NATIONAL SURVEY

OF

NATIVE WOODLAND IN IRELAND

A Report submitted to National Parks & Wildlife Service,
Department of the Environment, Heritage & Local Government

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Summary

Existing GIS data sets regarding forested areas in the state were obtained and modified. Data referring to obviously non-native woodland were removed to produce a new data set that contained woodland stands that could be classified as putatively native. This was further rationalised to exclude sites that fell below the minimum size criteria set for this study (1 ha in extent and 40 m in width). The accuracy of the original data contained within the GIS platform was checked by reference to a sample of aerial photographs.

By this method it was found that not more than 77,047 ha of native woodland are present in the state. This amounts to approximately 1% of the land area. Counties Cork, Clare and Kerry contain the largest area of this woodland, and the lowest area is contained within Counties Carlow, Dublin and Louth. Counties Wicklow, Clare and Waterford contain the highest density of native woodland, and Mayo, Roscommon, Sligo and Limerick, the least. Most woods in the state are small in size: 78.1% of FIPS polygons are less than 5 ha in extent, and less than 5% are greater than 20 ha.

Field surveys were carried out in Counties Carlow, Kilkenny, Laois, western Offaly and Wexford during Summer 2003. More than 300 sites were visited, and 204 of these were fully surveyed with at least one relevé recorded from each. Oak-ash-hazel woodland (WN2) was the most frequent habitat type in the sites surveyed. This was followed by mixed broadleaved woodland (WD1), acid oak woodland (WN1) and wet willow-alder-ash woodland (WN6). The least frequent (and least abundant) woodland type encountered was wet pedunculate oak-ash woodland (WN4). Most woodlands were subjected to only low or moderate grazing pressure, and less than half of the sites were affected by an invasive shrub species (Rhododendron, Cherry Laurel or Snowberry). However, the exotics beech and sycamore were frequent in woods surveyed, both as mature specimens and as regeneration, and both species diversity and abundance of natural regeneration were negatively associated with canopy cover by these species.

Ash was the most frequently recorded tree species in relevés, followed by birch, hazel and pedunculate oak. Few trees were of merchantable size (diameter $\geq$ 40cm). Oak, beech and sycamore were the most abundant large (dbh $\geq$ 40cm) trees. Dead wood was a component of almost all woods surveyed, and almost all relevés contained some natural regeneration of canopy species.

The data collected in the field survey were summarised for each site in order to evaluate the conservation status of each wood. Conservation score was based on species richness, area, diversity of structure and habitats, nativeness, natural regeneration, dead wood and the presence of features and species of interest. In addition, a threat score was calculated for each wood. This was based on the abundance of exotic and invasive species, on sub-optimal grazing regimes and damaging activities (dumping, clearance etc.).

Raw data from this survey are contained within a MS database and ArcView GIS. Appendices contain summary data per site, site species lists and references pertaining to native woodland in Ireland.

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Front Cover Photograph: Ullaun's Wood (WN1) Killarney - Chris Barron

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1 Introduction

1.1 Overview

The potential natural vegetation of most of Ireland is woodland (Cross 1998) and most of the Irish landscape was covered by trees following the last glaciation c. 10,000 BP (Mitchell & Ryan 1997). Millennia of human activity and climate change have dramatically reduced woodland cover, and that which remains is limited in extent, scattered in distribution and much modified from the primeval forest. Today however, Ireland is one of the least wooded countries in Europe, with only about 9% of the State now covered with trees (Gallagher *et al.* 2001). Woodland cover was estimated at less than 1% of the total land area at the start of the 20th century (Neeson 1991), and the recent figure reflects an active State policy for afforestation since that time. The majority of Irish woodland today comprises commercial plantations of exotic species.

None of the woodland present in Ireland today may be considered as wholly 'natural' as even the oldest woodland shows evidence of human activity and modification. The term 'native' woodland is therefore generally accepted to refer to broadleaved woodlands, comprised of native species that are not intensively managed. Native woodlands are especially limited in extent in Ireland, and various estimates of native woodland cover have been proposed (Purcell 1979, FIPS 1998, Forest Service 2001). While estimates vary with source, native woodland cover is probably in the range 80,000 - 100,000 ha. Part of the difficulty in estimation of the area occupied by native woodland is attributable to the differing definitions used by the various bodies involved in making such calculations. In addition, the nature of land management is such that woodland boundaries are rarely fixed over long periods, with some areas being cleared of trees, while other land is being colonised by scrub and tending towards closed canopy cover (Rackham 1980). Irish woodlands have been classified according to various systems *e.g.* EU Habitat types, Coillte stand classifications, National Parks and Wildlife Service habitat categories for NHAs and SACs, phytosociological communities, but no systematic survey and classification of all extant stands of native Irish woodland has been carried out to date. The present study is intended to be the first phase of a national inventory and survey of native woodland in Ireland.

The Forestry Inventory and Planning System (FIPS 1998) provides the basic information on which a national survey of native woodland can be based. FIPS utilises a combination of satellite imagery (1993-1997) and aerial photographs (1995) to digitally map the majority of woodland in the State, and also classifies woodland into broad woodland types.

This native woodland survey comprised a two-tier approach. The first was to conduct a desk survey of all possible native woodland sites in Ireland, identifying and mapping every block of native woodland greater than one hectare in extent. The second was to use this information to implement a systematic field survey of a subset of native woodland sites, in the south-eastern counties Carlow, Kilkenny and Wexford, and also in Laois and west Co. Offaly. This survey is the first step in a detailed and comprehensive investigation of the diversity of Irish woodlands, and an appraisal of the applicability of current classification systems. The survey also aimed to facilitate a systematic evaluation of the conservation value and the regeneration status of Irish woodlands.

1.2 Woodland history

The minutiae of woodland history in Ireland are the subject of much debate, and the lack of detailed documentary evidence (as exists for English woods) compounds the problem. Many authors have presented views on the subject: Forbes (1932, 1933); Mitchell (1982); Kelly & Fuller (1988); Neeson (1991); 0' Sullivan (1993); Rackham (1995); Hall (1995); Nicholls (2001). Paleoecological techniques allow us some glimpse into the situation, at least on a regional scale. The following account attempts to summarise the situation that is generally accepted, and to highlight some of the factors that affected woodland development and clearance over past millennia.

At the beginning of the Holocene (*c.*10, 000 BP), Ireland was dominated by a treeless, tundra-like landscape (Mitchell & Ryan 1997). As temperatures increased, vegetation succession to woodland took place. Early juniper scrub was initially replaced by willow and birch dominated stands. Gradually, more tree species colonised soil types suitable for their growth. Hazel, pine, elm, yew, alder, oak and ash all became significant parts of the woodland canopy, and land bridges between Ireland and Britain and Europe may have assisted their arrival. Several tree species native to Britain didn't reach Ireland until their introduction by human settlers, centuries later. These include beech, small-leaved lime, hornbeam and field maple.

Woodland dominated the landscape from *c.* 8,500 BP. The shifting cultivation techniques practiced by Neolithic farmers from *c.* 6,000 BP resulted in temporary woodland clearances, followed by secondary growth on abandonment of an area. Elm declined sharply at around this time, and a general decline in woodland cover is evident from pollen records from *c.* 7,000 BP. Peatland expansion in the uplands restricted pinewoods and the increasing populations of farming peoples and their grazing animals resulted in woodland clearance on an increasing scale. Bronze-age metal workers (4,000 – 2,000 BP) used wood to smelt ore, and iron-age technologies such as primitive ploughs (c. 2,300BP) allowed for easier woodland clearance. However, the social unrest that existed in this era generally resulted in less stable settlement and a corresponding recolonisation of previously cleared areas. Over the next few centuries, the arrival of the Vikings (840 AD), development of organised agricultural commerce by the Cistercians (1157 AD), and Norman Invasion (1169 AD) resulted in continuing exploitation of the woodlands, as cities were built (primarily of wood), and extensive areas of agriculture became permanent fixtures in the landscape (O' Corráin 1972).

By the time of the Tudor Plantations, much of the landscape had been cleared of its woodlands. The absence of any major survey of the country means that we have only a vague picture of the extent of woodland at this time. It is known that the Pale (a large area on the east coast stretching from Dundalk, westwards to Kells and Trim, and as far south as the foothills of the Wicklow Mountains) was largely devoid of woodland, while the mountains of Wicklow and Munster, and the valleys of the rivers Blackwater and Lee were at least partly wooded. McCracken (1971) estimated that at least one eighth (12.5%) of the country was wooded in 1600 AD. However, this figure is disputed by Forbes (1932) and Rackham (1995), who argue that the figure is probably closer to 2%, but admit that 'scanty' evidence

prevents arrival at an accurate estimate. Despite the efforts of the government to the contrary (Acts of Parliament and grants to encourage tree planting from 1698 onwards) and the planting of many 'Estate Woodlands', overall woodland cover continued to decline. This is mostly explained by the displacement of the native population onto marginal land (resulting from the 'plantations'), political unrest and the pre-famine population explosion. Rackham (1995) observes that by 1830, pre-1600 woodland covered only about 0.2% of the country.

The Land Acts (1881, 1903 & 1909), which resulted in the compulsory transfer of lands from landlords to the State, lead to the clearance of more woodland as the dispossessed hurried to liquidize their assets. Of the 380,000 acres (153,900 ha) of estate woodland which had existed in 1880, only 90,000 acres (36,450 ha) remained in 1958 (Neeson, 1991).

During the 20th century the state embarked on an active policy for afforestation. A minimum cover of 1 million acres (405,000 ha) of forest was the target set. By 1951, forest cover in the Republic of Ireland was 1.8%. However, most of the planting undertaken comprised non-native species and even native planting was often derived from foreign provenance. Sitka spruce (*Picea sitchensis*), lodgepole pine (*Pinus contorta*), Norway spruce (*Picea abies*) and Scots pine (*Pinus sylvestris*) were the most abundantly planted species. In 1985, a review of Irish woodlands concluded that 6% of the state (382,000 ha) was wooded (Review Group on Forestry, 1985). 21% of this was privately owned, and 79% was held in public hands. The composition of the state forest was 49% sitka spruce, 47% other conifer species and 4% broadleaved. Given that most of the state plantations originated from the 1950s and 1960s, most plantations are today a maximum of 50 years old.

During the 1970s many state forests were opened to the public (Forest and Wildlife Service, (FWS) 1985) and their amenity and wildlife value became an issue. By 1985, one single species, sitka spruce, accounted for almost half (49%) of state planting and broadleaved species only 5%. Since the 1980s, Ireland's ratification of the Convention on Biological Diversity (CBD) in 1996, increasing public concern over the environmental effects of coniferous block planting, and lobbying by various groups (*e.g.* The Tree Council of Ireland, Crann) has prompted Coillte (the state forestry body) to increase the proportion of broadleaved species planted. In 1999, it was estimated that 13,182 ha of the Coillte forest were under broadleaved species. Of this, beech accounted for almost 30%, oak for 22.6%, and ash for 17% (Coillte, 1999). Sycamore, birch and alder are among the other species planted.

1.3 Woodland ecology

1.3.1 Woodland trees

The Irish flora is depauparate relative to that of the European mainland and even that of our close neighbour, Britain (Webb 1982). Kelly (1991) lists 33 species of tree that are native or 'probably native' in Ireland. Many of these are rare in woodland or restricted in their distribution (Table 1.1).

Table 1.1 Native Irish Trees (after Kelly, 1991).

Habitat and Distribution are from Webb *et al.* (1996). W: West; S: South; N: North; E: East.

	Common Name	**Habitat & Distribution**
Alnus glutinosa	Alder	Riversides, lake shores, damp woods: very frequent
Arbutus unedo	Strawberry Tree	Wood margins and lakeshores: very rare except in SW and local sites
Betula pendula	Silver Birch	Bog-margins, woods: occasional
Betula pubescens	Downy Birch	Woods, especially on acid soils: very frequent, locally abundant.
Corylus avellana	Hazel	Woods and Scrub: locally abundant
Crataegus monogyna	Hawthorn	Hedges and Woods: locally frequent
Euonymus europaeus	Spindle-tree	Hedges, thickets on limestone; occasional
Frangula alnus	Alder buckthorn	Rocky, boggy places: very rare
Fraxinus excelsior	Ash	Hedges, woods, rocky places: abundant on limestone
Ilex aquifolium	Holly	Woods and hedges: very Frequent
Juniperus communis	Juniper	Mountain heath, lakeshores: occasional in N & W
Malus sylvestris	Crab Apple	Hedges and Woods: locally frequent
Pinus sylvestris	Scots Pine	Widely planted: frequent in W
Populus nigra	Black Poplar	Hedges, roadsides: occasional
Populus tremula	Aspen	Rocky places, hedgerows: frequent in W & N
Prunus avium	Wild Cherry	Woods and hedges: occasional
Prunus padus	Bird Cherry	Woods and damp rocky places: rare except in NW
Quercus petraea	Sessile Oak	Woods especially on acid soils: very frequent
Quercus robur	Pedunculate Oak	Woods especially on rich soils: very frequent
Rhamnus catharticus	Buckthorn	Rocky places, lakeshores: very rare except in W & centre
Salix alba	White Willow	Hedges, riversides: frequent
Salix caprea	Goat Willow	Hedges, woodland edges: frequent
Salix cinerea	Grey Willow	Hedges, thickets, damp woods: very frequent
Salix fragilis	Crack Willow	Riversides, hedges: locally frequent
Salix myrsinifolia	Dark-leaved Willow	By lakes and rivers: rare
Salix phylicifolia	Tea-leaved Willow	Cliffs: very rare
Salix pentandra	Bay Willow	Riversides, thickets, hedges: frequent in N
Salix purpurea	Purple Osier	Hedges, bog-margins, rivers: frequent
Salix triandra	Almond-leaved Willow	Hedges, thickets: rare
Salix viminalis	Osier	Ditches, river banks: frequent
Sambucus nigra	Elder	Hedges and Woods: frequent near houses
Sorbus anglica	Whitebeam	Killarney only
Sorbus aria	Common Whitebeam	Occasional: planted
Sorbus aucuparia	Rowan	Glens, hedges, mountain streams: frequent
Sorbus devoniensis	French Hales	SE only
Sorbus hibernica	Irish Whitebeam	Woods and cliffs on limestone: Centre, occasional
Sorbus ripicola	Rock Whitebeam	W & N: occasional
Taxus baccata	Yew	Woods, cliffs, rocky areas: rather rare
Ulmus glabra	Wych Elm	Upland glens in North: frequently planted

In addition to these species, several introductions have become widely naturalised in Irish woodland. The most frequent of these are sycamore and beech. Horse-chestnut, Spanish chestnut, hornbeam and lime also occur.

1.3.2 Woodland Soils

Apart from the effects of anthropogenic factors it is predominantly the local variation in soil that determines the assemblage of plants present at a given site. Soils are heavily influenced by climate. The combination of high precipitation and low evapo-transpiration in many parts of Ireland results in a tendency towards podzolisation of free-draining soils, and to gleying and peat formation where drainage is impeded. O' Carroll (1984) lists seven groups of (forest) soil in Ireland:

Peats These are organic soils which are generally wet, acidic and have low nutrient availability. There is a wide variation in peat depth ranging from 30 cm – 3 m in upland blanket bog to 12 m in midland raised bogs. Peatlands which have been drained or which are naturally drying have become colonised by birch and willows (Kelly and Iremonger, 1997). Cutaway bogs have frequently been the sites for afforestation with coniferous species (especially sitka spruce) during state forestry programmes. Such sites are often colonized by birch if left unmanaged.

