN3), a priority type habitat under European Union legislation (Fossitt, 2000). The only extensive yew-wood in Ireland today is Reenadinna Wood in Killarney National Park (Kelly, 1981; Mitchell, 1990a; Perrin, 2002). Small stands of yew occur by Lough Derg and elsewhere. The flora of yew woodland is similar to that of Burren-type hazel woods but generally with a sparser field layer. The limestone rock is generally concealed under a blanket of mosses. (*Taxus baccata* woodland is also recognised as a distinct category, W13, in the British National Vegetation Classification; however, this comprises the yew woods on the chalk of south-east England, which differ sharply in having an extremely poor bryophyte flora as well as a depauperate field layer (Rodwell, 1991)). The pollen record shows that yew woodland was formerly more widespread in Ireland (cf. O'Connell, this volume). The Burren appears to have supported 'considerable stands of yew-woodland' between 5000-2000 years ago (Watts, 1983); the species survives there today only as scattered individuals, clinging to cliff faces or stunted by browsing.

### Wetland woods

Irish wetland woods are more diverse and in general more natural than woodlands on well-drained soils; they also contain a higher proportion of 'priority type habitats'. In our attempts at classifying them, a first division is between oligotrophic sites on acid peat (usually dominated by downy birch (*Betula pubescens*)), and mesotrophic to eutrophic sites (Kelly & Iremonger, 1997; Cross & Kelly, 2003). The mesotrophic-to-eutrophic group is further divided between sites that are liable to flooding for considerable periods, at least in winter, and sites that are subject to waterlogging but not to prolonged flooding. The Osmundo-Salicetum association (Braun-Blanquet & Tüxen, 1952) (Willow-alder carr on fen peat, WN6 subcategory 1), is a widespread community of sites prone to flooding, such as around many of our lakes. The Braun-Blanquet name is less than ideal, as royal fern (*Osmunda regalis*) is only occasional in this community; in Ireland it is much commoner in open habitats. Purple loosestrife (*Lythrum salicaria*) and the mosses *Climacium dendroides*, *Calliergon cordifolium* and *Homalia trichomanoides* are better diagnostic species.

River valleys may include a diversity of hydrological regimes at different levels and different distances from the river channel (or channels), and hence may include a diversity of woodland types (Kelly & Iremonger, 1997; Coroi *et al.*, 2004). In the Salicetum albae (Willow woodland alongside river channels (riparian woodland), WN5), the moving flood-waters have a marked fertilising effect, producing a rank field layer with nutrient-demanding species such as hemlock water dropwort (*Oenanthe crocata*), cleavers (*Galium aparine*) and stinging nettle (*Urtica dioica*). (This community was erroneously labelled as 'Salicetum albo-fragilis' by Kelly & Iremonger, 1997).

'Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae)' are listed as an EU priority type habitat (Fossitt, 2000). The best surviving fragments of comparable old alluvial forest in Ireland are in the Gearagh - a unique area formed by the braided channels of the R. Lee (White, 1985) - and beside the R. Nore in the Abbey Leix demesne, Co. Laois. The prevailing vegetation-type in these fragments is the Corylo-Fraxinetum deschampsietosum (wet pedunculate oak-ash woodland WN4). The most distinctive species are tufted hair-grass (*Deschampsia caespitosa*), thin-spiked wood sedge (*Carex strigosa*) and water avens (*Geum rivale*). A similar (but possibly distinct) community is found on the impervious clays of the drumlin belt in Ulster and Connaught.

The Carici remotae-Fraxinetum (Ash-alder-remote sedge woodland, WN6 subcategory 2) is a widespread community of flushed sites subject to waterlogging but not to flooding. The species-rich field layer commonly

has a 'grassy' appearance, principally owing to the abundance of remote sedge (*Carex remota*). A specialised microcommunity of calcareous flushes is distinguished as the Equiseto telmatejæ-Fraxinetum (calcareous springs FPI). This is characterised by the apple-green pleurocarpous moss *Palustriella commutata* (syn. *Cratoneuron commutatum*), often associated with great horsetail (*Equisetum telmateia*). These flushes are lime-saturated, and both substrate and mosses are commonly encrusted with white deposits of calcium carbonate. Such 'petrifying springs with tufa formation' are another priority type habitat (Fossitt, 2000).