Gleys These are poorly drained mineral soils which have a heavy texture and poor structure. They may be podzolised (*i.e.* leached of minerals) and peaty gleys have a shallow layer of peat at the surface. Gleys occur extensively over carboniferous strata (such as the limestone of the midlands) and Cross (1998) describes the woodland communities found here as 'Alder-oak-ash woodland with hazel' equivalent to Corylo-Fraxinetum deschampsietosum caespitosae (Braun-Blanquet et Tuxen 1952). While these soils are relatively fertile in the context of coniferous forestry, the poor drainage restricts rooting and stands may be susceptible to windthrow.

Podzols These are intensely leached mineral soils derived from light textured parent material. They often have a shallow layer of raw humus at the surface with a pale upper layer beneath this, and brown/red lower layer. If an iron pan (where leached iron oxides have precipitated out of solution to form an impermeable layer) is present, drainage may be impeded thus restricting the depth of rooting. These soils generally have a low pH, occurring over acid bedrock such as Old Red Sandstone (in the south-west), Mica-Schist (in the Wicklow Mountains) and Quartzite (in the north-west). Many Irish oakwoods exist over podzols (Little *et al*. 1997), and these are usually dominated by *Quercus petraea* and have low nutrient availability.

Brown Podzolics These are deep free-draining soils showing some evidence of podzolisation. They are most common under old forests of the south-east. Cross (1998) describes such woodland as *'Species-poor Quercus petraea forests'* and equates them to the Blechno-Quercetum typicum (Braun Blanquet & Tuxen 1952). *Quercus petraea* is the principal species, and *Fagus sylvatica*, when introduced, grows strongly on such sites (Cross 1998).

Grey-Brown Podzolics Such soils in Ireland are productive and usually found under agricultural grassland (O' Carroll 1984). However, Cross (1998) predicts that the potential woodland vegetation of such sites would be dominated by a mixture of oak and ash, and would be classified as Blechno-Quercteum coryletosum (Braun-Blanquet et Tuxen 1952).

Brown Earths These deep free-draining soils are slightly acidic with a good structure and texture and show little development of horizons. As they are very productive, they are usually under agriculture (O' Carroll 1985). Cross (1998) predicts that woodland on such soils would be species-rich and dominated by *Quercus robur* and *Fraxinus excelsior*, and equivalent to Corylo-Fraxinetum veronicetosum and typicum (Kelly and Kirby 1982).

1.3.3 Native woodland types

The phytosociology of Irish woodland is treated in detail in Kelly & Iremonger (1997) and Cross & Kelly (2003) (wet woodlands), Kelly & Kirby (1982) (woodland over limestone) and Kelly & Moore (1974) (acidophilous woods). More recently an effort has been made to simplify and standardize the classification of all habitat types in Ireland (Fossitt 2000). This classification lists 7 categories of semi-natural woodland, 5 categories of highly modified/non-native woodland and 5 categories of scrub/transitional woodland. This system uses broader categories than those described in the traditional phytosociological literature, and so is accessible to non-specialists. This standard has been adopted for general use in habitat description and conservation in Ireland. The categories are described and some relevant analogous categories from other classification systems are presented in Table 1.2.

Many other habitat types (grassland, bog) tend to develop towards woodland under certain circumstances, and the existence of transitionary stages between other habitat types and woodland can cause difficulties when defining habitats in the field. Such areas are usually described as scrub of one form or another, but the treatment of 'scrub' by ecologists has varied much between authors and studies. A recent survey in Britain has described the diversity and conservation value of scrub (Mortimer *et al.* 2000*)*. Fossitt (2000) has defined woodland as 'any area that is dominated by trees, as opposed to shrubs, and where the canopy height is greater than 5m, or 4m in the case of woodland in wetland areas or in bogs'. We have used this definition in the present study, along with the further stipulation that woodland area must contain closed canopy over at least half of its area.

Table 1.2 Woodland Types in Ireland (after Fossitt 2000)

† This column lists relationships with other published classification systems.

1: Braun –Blanquet et Tuxen; 2: Cross & Kelly 2003; 3: EU Annexed Habitats – * denotes priority habitats.

Code	Woodland Type	Description	†Affinities
WN	All semi-natural categories	Woodlands dominated by native tree species; non-natives may be present but not dominant.	
WN1	Oak-birch-holly woodland	Woods occurring on acid or base-poor, reasonably well-drained soils. Usually dominated by sessile oak (sometimes with pedunculate or their hybrids). Birch, holly and rowan may be frequent. Ash and hazel may be present, but usually in small amounts. The field layer typically includes ling, bilberry, hard fern and woodrush.	Blechno-Quercetum (1) Old sessile oakwoods with Ilex and Blechnum in the British Isles 91A0.(3)
WN2	Oak-ash-hazel woodland	Woodland occurring on reasonably well-drained base-rich or calcareous soils or on rocky limestone terrain. Typically dominated by some combination of pedunculate oak, ash and hazel. The field layer often includes wood sanicle, *Polystichum setiferum*, and violets.	Corylo-fraxinetum (1)
WN3	Yew woodland	Stands of woodland dominated by yew. This woodland type is very rare in Ireland (and in Europe) and is usually found over limestone, often on shallow, rocky soils. The field layer is often sparse and may include calcicole species and wood sage.	*Taxus baccata woods of the British Isles 91J0 (3)
WN4	Wet pedunculate oak-ash woodland	Woodland occurring in areas that are subject to winter flooding, but are dry in summer, and on poorly drained, heavy clay soils. Usually dominated by some combination of pedunculate oak and ash. Hawthorn, holly, hazel, alder and willows may also be present in varying amounts. The field layer typically includes bramble, meadowsweet, enchanter's nightshade and ramsons.	Type D (2) Corylo-Fraxinetum deschampsietosum caespitosae (1) *alluvial forests with Alnus glutinosa and Fraxinus excelsior 91EO (2) (on alluvial sites)
WN5	Riparian Woodland	This refers to woodlands that are subject to regular flooding – along river margins, on low lying river islands, in the tidal zone. The canopy is dominated by willows, and alder may be occasional. The field layer typically includes nettle, angelica, meadowsweet, and hemlock water dropwort. Stands of reed canary-grass may be present.	Type A (2)
WN6	Wet willow-alder-ash woodland	Woodland in permanently waterlogged sites. Usually dominated by some combination of willow, alder and ash. Includes lakeside woods, woods on fen peat (carr) and woods on spring-fed or flushed sites. Field layer species include creeping bent, common marsh bedstraw and meadowsweet.	Types C1, C2 & C3 (2)
WN7	Bog woodland	Woodland on peat bogs (including cutover bogs and bog margins). Usually found on deep acid peat and dominated by birch. Holly, oak, rowan, scots pine and willows may also be present. The field layer often comprises ling, bilberry, bracken, bramble and purple moor-grass.	Types E-H (2) *Bog Woodland (91DO) (3)
WD	Highly modified/ non-native woodland	Woodland not dominated by native species, & intensively managed stands (both native and non-native) that are not regenerating naturally.	
WD1	(Mixed) Broadleaved woodland	Woodland with 0-25% conifers and 75-100% broadleaves. If more than one broadleaved species is present in significant amounts the term 'mixed' is applied.	
WD2	Mixed broadleaved/ conifer woodland	Woodland where both conifer and broadleaved species have a minimum cover of 25%.	

Wet woodlands

The term wet woodlands describes woods that are subjected to temporary or permanent water-logging. It includes bog woodlands, carr, and woodlands present along lake shores and rivers. Many of these woodland types have persisted in these locations because the land there is of low agricultural value. In addition, the generally poor stature of the canopy species renders them unsuitable for timber use and so wet woodlands have rarely been planted up with exotic species or with native species of foreign provenance. Some stands have been intensively managed in the past for the production of willow rods for weaving. The relatively poor rooting present in such woodlands renders the canopy trees vulnerable to windthrow, so that these sites usually have a complicated structure, with many horizontal stems. Because these woods are difficult to move through, they are unpopular with walkers and so often remain an unmodified haven for wildlife. Wet woodlands provide a wide variety of niches and their proximity to water and edge effects make them one of the most diverse habitats. The conservation importance of wet woodlands is highlighted by the fact that some types are designated as priority habitats under the EU Habitat Directive. Wet woodlands are subject to various threats. These include drainage, overgrazing, clearance, and infestation by invasive species such as knotweed, Himalayan balsam, dogwood and locally, sycamore.

Cross & Kelly (2003) present a summary of wet woodland types present in Ireland, derived from Kelly & Iremonger (1997), Browne *et al.* (2000) and other sources. They emphasise that woodlands vary greatly by site, and that some sites are intermediate between the types described. They describe ten wet woodland types (Table 1.3).

Table 1.3 Wet woodland types in Ireland. (after Cross & Kelly 2003)

Woodland Type	Dominant Trees	Soil Type	Water Regime	Fossitt 2000
A. **Riparian Woodland** (Salicetum albae association)	Willows, alder	Base-rich, eutrophic alluvium	Winter flooding	WN5
B. **Stagnant carr** (Osmundo-Salicetum association)	Common sally, alder	Fen peat	Winter flooding	WN6
C1. **Alder-tussock sedge carr** (Alnus glutinosa-Carex paniculata community)	Alder, sally, downy birch	Fen peat	Water table always close to surface	WN6
C2. **Alder-ash woodland with remote sedge** (Carici remotae-Fraxinetum association)	Alder, ash	Fen peat/mineral	Usually flushed; Waterlogged at least in winter	WN6
C3. **Alder-ash woodland with giant horsetail** (Equisetotelmatejae-Fraxinetum association)	Alder, ash	Calcareous mineral	Fed by calcareous springs	WN6
D. **Alder- oak-ash with hazel** (Corylo-Fraxinetum deschampsietosum)	Ash, pedunculate oak, alder	Mineral	Winter waterlogging, drying out in summer	WN4
E. **Birch woodland on cutaway bog** (Vaccinio uliginosi-Betuletum pubescentis association)	Downy birch	Drained bog peat	Water table seldom more than 30cm below surface	WN7
F. **Birch-sally woodland on peat** (Sphagnum palustre-Betula pubescens community)	Downy birch, common sally	Bog peat	Waterlogging but not flooding	WN7
G. **Birch woodland on intact raised bog** (Salicetum auritae)	Downy birch	Raised bog peat	Flushed, waterlogged	WN7
H. **Birch scrub in blanket bog**	Downy birch	Blanket bog peat	Flushed, waterlogged	WN7

Woodland on free draining soils over acid substrates

These woodlands are described by Kelly & Moore (1974) and many of the most intensively studied woods in the state belong to this type (*e.g.* at Brackloon, Glengarriff, Glenveagh, Killarney). These woods occur over acid substrata such as sandstone and granite, and so are distributed in upland areas and to the west of the country. Many such sites persist on steep slopes and inaccessible areas. The canopy is invariably dominated by sessile oak (*Quercus petraea*) and birch, rowan, alder and yew also occur in varying quantities. Holly is a major component of the sub-canopy, and in places, hazel may also be abundant. The field layer is often species poor, with hard fern, wood sorrel and bilberry commonly present. The combination of high precipitation and low evapotranspiration rates with acid soils results in a tendency of soils towards podzolisation in many of these woods, and they are usually relatively infertile (Little *et al*. 1997). However, high humidity, especially in the milder west and southwest of the country, allows these woods to support an abundance of epiphytes, in particular, a diverse range of bryophyte and lichen species (Kelly & Moore 1974). Given the location of these woods on or adjacent to marginal land, grazing pressure can become quite intense, and as a result, natural regeneration is often limited (Neff 1974, Hester *et al*. 1998, Higgins 2001). The preference of the highly invasive *Rhododendron ponticum* for acid soils render this woodland type extremely vulnerable to infestation and many sites are badly affected (Cross 1982).

Fossitt (2000) assigns the name oak-birch-holly woodland (WN1) to these stands. They include the association Blechno-Quercetum petraeae (Braun-Blanquet et Tuxen, 1952) with three sub-associations described by Kelly & Moore (1975).

(i) scapanietosum - woodland with a large number of bryophytes, occurring in areas of high rainfall such as the south west.

(ii) typicum - woodland lacking an extensive bryophyte layer, occurring in the drier eastern areas of the island.

(iii) coryletosum - woodland with several species more typical of the Corylo-Fraxinetum to which it is transitional.

Woodlands on free draining soils over calcareous strata

The majority of woodland over fertile soils has been cleared in past centuries for agriculture and other reasons (*c.f.* 1.2). However, a number of woodland types persist in base-rich conditions. Perhaps the most common are those stands that remain within former demesne (or estate) woodlands. In addition, where eskers have escaped destruction by quarrying, they often support some woodland (Cross 1992). Limestone pavement that is not subject to browsing will tend towards hazel dominated scrub and sometimes to ‘high’ forest (Kelly & Kirby 1982). The yew dominated stand at Muckross, Co. Kerry is a rare woodland type, subsisting on limestone pavement. Where mineral soil has developed, woodlands are dominated by some combination of pedunculate oak (*Quercus robur*) and ash. Elm was probably a major component of the canopy in such woods prior to its decline (Kelly & Kirby 1982). These woods tend to be species rich, particularly in the herb flora, but are not particularly diverse in terms of bryophytes.

Kelly and Kirby (1982) assigned these woodlands to the association Corylo-Fraxinetum, which has four sub-associations:
(i) nekeretosum - this describes *Corylus* scrub on shallow and stony limestone bedrock.
(ii) veronicetosum - woodland on deep soils with mull humus and with *Hyacinthoides non-scriptus* in the field layer.
(iii) typicum - woodland similar to that in (ii), but lacking the presence of moisture demanding species (*e.g. Chrysosplenium oppositifolium*) in the field layer.
(iv) deschampsietosum – *Fraxinus excelsior* is often the dominant tree species occurring on base-rich mineral soils which are waterlogged in winter but dry out in the summer.
The sub associations defined by Kelly & Kirby (1982) generally fall under Fossitt's oak-ash-hazel woodland (WN2). The main exception is one type of the nekerostosum community when dominated by *Taxus bacatta*, which Fossitt assigns to a separate category, Yew Woodland (WN3).

1.4 Woodland conservation

The need to identify and conserve natural habitats and species is now well established and is increasingly reflected in international and national policies and legislation. The most appropriate methods to be used in achieving 'nature conservation' however, are still the subject of much research and debate. In all conservation schemes, decisions must be based on a clearly defined objective *e.g.* to achieve greatest species diversity, or, to mimic the natural situation as closely as possible, or, to increase the numbers of a target species to achieve a viable population. Defining goals in habitat conservation is more difficult than in species conservation: in many cases we do not fully understand the processes that exist within natural habitats, and are especially challenged by the fact that human and other impacts are often indiscernible. This situation is no less true for woodland than for any other habitat.

In order to conserve natural habitats we must first define them, so that we can identify them. Site selection for nature conservation is not straightforward however. Cross (1990a) says that 'In many ways site quality classification is an art, rather than a science'. Ratcliffe (1977) in his nature conservation review, highlighted the factors that affect the conservation value of a site and these have proven useful, and been widely applied to habitat conservation (Spencer & Kirby 1992, Cross 1992, Kirby 1988, Kirby *et al.* 2002, van der Sleesen & Poole 2002, Woodland Trust 2000, Lockhart *et al.* 1992).

No primeval woodland remains in Ireland, or even Europe (Peterken 1995). All existing woodlands in Ireland have been modified to a greater or lesser extent by human activities. However, some woodlands are clearly closer to their potential 'natural' state than others, and usually these woodlands have a high conservation value. Naturalness is probably the single most important factor, and applies both to the species composition and structure of a wood. Semi-natural forest stands usually have a variety of age classes present, and this provides heterogeneity of structure which accommodates a high diversity of life-forms and species. A native species composition is also of value. High abundances of non-native species, especially in the canopy, can dramatically alter the environmental conditions present within a wood, and in some cases can have adverse impacts on the native species, either through competition or other mechanisms.

Woodland age is also often heavily valued. This is based on two premises. Firstly, woodlands that have existed for many centuries are more likely to be linked to the 'primeval' woodland that once covered much of the landscape. Rackham (1980) further develops this concept by reference to the fact that prior to 1600, the planting of 'new' woods was very rare in England, and so any woods that were known to have existed at this time are highly likely to have arisen naturally. Thus these may contain relict soil structure or even flora and fauna, and so such sites, even where the tree composition has been dramatically altered, may serve as good sites for reinstatement of native woodland. Thus high conservation value is assigned to ancient woodland. The second reason that older woodlands are considered to be important is that they often contain species which are slow to colonise new habitats. A large number of specialist species, particularly invertebrates and lichens, are exclusively found in old woodlands (Woodland Trust 2002). Some species have been used as 'ancient woodland indicators' (Rose 1976, 1999 and Peterken 1974, 2000). Old woodland sites often contain features that have resulted from past management *e.g.* pollard/coppice stems and banks and ditches, and these may add to the structural and species diversity of the site. Such historical features are also often of interest in their own right (Rackham 1990).

Larger sites are usually favoured over smaller sites as they contain a greater 'core area' (Laurence 1991) in which true woodland conditions prevail, and also because they usually contain higher levels of biodiversity (Woodland Trust 2002). In addition, many species are known to require a minimum area of habitat in order to maintain a viable population. Many bird species now extinct in Ireland, for example, goshawk and woodpecker, have suffered extinction because of fragmentation of the woodlands (D'Arcy 1999). Many woods are completely surrounded by intensively managed farmland. This can restrict the movement of species and gene flow between sites (populations). It also restricts the potential of a woodland site to expand. Thus the proximity of other semi-natural habitats to woodland sites increases its conservation potential.

1.4.1 Identifying native woodlands

The first woodland specific survey of Irish woodland was the National Inventory of State and privately owned forests carried out between 1966 and 1973. The main aim of this survey was to estimate the commercial potential of Irish forests, and so the emphasis was placed on conifer stands, for which yield class data were published (O' Flanagan 1973, Purcell 1979). Coillte (the semi-state body responsible for forestry in Ireland) has continuously monitored the state forests since its inception in 1988 and maintains a GIS database pertaining to all aspects of forestry (see below). In addition, efforts have been made in recent years to assess and enhance the conservation value of relevant stands within the Coillte estate.

Probably the earliest conservation focused inventory of woodland in Ireland was the An Foras Forbatha survey of important areas for nature conservation in the 1970s. This county-by-county survey resulted in a list of some 1500 Areas of Scientific Interest (ASIs). The resurvey of the majority of ASIs in the 1990s resulted in the proposal of many sites as Natural Heritage Areas (NHAs), and later as Special Areas for Conservation (SACs). The woodland within designated areas such as nature reserves, NHAs and SACs is reasonably well known and in some cases has been mapped (SAC management plans) and in others

relevés have been taken. However, until now, no comprehensive inventory and field survey of native woodland in the state has been undertaken (Anon. 2002).

The most recent census of woodland cover in the Republic of Ireland is that carried out as part of the Forest Inventory and Planning System (FIPS). FIPS is an Arc View® based GIS system that has mapped and provided attribute data on wooded areas within the State. FIPS has utilised a combination of satellite imagery (1993-1997) and aerial photographs (1995) to digitally map all woodland sites $\geq$ 0.2 ha in the State (Gallagher *et al.* 2001). FIPS has also used the same images to classify woodland into broad woodland types. Most GIS systems used in natural resource management have some error (Bolstad & Smith, 1999) and the overall accuracy of FIPS is stated to be 88% (Gallagher *et al*., 2001). According to FIPS, total woodland cover in the State, as of 1998, stands at ~650,000 ha, which amounts to approximately 9% of the land area. However, most of this is recent (post 1950) plantation forestry and only 7.8% of the total area is classified as 'mature oak and other broadleaves'. While this figure undoubtedly contains some plantations, it also includes the semi-natural woodland that remains in Ireland. This semi-natural resource includes old plantations from the 17th and 18th centuries and stands that were managed as coppice in the past, as well as more recent secondary woodland. Less than 0.7% of Ireland is covered with mature semi-natural woodland.

In addition to FIPS, there are three other GIS platforms relevant to native woodland in Ireland. These are the Coillte database, the Soil Parent Materials Classification Project, and the National Parks and Wildlife database of digitised habitat maps. The Coillte database is an Arc View based GIS platform that has mapped and linked attribute data on all areas of land owned by Coillte. Coillte manages approximately 70% of all Irish forests, but this percentage is steadily declining as increasing levels of planting are carried out privately (Gallagher *et al*., 2001). The Coillte database contains more detailed information than FIPS, on the tree species planted in each area and also has additional sources of information such as topographical data. The Soil Parent Materials Classification database is an ongoing project using a combination of 3D images generated from aerial photographs, field visits and published literature to produce a parent material map for the country in Arc View. At present 13 of the 26 counties have been completed (R. Meehan, *pers.comm*.). National Parks and Wildlife Service is the State agency responsible for the conservation of natural areas, and has digitised habitat maps for a significant number of designated areas. The habitat maps were originally produced by ecologists on 6 inch maps during field visits to sites, but as part of an ongoing process a significant number have been digitised.

1.4.2 Mechanisms for woodland conservation in Ireland

As with nature conservation in general, formal woodland conservation is a relatively recent development in Ireland. Prior to the 1970s, the Bourn Vincent Memorial Park (now incorporated into Killarney National Park) was the only area in the state, specifically designated for wildlife conservation. In addition, no single state agency had responsibility for conservation, nor was there any legislation relating specifically to wildlife* (Craig 2000). [* Excepting the Game Preservation Act (1930) and the Wild bird (Protection) Act 1930] The principal instruments of woodland conservation in the state today are the

Wildlife Act (1976), the Wildlife (Amendment) Act (2000) and the European Union (Natural Habitats) Regulations 1997. Some Forestry Acts (1946, 1956, 1988) have also some relevance, but are primarily targeted at commercial forestry (O' Sullivan 1999). Nature Conservation is the remit of the National Parks and Wildlife Service (NPWS, formerly Dúchas) which is currently contained within the Department of the Environment, Heritage and Local Government. NPWS has been responsible for the implementation of the aforementioned legislation. Much emphasis has been placed on the identification and designation of important woodland (and other) sites for conservation. There are four main designations relevant to woodland conservation. In many cases these overlap, both physically and in terms of effect.

National Parks and Nature Reserves

These are areas designated for nature conservation and are in almost all cases entirely owned and managed by NPWS, and so constitute the most strictly protected conservation areas in the State. There are currently 6 National Parks in Ireland, which combined, cover 59,060 ha (Craig 2001). These have an amenity, educational and research function in addition to the primary objective of wildlife conservation. Killarney National Park contains over 1000 ha of semi-natural woodland. Most of this is acid oak wood, but considerable areas of wet woodland are also present and a unique yew woodland is also present (OPW 1990). The Burren National Park contains extensive areas of hazel scrub, associated with limestone pavement. Smaller areas of acid oakwood are contained within Connemara, Glenveagh and the Wicklow Mountains National Parks. Nature reserves are usually smaller areas (up to hundreds of hectares) and there are 33 reserves that contain woods of conservation value. The total area of woodland contained within these designated areas is 5,736 ha (O' Sullivan 1999). While damaging activities such as felling and underplanting are generally prevented in these sites, problems associated with invasive species and overgrazing are as yet, unresolved in many areas.

Natural Heritage Areas and Special Areas for Conservation

These are designations that apply to areas of significant conservation value irrespective of ownership. NHAs are provided for under the Wildlife Acts (1976, Amendment 2000) but to date none of the 1,100 proposed sites (extending over 900,000 ha) have been formally designated (Craig 2001). Nonetheless, the principals underlying the designation are usually considered during planning procedures etc. In some ways, the NHA designation has been superseded by the European Union Habitats Directive. This provides for the designation of SACs, and most NHAs (and many National Parks and Nature Reserves) are now contained within an SAC. Designation of sites is ongoing. By the end of the process each SAC will have a management plan, (drawn up by ecologists in consultation with landowners and relevant experts) which will ensure that activities carried out within the area will be appropriate to the conservation of the relevant habitats/species. Certain Irish woodland habitats, that are rare or important on a European scale, have been given special status in this process. These are alluvial woodland, woodland on intact bog, yew woodland and old sessile oak woodland. As with the more strictly protected sites, invasion by native species and sub-optimum grazing levels threaten many woodlands within NHAs and SACs. These sites are even more vulnerable, however, in that the primary activity in

such sites is rarely conservation, and so there is often substantial conflict of interest between the owners and the conservation agency.

Other schemes relating to native woodland

Nature conservation in general has gained increasing attention from all sectors in recent decades and this has resulted in the development of several initiatives of relevance to native woodland. The Biodiversity Action Plan was published in 2002, and proposes various actions to enhance the status of native woodland in Ireland.

Coillte, the state forestry body has been actively pursuing a nature conservation strategy since 1999. The most relevant aspect of this is the commitment to manage 15% of each Forest Management Unit (FMU) with nature conservation as the primary objective. To date, ecological surveys have been carried out in 14 FMUs and surveying is ongoing. In addition, Coillte has adopted a policy of sustainable forest management and is working towards achieving certification from the Forest Stewardship Council. Some notable measures include the identification and conservation of biodiversity features (*e.g.* areas of scrub, specimen trees), key habitats (*e.g.* for lesser horseshoe bats and hen harriers) and diversifying the structural elements of their forests (*e.g.* through allowing dead wood to accumulate).

The Peoples Millennium Forest was an initiative organised by Woodlands of Ireland, a collaboration between environmental non-governmental organisations (eNGOs), the Forest Service, Coillte and National Parks and Wildlife Service (NPWS, formerly Dúchas). It involved the creation of new native woodlands, using native seed sources, and provided funding for the restoration of others. In total, more than 600 ha of woodland will benefit from this scheme.

The Forest Service is currently administrating the Native Woodland Grant Scheme on behalf of a partnership involving, amongst others, The Heritage Service, NPWS, the Central and Regional Fisheries Board, the Marine Institute, COFORD, Coillte, The Peoples Millennium Forests and eNGOs. This scheme provides grant assistance for the restoration of existing broadleaved woodlands, and for the establishment of new native woodlands. This scheme differs from general afforestation grants in that timber and other forest products production will be secondary to nature conservation in all grant-aided sites. The scheme has involved a training course, in which ecologists, landowners and foresters have come together to plan for the effective conservation management of native woodlands.

1.4.3 Threats to native woodland

Most of our semi-natural woods are relatively small, fragmented and widely scattered and woodland is the rarest of the major habitat types in Ireland (Anon. 2002). The limited extent of this habitat type means that any clearance for development (*e.g.* drainage and/or removal for land 'improvement' or road development) will have a proportionately high impact on the total native woodland resource. In addition to the vulnerability of these habitats caused by such rarity and fragmentation, there are several other issues which pose a threat to their conservation.

Ireland has a relatively poor flora, and it is estimated that approximately one third of the vascular plant species present are naturalised introductions (Webb 1982). Most of these species are relatively benign, and have little impact on the function of native ecosystems. Some, however are highly effective competitors, to the extent that they may out-compete native species and, to a lesser or greater extent, result in the degradation of native habitats. There are several such species that affect native woodland. Red osier dogwood (*Cornus sericea*) and Himalayan balsam (*Impatiens glandulifera*) are a particular threat to wet woodlands. In drier sites, cherry laurel (*Prunus* laurocerasus), rhododendron *(Rhododendron ponticum)*, sycamore (*Acer pseudoplatanus)* and beech (*Fagus sylvatica)* are among the more widespread introductions, and have achieved local dominance in some places. The negative effects of rhododendron in native acid oakwoods and on heath are well documented, and many native woods, especially in areas of acid soils are badly affected (Neff 1974, Cross 1982, Hayes *et al*. 1991, Barron 2000). Rhododendron is a particular threat because of the difficulties entailed in successfully clearing it from an area once serious infestation has occurred. Despite concerted efforts to manage rhododendron in various woodlands over the past decades, few woodlands have been successfully cleared (but see Quirke 1999, Barron 2000). While beech and sycamore are certainly widespread, and in some places abundant, their impact on the native vegetation is less well understood, and attitudes towards these species vary among woodland managers and ecologists.

Grazing (including browsing) is a natural part of the woodland ecosystem (Putman, 1994, Vera 2000). However, the extinction of the wolf has meant, that in many woodlands, natural stocking densities are no longer maintained. The continued expansion of introduced grazing species, particularly sika deer (*Cervus nippon* L.) and the intense grazing of woodlands by domestic stock, chiefly cattle and sheep, has reduced the field layer and limited the success of natural regeneration in some Irish woods (Higgins 2001, Hester *et al.*1998). Where severe grazing pressure has been sustained over many decades, the population structure of a stand becomes skewed, and there is a dearth of younger generations. If this situation is allowed to continue indefinitely, the future of affected woodlands is seriously threatened, as the replacement of the current canopy is continuously prevented.

Native woodland is also threatened by the underplanting of broadleaved stands with exotic species, mainly conifers. Although this was practiced widely in the past, it is no longer common, and in some cases conifers and other exotics are being removed from within former native woodlands in order to reinstate the native habitat. In addition, in recent years there has been growing recognition of the need to

preserve the genetic integrity of native species (Martin *et al.* 1999) and many schemes (Native Woodland Grant Scheme, Peoples Millennium Forest) place emphasis on using not only Irish seed, but on sourcing it as locally as possible (Forest Service 2001).

With increased attention to conservation in general, and recent developments specifically relating to woodland conservation, a national inventory of native woodland is needed now more than ever. The present study aims to make the important initial steps in this process, identifying all potentially native woodland sites in the country, and beginning the field survey process. The resulting data will allow an informed assessment of the conservation status of woodland in Ireland, and will also provide important baseline data for the monitoring of this important resource for the future.

1.5 The field survey area

1.5.1 Geography

The area to be field surveyed in this study comprises the counties of Carlow, Kilkenny, Wexford, Laois and west Offaly. The area can be considered in two parts: Carlow, Kilkenny and Wexford in the extreme south-east of the country; and Laois and Offaly, in the Irish midlands. The former area is generally dominated by rolling lowlands containing important rivers (Barrow, Nore Suir and Slaney) and their floodplains. To the northwest of the region (northwest Kilkenny) the bedrock is mostly carboniferous limestone. The Blackstairs Mountains on the Kilkenny/Carlow/Wexford border are composed of granite and other intrusive rocks and rise to 2610 feet at Mount Leinster, the highest point in the entire survey area. The other notable upland area is the Castlecomer Plateau, composed of coal measures and achieving approximately 1,000 feet in height. Soils in the region are dominated by brown earth soils and the area is mostly under arable or mixed farming. There are three main parts to the Laois-Offaly area. Southern Laois is not dissimilar to north Kilkenny which it borders. The Slieve Bloom Mountains in north Laois and south Offaly are composed of sandstones and shales and are dominated by blanket bog and plantation forestry. The remaining areas are underlain by Carboniferous limestone, over which is found a mosaic of glacial deposits. Raised bogs and eskers are important features in this generally flat landscape, and soils other than peats are generally calcareous and derived from glacial drift.