The *Alnus glutinosa-Carex paniculata* community (alder carr with tussock sedge WN6 subcategory 3) is characterised by huge tussocks and treacherous pools. It develops in peaty mires that are fed by calcareous springs, and corresponds ecologically and floristically to the **swamp carr** of East Anglia. This community is known from only two or three sites in Ireland (Kelly & Iremonger, 1997), and deserves special recognition. The best-developed stand is in Cloghereen Pool Wood in Killarney National Park; it is threatened by *Rhododendron ponticum* invasion.

Woodlands on acid peat vary according to the degree of drainage. The *Vaccinio uliginosi-Betuletum* (Dry birch woodland WN7, subcategory 1) develops where the upper layers are well drained, usually as a result of artificial lowering of the water table associated with peat-cutting. Downy birch is an active colonist in such habitats; this type of woodland is steadily expanding, as increasing areas of bogland are cut away and then more or less left to Nature. This is, in general, a species-poor community, lacking in distinctive elements. The field layer is commonly dominated by brambles (*Rubus fruticosus* agg.) The topography is often irregular, with old peat cuttings and drains concealed in the undergrowth. (The community name is potentially confusing as bog bilberry (*Vaccinium uliginosum*) is absent from the Irish flora; the community was placed under the older name *Betuletum pubescentis* in Kelly & Iremonger (1997)).

The *Sphagnum palustre-Betula pubescens* community (Wet birch woodland with *Sphagnum* WN7, subcategory 2) occurs on acid peat in waterlogged hollows. Sally (*Salix cinerea*) is common as well as birch. The woodland floor is dominated by a carpet of green bog-mosses *Sphagnum* spp., mainly *S. palustre* and *S. recurvum* agg. Other characteristic species of this community include star sedge (*Carex echinata*) and that giant among mosses, *Polytrichum commune*.

The last priority type habitat is that of woodland on intact raised bog. The best surviving example is on All Saints' Bog in Co. Offaly (Cross, 1987). The dome of this bog appears to be flushed by upwelling water and supports some 20 ha of birch woodland. The woodland floor is composed of an undulating carpet of *Sphagnum* spp. The field layer includes bogland species such as crowberry (*Empetrum nigrum*), hare's-tail cottongrass (*Eriophorum vaginatum*) and cranberry (*Vaccinium oxycoccus*). This community is provisionally placed in the *Salicetum auritæ* association (Wet birch woodland with *Sphagnum* WN7 subcategory 3).

## Forest shrinkage and species survival

The area of native woodland in Ireland has shrunk to a mere vestige in the course of the past two millennia. Changes to the woodland composition have been qualitative as well as quantitative. How many woodland species have already been lost? And how many have dwindled past the point of no return?

One major loss is beyond dispute. We had extensive forests of Scots pine *Pinus sylvestris*, and they disappeared. (We do not know when or how). We know very little about the flora associated with the Irish pine forests, but we may surmise a resemblance to the present-day semi-natural pine forests of Scotland and Continental Europe. Species particularly associated with semi-natural pine forest in Scotland include a number of mycorrhizal herbs. These include two orchids (creeping lady's-tresses (*Goodyera repens*) and lesser twayblade (*Listera cordata*) – both widespread) and several Pyrolaceae: common wintergreen (*Pyrola minor*), intermediate wintergreen (*P. media*), round-leaved wintergreen (*P. rotundifolia*), one-flowered wintergreen (*Moneses uniflora*) and serrated wintergreen (*Orthilia secunda*) (Rodwell, 1991; Kelly & Connolly, 2000). Creeping lady's-tresses and one-flowered wintergreen are unknown in Ireland; the other species mentioned are scarce to rare here (cf. Table 2), and are not found mainly in woodland. Interestingly, round-leaved wintergreen occurs in a pine-

dominated plantation in Co. Wexford (J. Cross, pers. comm.). One of the most characteristic species of Scottish pinewoods is the plume moss *Ptilium crista-castrensis*; this species was not known from Ireland until 1987, when it was found in a corrie on Mweelrea, Co. Mayo (Blockeel, 1988); it should be looked out for in acid woodland habitats.