1.5.2 Climate

Ireland is situated off the northwest coast of the European continent and its position on the Atlantic seaboard means that the prevailing winds are warm south-westerlies, and the climate is mild, moist and strongly oceanic (Mitchell & Ryan 1997). Oceanicity decreases as one moves from west to east. Winters are relatively warm and summers rather cool, with average January and July daily temperatures of 4 and 15 º C respectively. The weather is dominated by frontal depressions and rainfall is generally high. The average annual number of rain days varies from 225 per annum in upland areas on the west coast, to less than 150 days per annum in the south east. Data relating to climate in the area covered by the field survey are presented in Table 1.4. The south east of Ireland has a less oceanic climate compared with the west and is generally the drier part of the country, with high sunshine values and greater extremes of temperature than the oceanic west.

Table 1.4 Meteorological data for the field survey area
(Met Eireann 30 Year Average Data – www.meteireann.ie/climate)

	Kilkenny	Rosslare
Mean Annual Rainfall (mm/yr)	822.8	877.1
Mean no. rain days per year (> 0.2 mm rain)	192	176
Mean no. sunshine days per year	300	304
Mean daily sunshine (hrs)	3.51	4.33
Mean daily minimum, mean, maximum temperature (˚C)	5.2, 9.3, 13.4	7.6, 10.1, 12.6
Mean no. of days with ground frost per year	111.5	47.4
Mean annual wind speed (knots)	6.5	11.5
Mean no. gale days per year	1.4	11.7

2 Materials and Methods

2.1 National survey of Irish native woodlands

2.11 Mapping of native woodlands and the integration of the relevant GIS platforms

One of the primary aims of this project is to identify and demarcate, on a 6 inch to 1 mile scale, every block of putative native woodland $\geq$ 1 ha, wider than 40 m in the State. FIPS was used as the primary data source for producing the Native Woodland Survey data set. FIPS is a GIS platform produced by the Forest Service that uses a combination of 1993-1997 satellite imagery and 1995 panchromatic orthophotos to digitally map the majority of woodland in the State (*c.f.* 1.4.1). The emphasis of FIPS had been commercial plantations and so it was necessary to modify the existing FIPS 1998 data set so that it could be used to achieve our primary aim. The following GIS methodology was applied using Arc View GIS 3.3.

1. FIPS class categories that were not relevant to the native woodland survey (*e.g.* Cleared areas, Conifer Forest and Planting Grant Application areas) were deselected and a new FIPS coverage map containing only woodland blocks that were potentially native was produced.
2. A conventional dissolve was used to join contiguous parcels of woodland. This allowed adjoining broadleaf parcels to be viewed as a single woodland block rather than multiple discreet forestry management parcels.
3. These newly generated woodland blocks were then mapped, their perimeters redrawn and their areas calculated.
4. All discreet polygons (woodland blocks) that fell below the minimum size for inclusion in this survey (area of at least 0.98 ha and a width of at least 40 m) were eliminated.
5. A new unique FIPS ID, which numbered from 1 to 17,542, was assigned to each of the putative native woodland polygons, ensuring that all attribute data, such as location data and woodland type were assigned to the new unique FIPS ID.
6. For every woodland polygon identified, the attribute data of grid reference and townland name was added

To this modified version of FIPS the secondary data sources from the Coillte database, the Soil Parent Materials Classification Project and the National Parks and Wildlife Service (NPWS) database of digitised habitat maps were added (*c.f.* 1.4.1). During the data integration process the aim was to add the maximum information to each putative native woodland site in a form that could easily be viewed in Arc View by the end user. To complement this native woodland data set the original versions of the FIPS, Coillte, Parent material and NPWS data sets were retained within the Native Woodland Survey Arc View project file so that all information contained within them could be viewed if required.

To incorporate the Coillte data set within the modified version of FIPS firstly all Coillte management units that contained only conifers were removed. The remaining Coillte polygons were then intersected with the FIPS unique polygons. This removed all Coillte data that did not comply with the native

woodland criteria of ≥ 1 ha, wider than 40 m. However, a manual verification of the intersected data set showed that significant areas of native woodland within the Coillte data set that were ≥ 1 ha and wider than 40 m had been removed. Also the addition of another hierarchical layer of information to the main attributes table (Fig. 2.1) made data retrieval from it very cumbersome. Due to these two facts the Coillte data was added to the National Native Woodland Arc View project file as an independent theme that could be used to complement the information already present within the FIPS polygons.

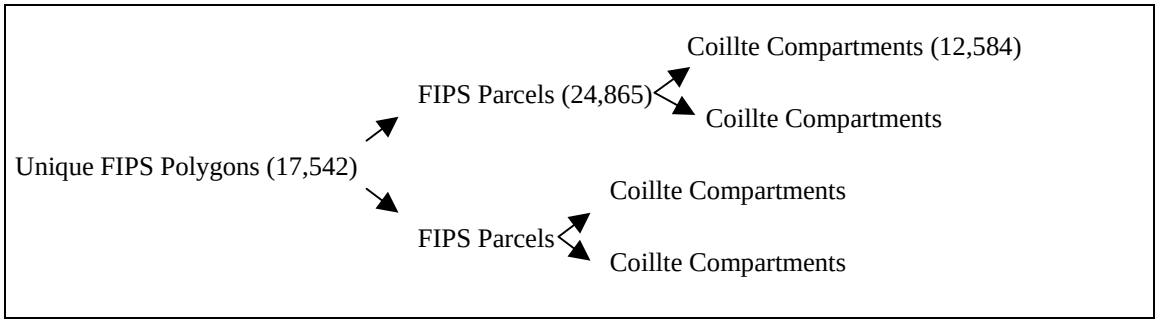


Fig 2.1 Hierarchical addition of information to the main attributes table

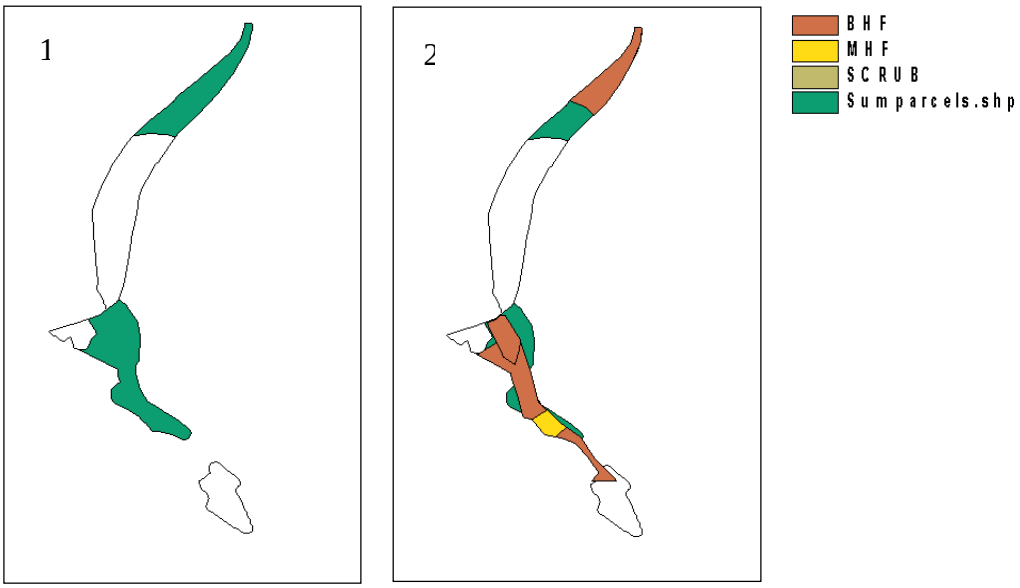


Fig. 2.2 The levels of information provided by the two GIS platforms FIPS 1998 (1) and the Coillte database (2).

1) FIPS - the area is represented as two polygons that contain broadleaved woodland, separated by an area of conifers (unfilled area). This is a modified version of FIPS that has combined FIPS parcels that contained the same woodland type. This process reduced the original 6 broadleaved parcels to two, separated by an area of conifers.

2) Coillte – the same area is represented by 5 Coillte polygons, 4 of which are broadleaved and one is mixed. In this version of the database coniferous Coillte parcels are not shown.

The Parent Materials Classification data was available for only 13 of the 26 counties due to the fact that this Forest Service project is still ongoing. To simplify the Native Woodland Survey view in Arc View it was decided not to have the parent material theme for each county displayed. However, the detailed parent material soil map for each county could be viewed if a detailed map for a site or region was required. The parent material data was added to each native woodland site by calculating the centroid of each woodland polygon in Arc View and then carrying out an intersection between the woodland centroids and the parent material polygons.

As for the Parent Material Classification data the digitisation of the designated area habitat maps by the National Parks and Wildlife Service (NPWS) is an ongoing process. Currently the maps have been digitised for 63 SACs and 1 Special Protection Area (SPA). To find out which designated areas contained areas of putative native woodland an intersection was carried between the Native Woodland Survey FIPS polygons and the designated area polygons. FIPS polygons that were found to be located in a designated area were then viewed over a NPWS habitat map and the habitat data was added to the attributes table for the Native Woodland Survey. For the remaining SACs that have not had the habitat map digitised an intersection was performed for all FIPS polygons that had their centre within the SAC and the SAC polygons for each county. This was done to remove all woodland polygons that only touched the boundary of an SAC and allowed the approximate area of woodland contained within SACs to be calculated. For NHAs, an intersect was performed to provide a list of all NHAs that contained an area of woodland. This list would be used to complement the data in Higgins (1999).

In addition to the three GIS data sources that were added to FIPS, the 2000 series of colour aerial photographs was available for the whole state and the photographs were used to help define areas of woodland and woodland type, and to test the accuracy of FIPS. In total 31 six inch maps from throughout the State were selected and the mapped FIPS data was printed on top of each of them. This data was then compared with the aerial photograph for each of the areas and the accuracy of FIPS was assessed by scoring the total number of putative native woodland sites; defined by the criteria stated above, as identified by FIPS with the total number of putative native woodland sites seen on the aerial photograph. Where FIPS had missed a site, the woodland type was recorded as broadleaf, mixed or scrub, and the area of the site was measured.

2.12 Other data sources

In order to maximise the usefulness of the woodland database, it was attempted to gather all information available pertaining to native woodland in Ireland. A literature survey was carried out in order to identify all published data on the subject. Contact was made with academics, NGOs and others working in the area of forestry and/or conservation, in an attempt to identify unpublished data and datasets.

2.2 Field survey of native woodlands

Sites in the counties of Carlow, Kilkenny, Laois, Wexford and West Offaly were prioritised for field survey using the information gathered during the desk survey. Only West Offaly was surveyed as East Offaly (east of x coordinate N212) had been surveyed for native woodland during the 2001 pilot study (Van der Sleesen & Poole, 2002). To ensure that a broad range of woodland types were included in the survey the criteria listed below were considered:

- Sites already designated for conservation e.g. NHAs and SACs were prioritised;
- large blocks of woodland for which little or no data exist were prioritised;
- woodlands in largely unwooded landscapes were targeted;
- older woodlands (those with extant blocks marked on the 1st Ordnance Survey [1830s-1840s]) were prioritised;
- sites with a high level of threat *e.g*. woodlands under private ownership which are more at risk from damage or felling were targeted.
- Woodland along the Rivers Barrow and Nore were extensively surveyed during 2000 (Browne *et al*., 2000) and therefore sites already surveyed during the 2000 survey were not selected again during this study.

Certain geographical areas within the relevant counties were found to have a low density of woodland sites and so aerial photographs (2000) were used to identify all possible areas of native woodland in these under-represented areas. Blocks of potentially native woodland identified from the aerial photographs were then mapped onto Ordnance Survey 6" sheets. In total this was done for 36 of the 152 six inch sheets that cover the study area. This manual site identification also acted as a control to check the accuracy of the FIPS data. However, the best test for the FIPS data (particularly regarding woodland type) has proven to be when a site is visited on the ground.

Once a site had been selected a site pack was prepared. This included a FIPS overlay of the woodland at the site on a 6 inch map, a blank 6 inch map and a 2000 aerial photograph of the site at a 6 inch scale. Site packs were then distributed among field teams along with the general site information listed in Appendix 1.

2.2.1 General site survey

The field survey methods can be divided into three sections: firstly, the description and general survey of the site; secondly, the description of relevés for each vegetation community in the site; and thirdly, the determination of tree size, abundance, and quality. Soil characteristics vary greatly within woodland and so soils were sampled at the relevé scale. There are specific field sheets for recording each type of data (Appendix 2) and an Access database was designed for storing the data (attached CD).

Specially designed field survey sheets were issued for completion at each site (Appendix 1). The general site survey sheet followed Fossitt (2000) for the definitions of the woodland communities and adjacent land uses at the site. Nomenclature followed Preston *et al.* (2002) for vascular plants and ferns, Blockeel & Long (1998) for bryophytes, and Dobson (2000) for lichens.

The altitude (in metres) for the lower and uppermost point of each site was recorded from the appropriate Discovery Map. The general slope (in degrees) for the woodland as a whole was recorded, having been measured with a clinometer or estimated by eye. If there was not an obvious, single measurement relevant to the site as a whole, the situation was described in the site notes. The aspect (N, NE, E, SE, S, SW, W, or NW) – was recorded for the site as a whole. Flat sites (*i.e.* with no aspect) were recorded as '0'. Where a site had more than one aspect this was indicated on the field card.

Site area (in hectares) was usually provided in the site pack, having been derived from FIPS. If the woodland boundary was found, during field survey, to differ from that given by FIPS, the new boundary was marked on the 6" map or aerial photograph provided. The new woodland area was measured later using a mechanical polar planimeter (Lasico).

The topographical position (*e.g.* upper slope, plateau) occupied by the woodland was noted. In many cases the woodland site extended over many topographical positions. Where the woodland site existed on/in a particular geographical feature, for example, in a valley or on a drumlin, this was recorded.

The predominant soil moisture regime observed at the site was recorded. In addition, any hydrological features *e.g.* streams, ditches and flushes observed were noted. Any evidence of management, both previous and current, in the wood was also noted. This included planting, felling, amenity use and coppicing.

Surface cover

The surface cover of various strata was assessed in order to give a general indication of the structure of the woodland. The scale used was DAFOR (dominant, abundant, frequent, occasional, rare). The categories assessed were: rock and boulders; stones and gravel; bare soil; litter; bryophytes; herbs; and low woody species. Only the actual wooded area was assessed e.g. gravel covered forest tracks/roads, car parks etc were not included when assigning scores to the categories.

Vegetation communities

Vegetation communities were classified using the system of Fossitt (2000) and where more than a single type was present, the proportion of the woodland area (survey area) allotted to each type was noted. The distribution of vegetation types at each site was described in the site notes and marked on the 6" map where practical.

Dead wood

The abundance of dead wood was recorded. Dead wood is an important component of the woodland ecosystem and different types of dead wood provide niches for many invertebrates and the species that depend on them. The AFOR scale used to record frequency of each category of the dead wood present, as it was assumed that dead wood would never be dominant at a site. The categories were defined as follow.

Standing Dead	Any tree, still rooted and seemingly entirely dead
Standing damaged	Trees with major branches lost/crown damage
Uprooted Trees	With/without main stem still present
Coarse woody debris	Non-leafy litter on the ground, dbh≥5cm
Fine woody debris	Non-leafy litter on the ground, dbh<5cm.

Site boundary

The type of woodland boundary(s) present was recorded and where a definite boundary, such as a wall or fence was lacking, the transition form woodland to non-woodland was described as either abrupt, or diffuse (i.e. with shrubs, saplings etc at margin, indicating potential woodland expansion).

Surrounding landuse

The surrounding landuse was observed during field survey and recorded for each site using categories defined by Fossitt (2000).

Grazing regime

Grazing is an inherent part of natural woodland dynamics, however very high and very low grazing may have negative impacts on the woodland ecosystem. During the general site survey, grazing level was assessed using the criteria listed in Table 2.1, modified from Mitchell & Kirby (1990). In addition, the types of grazer(s) present were deduced from available evidence on site (prints, droppings etc.).

Table 2.1 Definition of grazing levels

Evidence of Grazing	Value
No grazing apparent	0
Low: regeneration abundant, shrub layer dense, no obvious browse line	1
Moderate: Saplings localised, shrub layer patchy, field layer > 30cm in general	2
High: Shrub layer severely checked/lacking, ground vegetation generally <20 cm, tree regeneration rare/confined to safe sites, some bare soil/poaching visible	3
Severe: Shrub layer and regeneration almost completely absent. Definite browse line apparent, extensive bare soil present, ground flora confined to well bitten herbs grasses and bryophytes. Bark stripping at least occasional	4

Natural regeneration

The regeneration status of a wood is an important indicator of its future status. A failure of regeneration is reported for many sites, particularly in Britain, and a formal assessment of the presence of regenerating species in a survey such as this is of much interest. The principal canopy and sub-canopy species were scored for regeneration during the general site survey. For each regeneration class, DAFOR or Absent

was assigned. The classes used were: sapling (sp) up to 200 cm tall, <7 cm dbh; juvenile (j) 201 – 400 cm tall and dbh<7 cm; pole (p) >401 cm and dbh <7 cm; mature (m) dbh $\geq$ 7 cm.

Invasive species

Given the potential effects of introduced species on the woodland ecosystem, the presence and status of invasive shrub species was noted for every site surveyed. *Rhododendron ponticum* poses a serious threat to woodlands over acid soils, and successful management of this species must be based on an understanding of its ecology. Therefore, the classification system of Cross (1981 & 1982) was used where this species was present. Only one value is cited per site *i.e.* the most severe category visible, and the main areas of infestation were indicated on the 6" map or described in the site notes as appropriate.

Table 2.2 Classification of Rhododendron infestation (Cross, 1981 & 1982)

Description	Age (yrs)	Score
None Present	N/A	1
Plants scattered, small, none having flowered	< 12	2
Plants frequent, but not clumping. Some flowering, many seedlings	< 24	3
Plants abundant forming clumps, many seedlings	< 30	4
Plants forming dense thickets with very little ground flora below	>30	5

The level of infestation of other shrubby invasive species was assessed using the following criteria:

Table 2.3 Classification of shrubby invasives (excluding Rhododendron)

Level of Infestation	Score
None present	1
Plants scattered, not dominating any area	2
Plants dominating small areas, <1/5 woodland area	3
Plants dominating larger areas, 1/5 – ½ woodland area	4
Plants forming dense thickets over more than half the site area	5

The presence and abundance of potentially invasive canopy species was recorded in the same way as for native canopy species.

In addition to the specific data gathered and recorded on the various field cards, a general description of each site was recorded. This included all potentially relevant information apparent from the visit. Any evidence of animal activity *e.g.* badger setts was noted. Rare plants and particularly large trees (gbh>3 m) were noted and an 8 figure grid reference recorded, where possible.

The general species list for the site recorded the presence/absence of tree and shrub species in each of the canopy, shrub and field layers. The presence of all other plants is also recorded. Where a species was observed only in 'man-modified' microhabitats within the woodland site (*e.g.* on gravel tracks, car-parks etc.) this was also noted. Because the taxonomy of lichens is such a specialist subject, field surveyors were not required to produce an exhaustive species list for this group. Instead, a list of thirty-one lichens thought to be indicative of old/ancient woodlands in the south-east of Ireland (Howard Fox pers.comm). Appendix 3) and an identification booklet for these particular lichen species was provided. Field

surveyors were then required to check for the presence of these species within each relevé, and to record the substrate (species and part of tree) on which each species occurred. [Note: This list will require modification when survey begins in a new area.] The more 'notable' bryophytes were recorded from the site in general and added to the site species list. However, in order to improve the sampling of smaller and less obvious taxa, bryophytes were also intensively sampled from within each relevé, and collected for identification/verification in the laboratory.

2.2.2 Relevé for each vegetation community within the woodland sites

A 10 x 10 m relevé was taken within each of the vegetation community types identified within selected sites. Species cover was recorded on the Domin scale (Kent & Coker 1991), as were other aspects of the relevé (Appendix 2). Soil profiles were examined to a depth of at least 30cm and classified to Great Soil Group using the soil identification key produced by Trudgill (1989). Five soil samples were taken from each relevé (one from the centre and one from each quadrant) with an aluminium soil corer to a depth of 10 cm, and bulked. pH was measured in the field (or immediately on return from the field), using a glass electrode, and the remaining sample bagged and labelled. Soil samples were air dried and stored at c. 4˚C for later analyses by Coillte soil technicians. Loss on ignition was determined by heating samples to 500 ^{o}C for 5 hours (UNEP-UN/ECE Method 9107BSA). To estimate total Phosphate, samples were digested using Kjeldahl method and P determined using a molybdenum blue complex by spectrophotometer (AFNOR X 31-111).

Within the 10 x 10 m relevé, tree size, abundance and stem quality were measured. The species and number of all seedlings, saplings, juveniles and poles (all these classes have a dbh <7 cm) were recorded in each relevé using 5 height classes: a simplified version of Raunkier's scheme (Raunkier, 1934).

As the density of trees varies greatly between woodlands, the plot size for assessment of mature trees (dbh $\geq$ 7 cm) often had to be increased beyond the relevé to allow a statistically representative sample of c. 40 trees (G. Smith, pers. comm.) to be recorded. This variable plot size did not entail difficulties in data analysis, because all data were later expressed on an area basis. Abundance of trees was expressed both as the number of stems and the number of (individual) trees per ha. The basal area occupied by tree species were calculated in m^2/ha as a measure of dominance, and standing wood volume was calculated in m^3/ha.

For mature trees (dbh $\geq$7 cm), each individual stem was given a 'tree number' (multiple stems from the same tree sharing the same tree number) and the following information was recorded:

- Species name
- Dbh
- Crown position relative to other trees was recorded in four classes: dominant (trees emerging from the general canopy level), co-dominant (trees forming the canopy), intermediate (trees in the lower canopy that receive some direct light from above), suppressed (trees completely overtopped by the canopy).
- Height (to the nearest metre)

For trees of minimum merchantable size i.e. ≥ 40 cm diameter (Joyce *et al*. 1998) the following data were also recorded:

- Estimated log length - total length, in meters, of the portion of the main stem that was suitable for veneer or sawtimber, i.e. without the defects listed below.
- The presence of the following stem defects was recorded:
    - forks
    - heavy branches
    - stem galls/cankers
    - kinks/bends
    - damaged stem/bark
    - lean > 10%
    - fluted/buttressed bole
    - excessive taper
    - shelf fungi or other stem disease
    - excessive ivy

Where coppice stools were present, each pole of dbh ≥ 7cm was counted as an individual stem, and all of the stems sprouting from a single stool shared the same 'tree number'. Where the dbh of individual poles was <7cm, these were counted and the range of dbh and height given.

Within the relevé, the stratification of the woodland was sketched and photographed, with the dominant species, the height and percentage cover for each stratum recorded.

2.3 Data storage and analysis

The data gathered during this survey are stored in three databases. GIS data are stored in an ArcView database; Raw field data are stored within a MS Access database; and references/data sources are stored in an Endnote library. Photographs were scanned and are stored in jpeg format.

Prior to analysis, data were sorted using MS Excel, and basic summary analyses were also carried out with this programme. Further statistical analyses used Datadesk, SPSS and PCORD. Details of procedures used are given with results where relevant.

3 Results

3.1 National survey of native Irish woodland

3.1.1 GIS data sources

FIPS has identified 571,344.5 ha of land in the State as being forested. Forest areas are classified into six woodland categories and the most abundant of these is 'conifer forest' (Table 3.1). Of the six FIPS categories, those that are most likely to contain native woodland are 'broadleaf forest' and 'mixed forest'. These two woodland categories cover 85,898.8 ha and constitute 15.1% of the total area of forestry in Ireland.

Table 3.1 Summary of the FIPS 1998 data set

Woodland Category	Area (ha)	% of Forest Area
Broadleaf forest	57,548.1	10.1%
Mixed forest	28,350.7	5.0%
Conifer forest	299,184.8	52.4%
Planting Grant Application	102,653.4	18.0%
Cleared	81,799.2	14.3%
Other forest	1,808.2	0.3%
Total	**571,344.5**	

The methodology listed in Section 2.11 was applied to the FIPS data set in order to identify all areas that were probably native woodland. Each of these polygons was at least 0.98 ha in area and a minimum of 40 m wide. From the original 111,749 forestry parcels mapped by FIPS, a data set of 17,542 unique FIPS polygons was produced, with each polygon representing an area of putative native woodland. These FIPS polygons are made up of adjoining forestry parcels (the smallest mapped management unit) of the same woodland category and all were described in FIPS as either broadleaf woodland or mixed woodland.

Of the 17,542 polygons present, 12,607 are privately owned, 4,766 are owned by Coillte and 169 are owned by Dúchas. For some FIPS polygons, the woodland category has been further described as either oak (*Quercus petraea* and *Quercus robur*) or beech (*Fagus sylvatica*). If the 3,091.6 ha of known beech woodland in Ireland is excluded, there is 77,047 ha of potentially native woodland in Ireland, within the parameters described above, of which 5,652.3 ha is thought to be oak (Table 3.2). The full data set is available in the file NWSproject.apr (attached to this report) and can be viewed on Arc View GIS; Fig. 3.1 is a summary map of putative native woodland in Ireland. A summary table of the data set (with the non-native class genus of beech retained) on a county basis is shown below (Table 3.2). The data presented in Fig. 3.2 ranks each of the counties in order of the area of putative native woodland that they contain from Cork, the county with the largest area of native woodland, to Carlow, the county with the smallest area. When the data is expressed as the density of woodland per county (Fig. 3.3), to take account of the fact that some counties are much larger than others, Wicklow is shown to be the most densely wooded county and Mayo is the least densely wooded. The fact that Carlow, Dublin and Louth have low areas of native woodland is a result of the fact that these are the three smallest counties.

Table 3.2 A summary of the areas (ha) of putative native woodland and beech woodland in Ireland based on the FIPS 1998 data set.

COUNTY	Oak (*Quercus* sp.)	Other Broadleaves	Mixed Woodland	**Total Area (excl Beech)**	Beech (*Fagus sylvatica*)
Carlow	21.5	432.0	331.8	**785.3**	10.0
Cavan	59.1	1518.2	1037.6	**2614.9**	53.6
Clare	202.0	4821.6	1677.0	**6700.6**	126.2
Cork	831.8	6150.9	3288.0	**10270.7**	629.4
Donegal	651.1	2448.4	855.7	**3955.2**	82.5
Dublin	13.2	434.9	401.7	**849.8**	26.9
Galway	240.0	2460.7	2047.9	**4748.6**	274.3
Kerry	1453.9	2677.7	1468.6	**5600.2**	12.3
Kildare	58.4	992.4	904.9	**1955.7**	120.9
Kilkenny	130.5	1359.1	657.3	**2146.9**	179.6
Laois	104.8	893.9	1128.3	**2127.0**	300.9
Leitrim	22.6	1359.5	393.9	**1776.0**	37.0
Limerick	102.1	1023.0	863.3	**1988.4**	45.3
Longford	39.0	1033.0	245.1	**1317.1**	9.4
Louth	24.1	603.0	485.1	**1112.2**	146.0
Mayo	302.5	2397.3	577.9	**3277.7**	134.1
Meath	88.4	996.8	764.2	**1849.4**	71.7
Monaghan	23.1	920.0	714.2	**1657.3**	33.4
Offaly	48.8	1658.2	1074.0	**2781.0**	73.8
Roscommon	0.0	1105.8	500.5	**1606.3**	13.6
Sligo	53.7	948.8	319.6	**1322.1**	6.2
Tipperary	154.0	2362.7	1609.3	**4126.0**	141.0
Waterford	185.4	1834.9	1182.0	**3202.3**	154.0
Westmeath	27.6	1648.0	572.1	**2247.7**	209.2
Wexford	122.1	979.0	1243.5	**2344.6**	41.9
Wicklow	692.6	1432.0	2559.4	**4684.0**	158.4
Republic of Ireland	**5652.3**	**44491.8**	**26902.9**	**77047.0**	**3091.6**

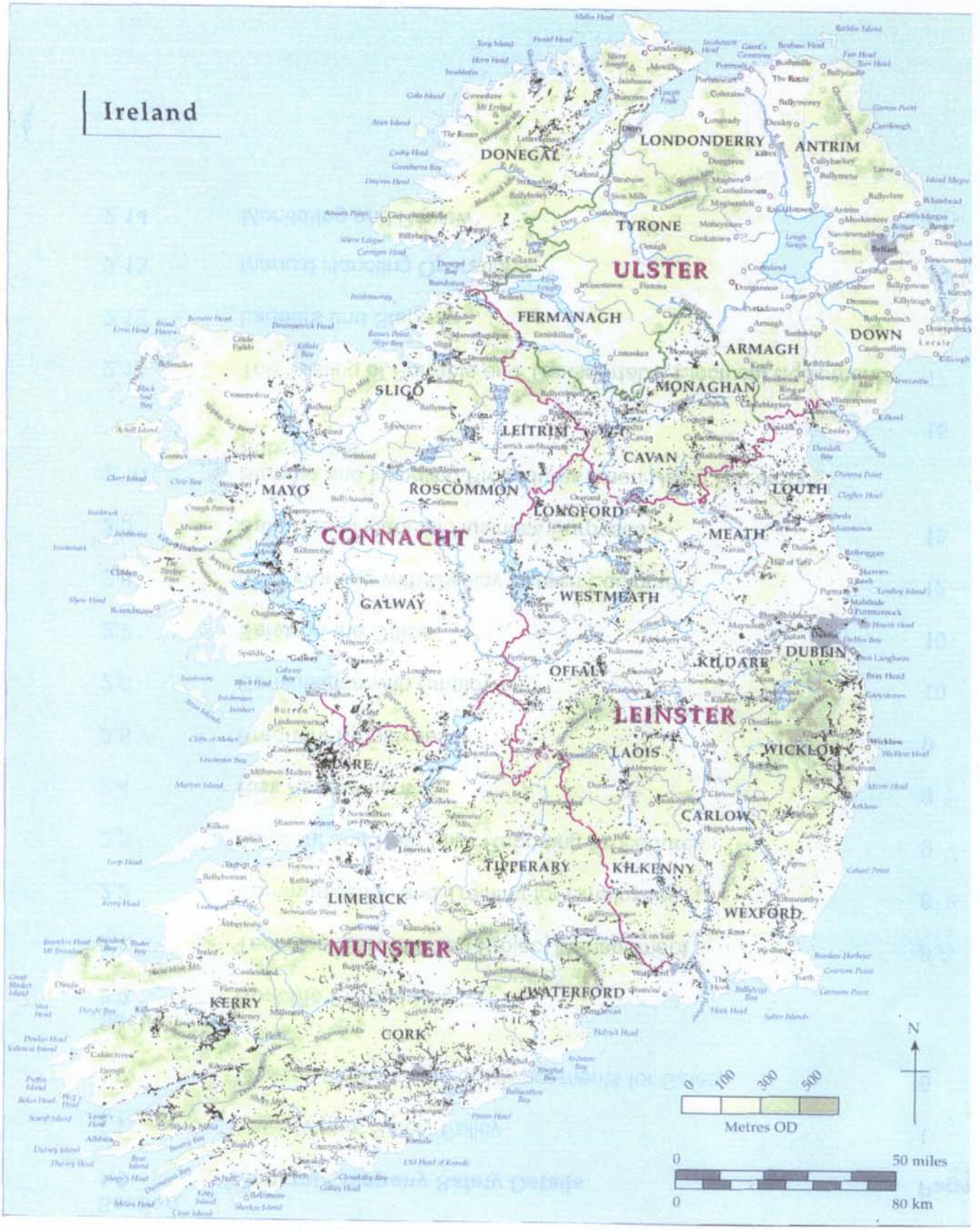


Figure 3.1 Map showing the areas of putative native woodland and beech woodland in Ireland. The map is based on the FIPS 1998 data set.