Assessment of the status of rare species is bedevilled by the deficiencies of biological recording in Ireland, especially in the Republic. However, the New Atlas (Preston *et al.*, 2002) gave a fillip to the recording of rare species, and I believe the data in Table 2 provide a fair approximation to reality. It is clear that woodland species have continued to go extinct on this island in recent centuries. It is also clear that a substantial number of surviving woodland specialists have declined steeply and that the viability of surviving populations is in question. Four of these (narrow-leaved helleborine (*Cephalanthera ensifolia*), yellow bird's-nest (*Monotropa hypopitys*), common wintergreen and intermediate wintergreen) were included in the shortlists of species considered characteristic of 'old woods'/'old forest' by Henry (1914) and Praeger (1934). The woods that now belong to Killarney National Park – the most extensive and diverse area of native woodland in the island – formerly supported both narrow-leaved helleborine (last recorded at Derrycunihy in 1902) and yellow bird's-nest (last recorded at Muckcross in 1896) (Scully, 1916). The former species has been sought assiduously in its old Killarney sites but not re-found (Hodd, 1999). Of the sole Irish site for starved wood sedge (*Carex depauperata*), in Co. Cork, a report for 1996 recorded that "the 20 tussocks seen here in August 1989 had now dwindled to just seven plants, of which only four produced fruiting culms" (O'Mahony, 1997). Four of the species in Table 2 are currently protected in the Republic of Ireland under the Wildlife Act of 1976 (Curtis, 2000). Seven are legally protected in Northern Ireland; however, one of these is clearly extinct and another appears not to have been seen in the past 18 years.

Reasons for the decline in our woodland flora are not hard to find. The small area and fragmented distribution of native woodland in recent centuries will have created difficulties for many species. Woodland specialists tend to have limited powers of dispersal, and are slow to regain lost territory. A recent study on nettle-leaved bellflower (*Campanula trachelium*) in Ireland has demonstrated reduced genetic diversity and lower reproductive success in very small populations (Smith, 2004b). Climate change may accentuate difficulties in dispersal and establishment, especially of drought-intolerant Oceanic species.

Many wetland woods have been affected by drainage and peat-cutting. For instance, All Saints' Bog, with its unique bog woodland, has been the site of large-scale moss peat extraction in recent years by Erin Horticulture Ltd. The company is now relocating operations to an alternative site, under a compensation package recently worked out with the National Parks & Wildlife Service (Hurley, 2004). Major effort and resources will be required to restore the damaged areas and to save this bog's unique features.

Felling of broadleaved high forest was widespread as recently as the 1960s. Native woodland communities have also been suppressed through underplanting with conifers or beech (*Fagus sylvatica*). They continue to be suppressed through invasion by alien species, chiefly *Rhododendron ponticum*, which continues to expand unchecked in many parts of the island. Other invasive species that are having major impacts locally include cherry-laurel (*Prunus laurocerasus*), red-osier dogwood (*Cornus sericea*), beech and sycamore (*Acer pseudoplatanus*). Heath fires nibble the edges of upland woods, as happened in Killarney National Park in the great fire of 1984. (Strawberry tree, however, may have been favoured by fire, in the past at least (Rackham, this volume)). Many woods have been subjected in recent decades to unsustainable levels of grazing, as a result of headage payments for sheep (Mitchell, G.F. 1993) and/or laissez-faire attitudes to the expanding populations of feral deer and goats. Overgrazing affects woodland plant communities through the elimination of vulnerable species from the field layer, and the expansion of tolerant species (cf. Mitchell, 1990b; Kelly, 2000). In the longer term, the elimination of tree saplings over extended periods threatens the survival of many woods, including some that are both legally 'protected' and of recognised international importance.