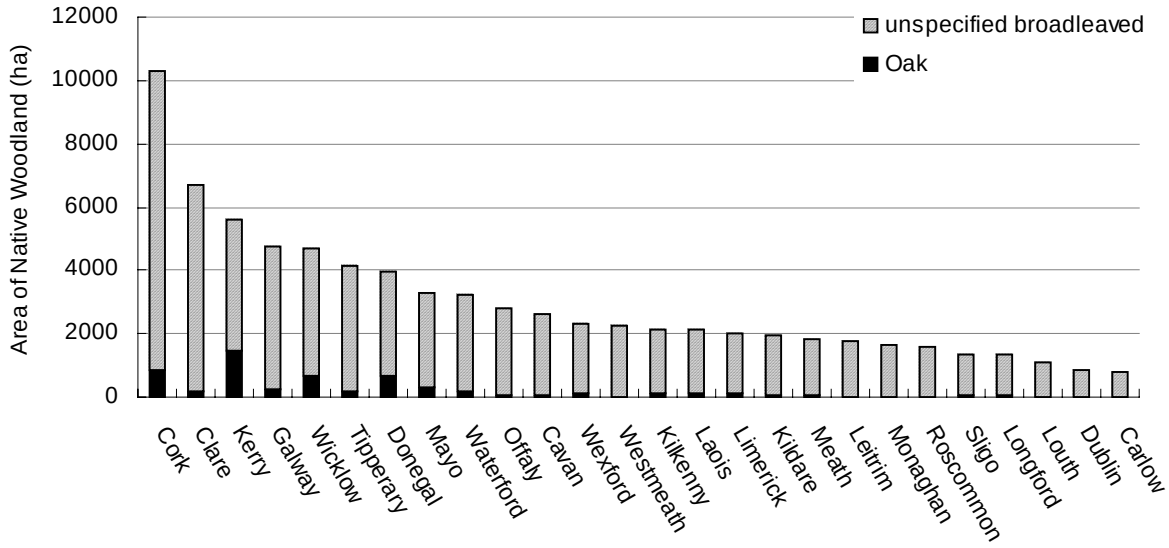


Fig. 3.2 Area of putative native woodland, by county. Source: FIPS 1998

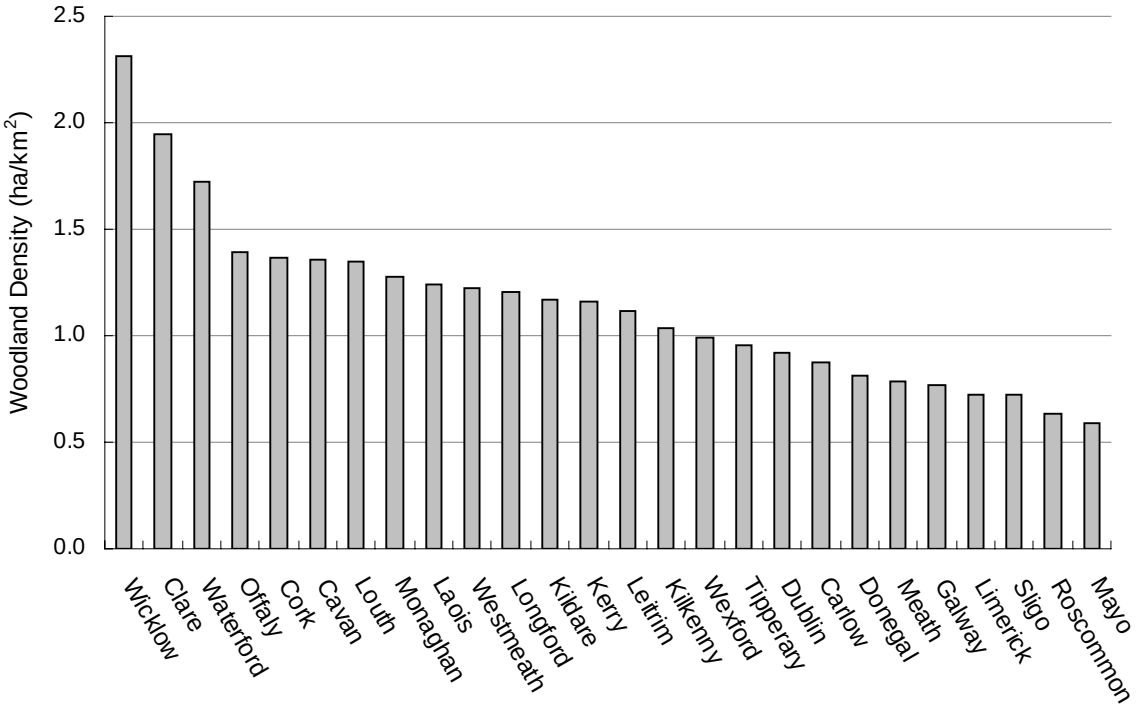


Fig. 3.3 Density of putative native woodland by county. Source: FIPS 1998

It should be noted that the 17, 542 FIPS units do not represent individual woodlands sites, but rather discrete areas of a single native woodland type. The reason for this is that native woodlands are often heterogeneous, with an individual woodland block made up of a combination of differing woodland types, for example two broadleaf areas divided by a thin area of conifers, or adjoining broadleaf areas of different type. For this reason an analysis of FIPS polygons will tend to overestimate the actual number of woodland sites and underestimate their size.

In order to examine the variation in the size of woodlands nationally, six size categories were examined (the same categories were also applied to the surveyed sites) and number of woodlands within each category was calculated. Table 3.3 list the 6 woodland size categories and the number of FIPS units found in each.

Table 3.3 Size of woodland polygons. Source: FIPS 1998

Size Category (ha)	No. of FIPS units	% FIPS units
1-5	13,695	78.1
>5-10	2343	13.4
>10-20	979	5.6
>20-50	425	2.4
>50-100	81	0.5
>100	19	0.1
Total	17,542	

Nineteen woodlands mapped by FIPS were greater than 100 ha in extent. Two of these had significant areas identified as beech woodland, and were removed as without the beech component they were less than 100 ha. Details of these largest blocks of native woodland are given in Table 3.4.

Table 3.4 Woodlands greater than 100 ha. Source FIPS 1998.
Abbreviations used are as follow: PR – private; DU – National Parks & Wildlife Service; CT – Coillte. KNP – Killarney National Park; SAC – Special Area for Conservation.

FIPS ID	Area (ha)	County	Woodland type (FIPS Category)	Ownership	Main Townland	Designation
11782	335.9	Kerry	Oak	DU	Glena (Tomies)	KNP, SAC
11337	314.1	Clare	Other Broadleaves	DU & PR	Dromore	SAC
11627	283.3	Waterford	Other Broadleaves	PR	Curraghmore	SAC
714	172.1	Kerry	Oak	DU	Gortroe	KNP, SAC
17422	151.4	Kerry	Mixed Woodland	DU	Torc	KNP, SAC
7764	150.9	Cork	Oak	DU & PR	Esknamucky	SAC
7761	144.8	Cork	Oak	PR	Dromgarriff	SAC
11778	144.6	Kerry	Oak	DU	Muckross	KNP, SAC
11773	136.3	Kerry	Oak	PR, D & CT	Cahernaduv	KNP, SAC
11751	131.4	Kerry	Other Broadleaves	CT & PR	Freaghnanagh	
17269	127.9	Galway	Mixed Woodland	DU & PR	Garryland	SAC
11519	124.3	Limerick & Tipperary	Other Broadleaves	PR & CT	Lackanagoneeny	SAC
12053	122.9	Mayo	Oak	PR & CT	Laughil	SAC
7734	121.8	Cork	Other Broadleaves	DU & PR	Raleigh South	SAC
13815	110.9	Offaly	Mixed Woodland	CT	Moanvane	
10108	110.4	Roscommon	Other Broadleaves	PR/DU	Rinnagin	SAC
5192	108.2	Kerry	Other Broadleaves	PR	Derryquin	
Total	**3133.5**					

Kerry contains seven of these large sites representing 1,180 ha of woodland. It should be noted that there could be many other sites containing areas of woodland greater than 100 ha but they have not been recorded by FIPS due to the fact that they are heterogeneous and contain different woodland types or are segmented by areas of non native species.

Of the 17,542 FIPS polygons, 4,766 covering 18,848.8 ha are owned by Coillte. Table 3.5 shows the total area calculated from the Coillte database for the tree species that were present in native or mixed Coillte woods.

Table 3.5 Area of the different tree species planted in Coillte woods included in the National Native Woodland Survey

Species	Area (ha)
Oak	3,654.6
Ash	3,108.8
Birch	3,425.4
Alder	1,132.5
Other Broad leaves (includes the native species elm and hazel)	1,531.8
Beech	3,940.6
Sycamore	919.6
Total broadleaves	17,713.3
Total native broadleaves	**11,321.3**
Total Conifers (in mixed woodland)	7,937.1
Total area (mixed or broadleaf woodland)	**25,650.4**

When the total area of native woodland contained within the Coillte estate is calculated from the Coillte data, it is significantly higher at 25,650.4 ha than the 18,848.8 ha calculated from the FIPS data. However, it is difficult to make direct comparisons between the two figures because the Coillte data was not fully integrated into the FIPS data (*c.f.* section 2.11), allowing some Coillte sites that are less than 1 ha to be included in the area totals for each species. Table 3.5 is most useful in showing the proportion of the different tree species located within the Coillte estate.

In addition to the Coillte data not being integrated into FIPS it was hypothesised that the difference between the area of native woodland calculated for the Coillte estate by the two datasets was partly due to the greater accuracy of the Coillte data set. To compare the accuracy of the two GIS platforms the 60 Coillte sites that were visited during the field survey were used as a control that both the FIPS and Coillte data could be tested against. Apart from site 302 (Garryrickin South), an area of native broadleaf woodland which both Coillte and FIPS listed as an area of conifers, the two GIS platforms correctly predicted the woodland type that was recorded at 59 of the sites. Therefore, the evidence from this survey does not prove the Coillte data set to be any more accurate than FIPS and the difference between the area of native woodland listed in the ownership of the Coillte estate by the two GIS platforms needs to be investigated further.

Analysis of the FIPS database indicated that the State (through the National Parks and Wildlife Service) owns only 1772.89 ha of native woodland; as defined within the parameters of this project. However, the State actually currently owns a larger area of native woodland than this figure calculated from FIPS

would indicate (J. Cross pers. comm.). This is possibly due to the ownership information within FIPS not being up to date. Furthermore, the process of SAC designation is enabling a much larger area of native woodland to be conserved than would be possible through land acquisition.

Analysis of the designated areas data set provided information in two ways. The first was an analysis of the 64 SAC habitat maps that have been digitised. This provided specific habitat information for 126 FIPS polygons, and this data was integrated into the overall Native Woodland Survey data set in ArcView. SAC data was also used to calculate the area of woodland contained within these designated areas (Table 3.6). In total, 1,860 FIPS polygons were centered within SACs representing 18.9% of the total area of putative native woodland in the State. Kerry had the highest percentage of its woodland (49.9%) contained within SACs. Monaghan had the least amount of designated woodland, with no woodland located within SACs. The analysis of NHA data produced a list of 632 NHAs from all 26 counties of the State that contained woodland (Appendix 4). However, owing to the fact that many NHAs are located within SACs, no separate area calculation was carried out for this type of designation.

Table 3.6 The area of native woodland in SACs. The counties are ranked by the percentage area of their woodland total that is located within SACs

County	Total area of woodland (ha)	Area of woodland in SACs (ha)	% of woodland in SACs
Kerry	5612.5	2799.5	49.9
Carlow	795.3	371.4	46.7
Waterford	3356.3	1127.8	33.6
Galway	5022.9	1483.6	29.5
Sligo	1328.3	383.2	28.8
Longford	1326.5	365.1	27.5
Limerick	2033.7	543.3	26.7
Clare	6826.8	1617.4	23.7
Wicklow	4842.4	876.3	18.1
Donegal	4037.7	728.3	18.0
Kilkenny	2326.5	413.3	17.8
Cavan	2668.5	396.8	14.9
Offaly	2854.8	405.1	14.2
Cork	10900.1	1531.3	14.0
Roscommon	1619.9	216.2	13.3
Meath	1921.1	228.8	11.9
Westmeath	2456.9	284.5	11.6
Tipperary	4267.0	458.3	10.7
Laois	2427.9	213.4	8.8
Leitrim	1813.0	147.6	8.1
Wexford	2386.5	180.3	7.6
Kildare	2076.6	150.5	7.2
Dublin	876.7	56.2	6.4
Mayo	3411.8	157.4	4.6
Louth	1258.2	44.2	3.5
Monaghan	1690.7	0.0	0.0
All Counties	**80138.6**	**15179.9**	**18.9%**

Testing the accuracy of the FIPS data

To test the accuracy of FIPS, 31 six inch maps from throughout Ireland were selected and the woodland mapped by FIPS was compared with the areas observed on aerial photographs (2000). In total, 451 areas of woodland were located on aerial photographs, of which 369 (82%) had been mapped by FIPS. Of the 82 new sites, 57% were woody scrub, categorised as either scrub or a combination of scrub and more mature broadleaf trees (Table 3.7).

Table 3.7 Non-FIPS sites located during a survey of 31 six inch maps using year 2000 aerial photographs

Number of sites not mapped by FIPS	Native Woodland type	% of unmapped sites
47	Woody scrub	57.3
33	Broadleaf woodland	40.2
2	Mixed	2.5

The size of the individual sites missed by FIPS ranged from 1 to 10 ha and the mean area was 2.42 ha. The most common apparent cause for the absence of a site from FIPS was the open nature of the woodland or its low scrub structure. The full data set is contained within Appendix 5.

3.1.2 Other data sources

Several research initiatives regarding woodland conservation are in place. COFORD is the national council for forest research and development, and some of this research has involved native species, and native woodland. Teagasc is involved in provenance trials for various native tree species, the investigation of biomass and the genetics of native tree species. Other relevant research groups include Bioforest (Coillte/TCD/UCC) which is examining ways in which to increase the biodiversity of plantation forestry in Ireland, the Forest Ecosystem Research Group, based at the Department of Environmental Resource Management in UCD, the Woodland Ecology Group based in the Botany Department of TCD, Bioscape (UCC) investigating biodiversity in forested landscapes. All available references identified are listed in Appendix 6.

Relevant research to date has included:

- Some woodland types have been the subject of specific research: esker woodland - Cross 1992; wet woodland - Kelly & Iremonger 1997, Cross & Kelly 2003; yew woodland – Mitchell 1990, Perrin 2003; acid oak woodland –Kelly various, Kelly & Moore 1974; woodlands over limestone – Kelly & Kirby, 1982;
- Intensive monitoring (including long-term studies) has been carried out at some sites *e.g.* Killarney National Park (Kelly various, Hayes *et al*.1991, Higgins *et al*.1996, 2001) and Brackloon (Farrell *et al.* 1993, Little & Farrell, 1997, Little *et al* 2001);
- Paleoecological research – mainly at QUB, TCD and UCG;
- Ancientness – O' Sullivan 1991, Fuller 1990, Bohan 1997;
- The restoration of native woodland at forestry clearfell sites (Smith *et al.* 2003);
- The impact of grazing and rhododendron management on natural regeneration at Killarney National Park (Kelly, various, Hayes *et al.*1991, Higgins *et. al.* 1996, 2001).
- Gap dynamics, browsing and natural regeneration (Higgins 2001, Higgins *et al.* in press)
- Woodland soils – Little 1994, Little & Bolger 1995, Little *et al*. 1990, 1996, 1997.

3.2 Field survey of native woodland

3.2.1 Site selection

Between April 8th and 3rd October 2003 three hundred and twenty-five potentially native woodland sites were selected for a field survey. Three hundred and nine of the sites were selected using FIPS and 16 were sites that had not been mapped by FIPS and were selected from aerial photographs. Site packs were made up for each of these sites and passed on to the field teams. Of the 325 selected sites, 312 were visited and 204 (with 248 relevés taken at these sites) were selected for a full field survey. The locations of the selected sites are shown on Fig. 3.4. Details of the number of sites selected for each county and the number of full surveys carried out are shown in Table 3.8. There were significantly fewer sites selected and surveyed in Carlow and West Offaly because of the smaller areas of woodland in these regions. Kilkenny, Laois and Wexford all have approximately the same areas of native woodland and this is reflected in each of these areas being sampled evenly. On field inspection, some sites were found to be unsuitable for inclusion, and were either rejected or only briefly surveyed. The reasons for the rejection of 108 sites are listed in Table 3.9.

Table 3.8 Summary of the selected and surveyed sites by county
The number of relevés is shown in parentheses.

County	No. of selected field sites	No. sites fully surveyed
Carlow	48	28 (35)
Kilkenny	83	48 (61)
Laois	62	42 (51)
Wexford	80	48 (57)
West Offaly	52	38 (44)
Total	**325**	**204 (248)**

Table 3.9 Reasons for lack of full field survey of sites during 2003 field season

Main reason for not carrying out a full survey	Number of sites
Large non-native broadleaf element	26
Large conifer/non-native mixed element	12
Physical access to the site too difficult	15
Access to site not granted by owner	20
*Other	35
Total	**108**

**included woods with an open canopy, a canopy that was too low or too narrow or highly managed areas such as golf courses*.

Table 3.9 shows that for 35 (11.2%) of the 312 sites visited there was an access problem that prevented a full woodland survey being carried out. For 73 (26.4%) of the 277 sites to which access was possible, the woodland was not fully surveyed because it did not conform to the parameters defined in the methodology *i.e.* native woodland covered an area < 1 ha, less than 40 m wide or did not comply with the definition of woodland as defined in Fossitt (2000).

Fig. 3.4 Location of woodland sites surveyed during 2003

In summary then, 312 sites were visited in the field and 204 of these were fully surveyed. The complete data pertaining to each surveyed woodland are contained within the Native Woodland database (MS Access, attached), and some of the information is given in tables in the Appendices to this report. Some of these data are summarised and presented below.

3.2.2 General features of surveyed woods

In addition to the vegetation of a wood, other factors are important. These give insight into past history of the site and may give clues about vegetation succession. Also, various features present in woodland may be important in their own right, adding structural diversity, providing particular species requirements etc. The types of management used, both past and present, are also of importance, especially with regard to planting, felling and grazing. Such data were gathered during the field survey and the results are presented here. It is important to note that while individual features are of interest, it is really the sum of many factors that determines the conservation value and/or potential for a given site. Therefore, the information below is presented feature by feature before being assimilated into an overall site by site assessment at the end of this section.

Woodland area

The size of each surveyed wood was determined by using one of two methods. Where the boundary of the survey area corresponded exactly with a parcel/parcels of woodland mapped in FIPS, the area was taken directly from FIPS. In complicated sites where only part of a FIPS site was surveyed, or where part of a site was excluded, the survey boundary was drawn in the field onto the 6" map. The survey area was then measured from the mapped boundary using an area-line meter.

In most cases, the entire woodland site, as per FIPS, was surveyed. The situation where parts of a site were excluded or a site was only partially surveyed was usually where the site was a large conifer site, only pockets of which contained woodland relevant to this survey. For predominantly native sites that contained small areas of conifers, the area figure given usually refers to the entire site, with an indication of the extent of the non-native woodland given under the 'Vegetation Types' heading on the general site survey sheet.

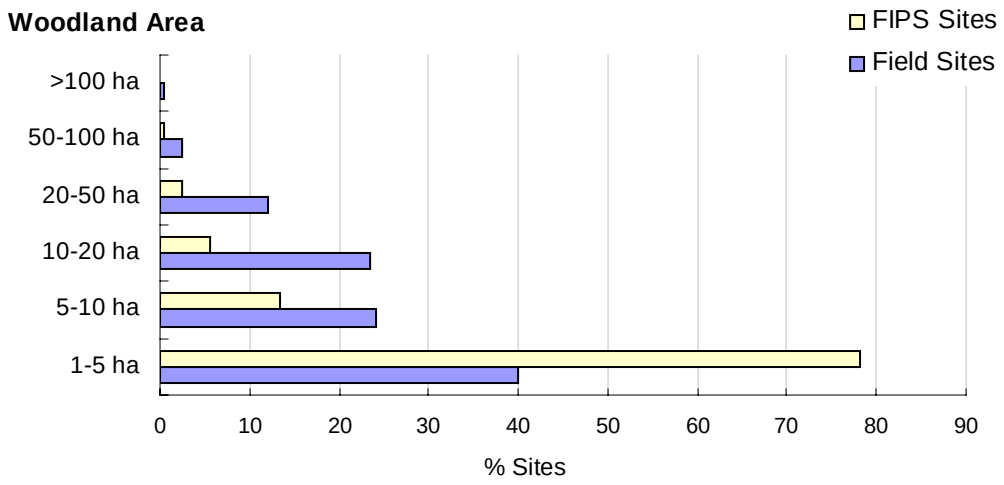


Fig. 3.5 Extent of native woodlands in Ireland (from FIPS) and those surveyed

The majority of native woodland sites in the country are small, and in many cases such sites are merely the remnants of former extensive wooded areas. Almost 80% of native woodland parcels mapped by FIPS are less than 5 ha in extent. Larger woodlands were prioritized for field survey, nonetheless, sites less than 5 ha still comprised 40% of surveyed woods. Despite this prioritization of larger areas, less than 10% of sites surveyed contained more than 50 ha of native woodland.

The larger sites tended to be those contained within demesne lands, *e.g.* Borris, Castlemorres, Castledurrow, Carrickduff. Some of these (Borris, Carrickduff) are still in the possession of the original owners, and are managed in sympathy with nature conservation. Other reasonably large sites are designated Nature Reserves and owned by the State *e.g.* Garryricken, Ballykeefe, Grantstown, Kyledohir. Usually these larger sites were dominated by oak/ash (WN2) or acid oak (WN1) woodland, but often had other woodland types present in lesser amounts. Sites dominated by wet woodland and bog woodland were usually relatively small.

Woodland ownership

Most sites surveyed (50%) were in private ownership (Fig 3.6). Coillte was the second biggest owner of woodlands in the survey area, owning 35% of sites surveyed, and the State owned the smallest number of sites (16%).

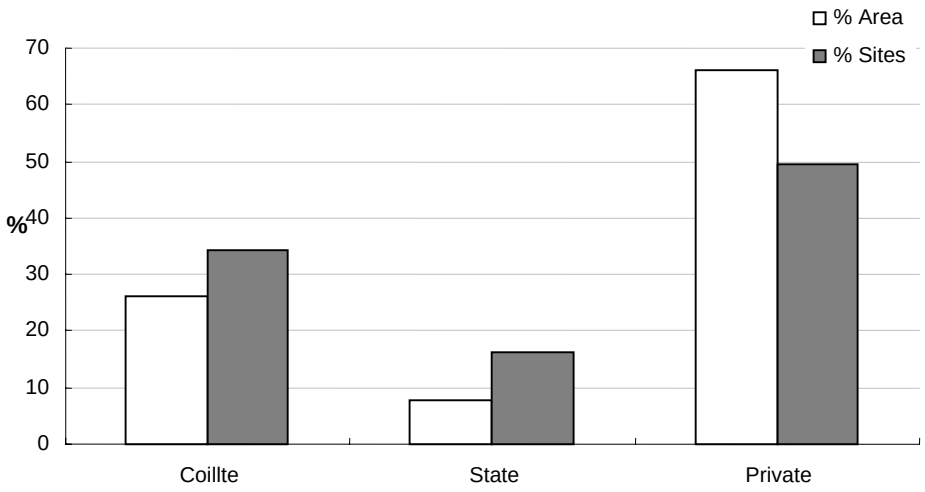


Fig. 3.6 Ownership of surveyed woodlands

Woodland type

The type of woodland present in each site was defined using the standard scheme described by Fossitt (2000). Many woodlands contained more than one woodland type and where there was a significant area (≥ 1 ha) of any woodland type present at a site, it was recorded (Fig. 3.7.)

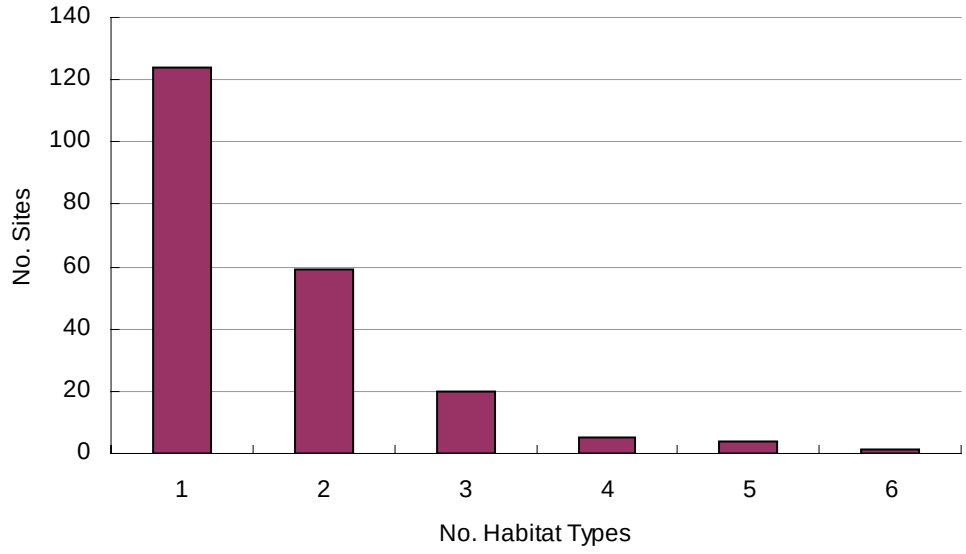


Fig. 3.7 The number of habitat types (Fossitt 2000) in surveyed woodlands

Oak-ash woodland (WN2) was the most frequently recorded habitat type, and was identified at 84 sites (Fig. 3.8a). Highly modified woodlands (WD1, WD2) were abundant within the area, and usually consisted of oak/ash or acid oak woodland that had high amounts of non-natives (particularly beech and sycamore) in the canopy. Yew woodland (WN3) was the only category of native woodland that was not recorded within the survey area. Wet woodland types were less frequent than woodland over drier soils, with wet pedunculate oak/ash woodland (WN4) being the rarest, recorded in significant area at only 4 sites.

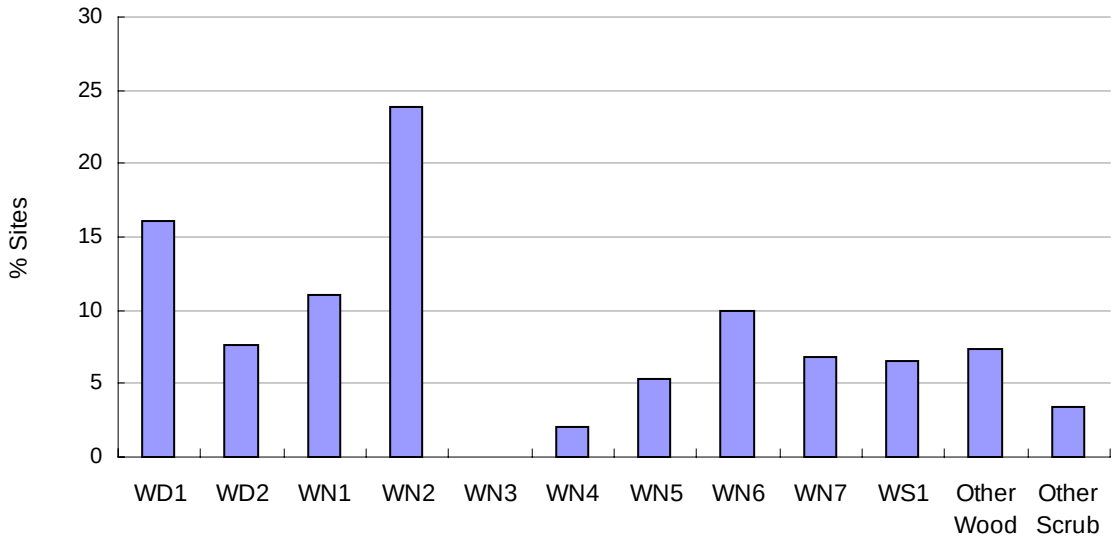


Fig. 3.8a Occurrence of woodland types in surveyed sites

The area of each significant habitat type present was calculated by estimating the percentage of the total site area that it covered (Fig. 3.8b). The pattern here broadly mirrored that for the frequency of habitat types. However, wet woodland types were usually only present as small areas; while wet willow/alder/ash wood was present at 10% of surveyed sites, it only accounted for 5% of the area surveyed. A similar situation is seen for scrub woodland (WS1) and wet oak/ash woodland (WN4).