Table 1: A conspectus of Irish native woodland communities

Phytosociological system of Braun-Blanquet	Fossitt (2000) habitat classification	Bohn <i>et al.</i> (2004) Map of the Natural Vegetation of Europe (Titles of map units condensed)
<b>Acidophilous woodlands</b>		
Blechno-Quercetum Blechno-Quercetum scapanietosum	WN1 Oak-birch-holly woodland WN1 Oak-birch-holly woodland	F1 West Irish-west British hyperoceanic, moss- and lichen-rich sessile oak forests
Blechno-Quercetum typicum	WN1 Oak-birch-holly woodland	F2 East Irish-British oak forests, mostly with downy birch & holly
Blechno-Quercetum coryletosum	(WN1-WN2 intermediate)	F32 Irish-British-Norman mixed pedunculate ash-oak forests with bluebell
<b>Woodlands of base-rich soil</b>		
Corylo-Fraxinetum Corylo-Fraxinetum veronicetosum	WN2 Oak-ash-hazel woodland WN2 Oak-ash-hazel woodland	F28 Irish pedunculate oak-ash forests on rich basiphilous soils
Corylo-Fraxinetum typicum	WN2 Oak-ash-hazel woodland	F28 Irish pedunculate oak-ash forests on rich basiphilous soils
Corylo-Fraxinetum neckeretosum	WN2 Oak-ash-hazel woodland	F29 Irish-English hazel-ash forests on shallow calcareous soils
Corylo-Fraxinetum neckeretosum <i>Taxus facies</i>	WN3 Yew woodland	F29 Irish-English hazel-ash forests on shallow calcareous soils (local variant)
<b>Wetland woods</b>		
Corylo-Fraxinetum deschampsietosum	WN4 Wet pedunculate oak-ash woodland	U23 Irish-British pedunculate oak-alder-ash forests with sally
Salicetum albae	WN5 Riparian woodland	U7 Irish-British hardwood alluvial forests in combination with willow alluvial forests
Carici remotae-Fraxinetum	N6 Wet willow-alder-ash woodland	U23 Irish-British pedunculate oak-alder-ash forests with sally
Osmundo-Salicetum	WN6 Wet willow-alder-ash woodland	-
<i>Alnus glutinosa-Carex paniculata</i> community *	WN6 Wet willow-alder-ash woodland	T1 Alder carrs, partly with downy birch, sally, bay-leaved willow, Norway spruce
Equiseto telmatejiae-Fraxinetum	FPI Calcareous springs	-
Vaccinio uliginosi-Betuletum	WN7 Bog woodland	T4 Birch carrs, partly with Scots pine
<i>Sphagnum palustre-Betula pubescens</i> community **	WN7 Bog woodland	
Salicetum auritae	WN7 Bog woodland	
* Rodwell (1991) ** Birse (1982)		

Table 2. Very rare and extinct species in the vascular plant flora of Irish woodlands

Numbers are counts of 10km x 10 km Irish grid squares in which a species has been recorded as native.  
NI = Northern Ireland, RI = Republic of Ireland.

Sources: Curtis 2000, Curtis & McGough 1988, Hackney 1992, Preston *et al.* 2002.

Scientific name	English name	Last recorded before 1970	Last recorded between 1970-86	Recorded since 1986	Legally protected?
1 Extinct prior to the 20th century					
<i>Pinus sylvestris</i>	Scots Pine	0	0	0	-
<i>Carex buxbaumii</i> (1)	Club Sedge	1	0	0	-
2. Became extinct during the 20th century					
<i>Hordelymus europaeus</i> (2)	Wood Barley	1	0	0	NI, since 1985
3. Very rare species					
<i>Gymnocarpium dryopteris</i> (3)	Oak Fern	8	2	0	NI, since 1985
<i>Adoxa moschatellina</i> (4)	Moschatel	1	0	1	NI, since 1985
<i>Cardamine impatiens</i>	Narrow-leaved Bittercress	0	0	1	RI, since 1980
<i>Carex depauperata</i>	Starved Wood Sedge	0	0	1	RI, since 1980
<i>Geranium sylvaticum</i>	Wood Cranesbill	2	0	2	NI, since 1985
<i>Orthilia secunda</i> (5)	Serrated Wintergreen	4	1	2	NI, since 1985
<i>Melampyrum sylvaticum</i>	Small Cow-wheat	14	3	3	NI, since 1985
<i>Hypericum hirsutum</i>	Hairy St. John's Wort	5	0	5	RI, since 1980
<i>Cephalanthera longifolia</i>	Narrow-leaved Helleborine	21	3	7	RI, since 1999
<i>Monotropa hypopitys</i>	Yellow Bird's-nest	13	3	8	NI, since 1985
<i>Campanula trachelium</i>	Nettle-leaved Bellflower	6	1	10	RI, 1980-2000
<i>Pyrola media</i>	Intermediate Wintergreen	28	6	13	no
<i>Pyrola minor</i>	Common Wintergreen	30	6	14	no

## Notes

1. Last recorded in 1886 (Hackney 1992)
2. Last recorded in 1949 (Hackney 1992, Preston *et al.* 2002)
3. Last recorded in 1986 (Hackney 1992) - perhaps extinct
4. Possibly introduced (Hackney 1992)
5. In Ireland recorded only in bog and wet heath, but found in woodlands over most of its range.

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