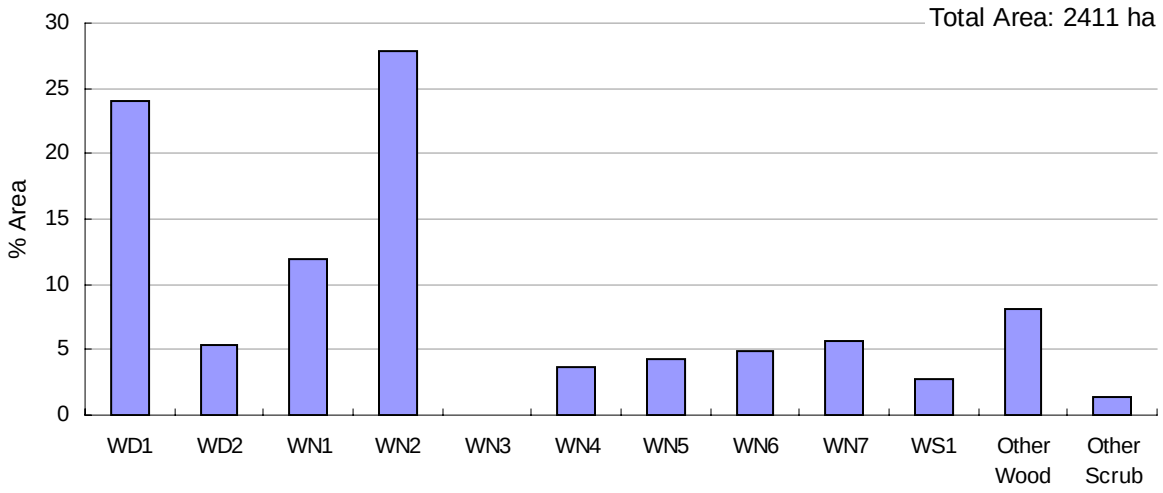


Fig. 3.8b Extent of habitat types (after Fossitt 2000) within the surveyed woodlands

Geography of woodlands surveyed

Because of the heterogeneity of soils and hydrology across most sites, these are dealt with on a relevé basis. For each woodland, some indication of the general topography of its situation was recorded. Many large woods extended over various geomorphological situations, *e.g.* clothing the slopes of a hill

and extending into a valley bottom. Smaller sites were often confined to a single situation. Eighty-six sites were contained entirely on flat ground and 92 sites were contained entirely on sloping ground. Wet woodlands and bog woods dominated the former group, while acid oakwoods are well represented among the sloping sites.

Other features of surveyed woodlands

The nature of this study meant that most of the sites surveyed were not managed intensively for timber production. However, many sites had experienced management in the past, and this is often highly relevant to woodland conservation in the present. Some activities were taking place at many sites. Much of the biodiversity found in wooded habitats is associated with the heterogeneity of structure found in these ecosystems. Features such as dead wood, variation in plant height and variation in soils provide a variety of micro-climates which support a wide range of life-forms and species. In addition, management features can impact the diversity of niches present. Walls may provide a habitat for particular species of fern and bryophyte, ruined buildings may act as roosts for bats, and exclosures may provide safe sites for regeneration in an otherwise heavily grazed wood. The presence of dead wood, hydrological and management features was recorded for all sites surveyed. The results are summarised in the figures below.

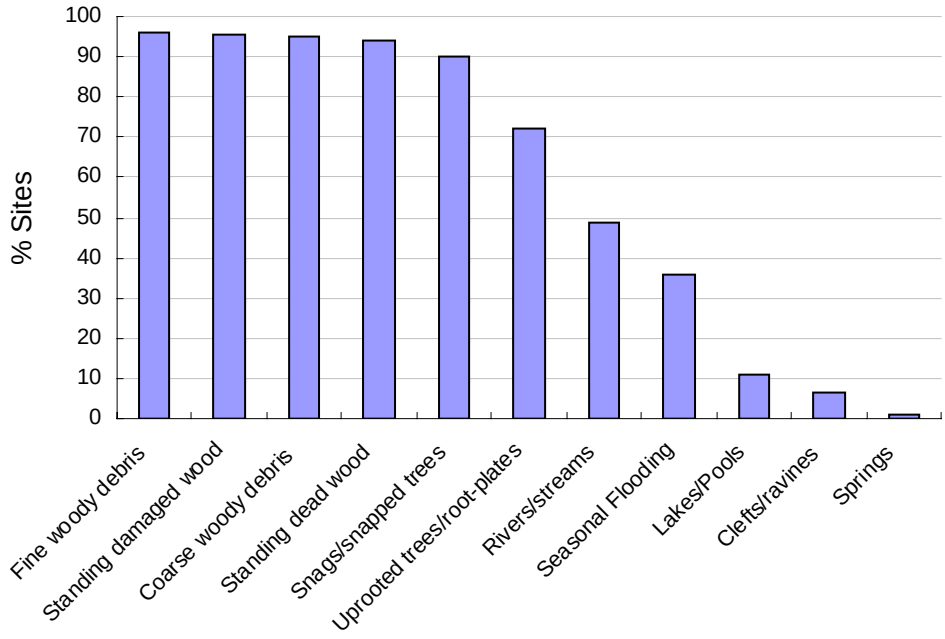


Fig. 3.9 Frequency of natural features in surveyed woodlands

Dead wood was noted as a component of almost all woods surveyed (see also Fig. 3.11). Woody debris and dead and damaged standing wood were each recorded for more than 90% of sites visited. Snagged and uprooted trees were less frequent, but still occurred widely among the surveyed sites.

Natural hydrological features were less frequent than dead wood. Almost one third of sites surveyed (73 sites) contained no significant natural hydrological feature. Rivers and streams were the most frequently

encountered water features, occurring in almost half of the woods visited. Clefts, ravines and springs were the rarest hydrological features noted: this is probably because of the rolling lowland terrain that made up the majority of the survey area.

The frequency of anthropogenic features encountered in the surveyed woods is shown in Fig.3.10. Ditches were the most commonly recorded manmade feature, in many cases providing some open water in woods that had no stream or pool. Evidence of old planting and coppicing was also common. Recent planting and coppicing were rarer, occurring in less than 10% of sites. Almost 20% of woodlands had some evidence of use for amenity. Amenity activities detected included shooting, walking, and horse-riding. No lazy beds were observed in any wood during this survey; this is indicative of the history of the region, and the origin of the woodlands.

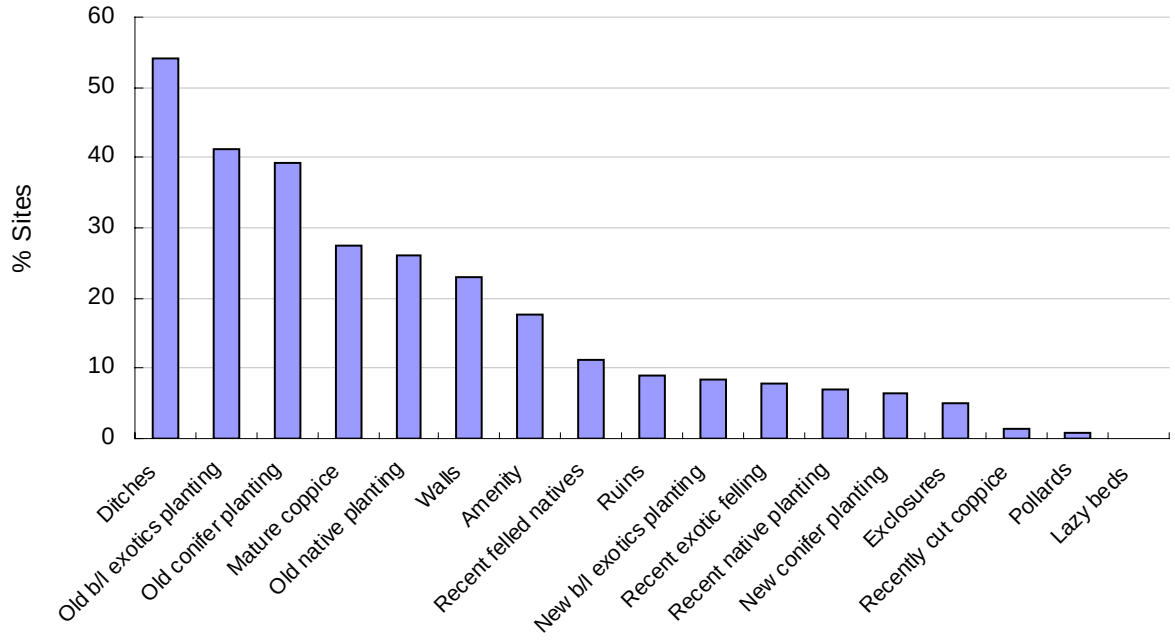


Fig. 3.10 Frequency of management features in surveyed woodlands

The presence of dead wood was recorded from all sites visited, and the abundance of each category of dead wood was estimated as absent, rare, occasional, frequent or abundant. Snagged or snapped stems, standing dead, standing damaged and uprooted trees were usually rare or occasional in the woods surveyed. This is a feature of younger (sub-mature) stands, and woods in non-windy climates, such as that in the south east of Ireland. Woody debris was often frequent and sometimes abundant.

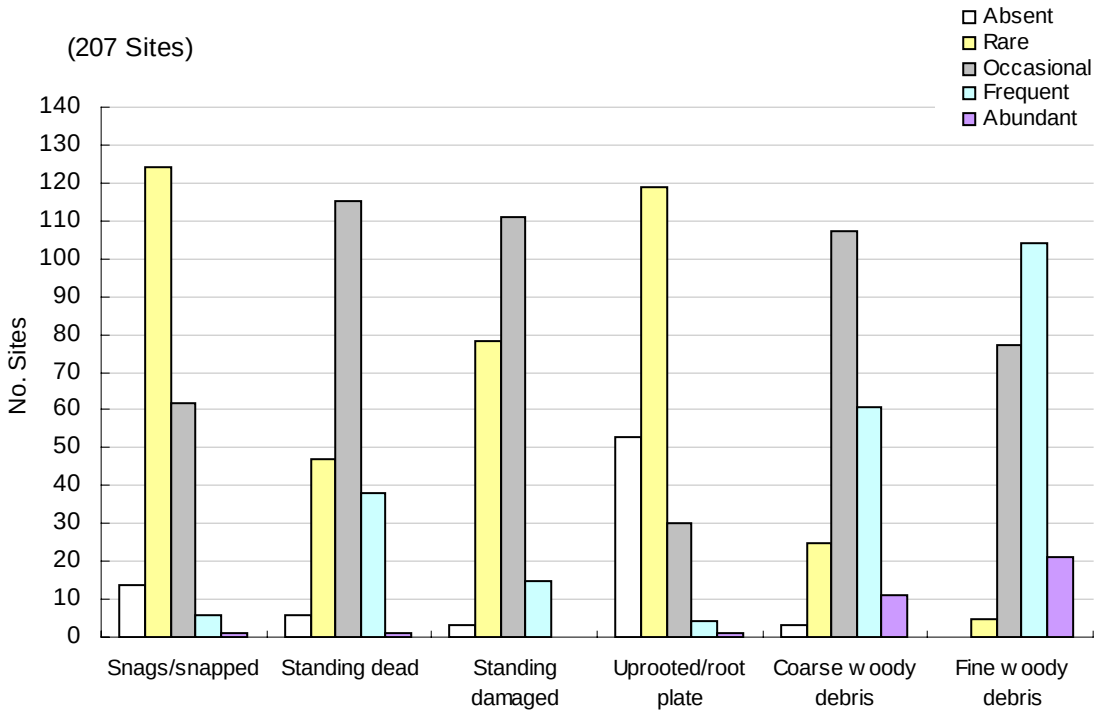


Fig. 3.11 Abundance of dead wood in surveyed woodlands

Adjacent landuse

Improved grassland was the most common landuse found adjacent to surveyed sites and was present next to more than 175 (>80%) sites. Highly modified/non-native woodland was the next most common adjacent land use. This results from the survival of remnant native woodland at many sites that are now used for commercial forestry. Semi-natural land use types were less frequent than highly modified types. Unimproved grassland and peat bogs were the most common semi-natural, terrestrial land uses, occurring at 18% and 12% of sites respectively. However, most sites were bounded by several land use types, and only in 13.6% of cases were woodlands entirely surrounded by semi-natural land use types.

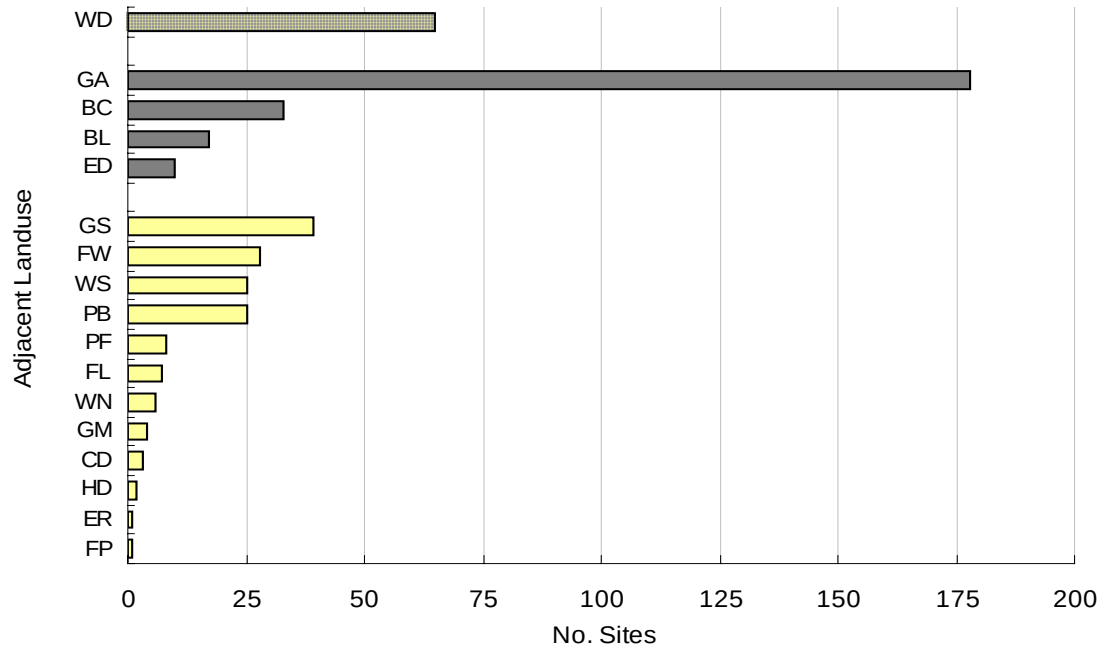


Fig. 3.12 Frequency of adjacent landuse categories at surveyed woodlands

Codes for land use from Fossitt (2000). *WD: Highly modified/non-native woodland; GA: Improved grassland; BC: Cultivated land; BL: Built land; ED: Disturbed ground; GS: Semi-natural grassland; FW: Watercourses; WS: Scrub woodland; PB: Bogs; PF: Fens & flushes; FL: Lakes & ponds; WN: Semi-natural woodland; GM: Freshwater marsh; CD: Sand dune systems; HD: dense bracken; ER: Exposed rock; FP:Springs. Intensively managed landuse types are shown in grey. Semi-natural landuses are shown in yellow. Non-native woodland is hatched.*

Grazing levels in woodlands surveyed

The level of grazing prevalent at each wood was assessed using the method of Mitchell & Kirby (1990). In addition, efforts were made to identify what species were grazing the woodland. Many of the woodlands (45%) surveyed showed no evidence of being grazed. Thirty-two percent of sites were classified as being subjected to 'low' grazing pressure (see Table 3.10), 13% were classified as 'moderate', 8% as high and only 2.3% (5 sites) as severely grazed.

Table 3.10 Instances of grazing in surveyed woodlands

Grazing Level	None (n = 96)	Low (n = 68)	Moderate (n = 27)	High (n = 17)	Severe (n = 5)	All Sites (n = 213)
% Sites	**45**	**32**	**13**	**8**	**2**	
% Deer grazed	/	25	33	35	40	**34**
% Cattle grazed	/	32	56	35	20	**44**
% Sheep grazed	/	12	19	29	80	**22**
% Rabbit grazed	/	16	11	6	20	**16**
% Unknown grazers	/	22	11	0	0	**18**
% *Other grazers	/	7	7	18	0	**10**

**Other denotes Squirrel, invertebrate and goats.*

Grazing by cattle was the most commonly identified grazing type, with 44 instances recorded (30% of instances). Deer and sheep grazing were also commonly encountered, accounting for 23.5% and 15% of instances recorded. For most sites, only a single species of grazer was identified (Fig. 3.13).

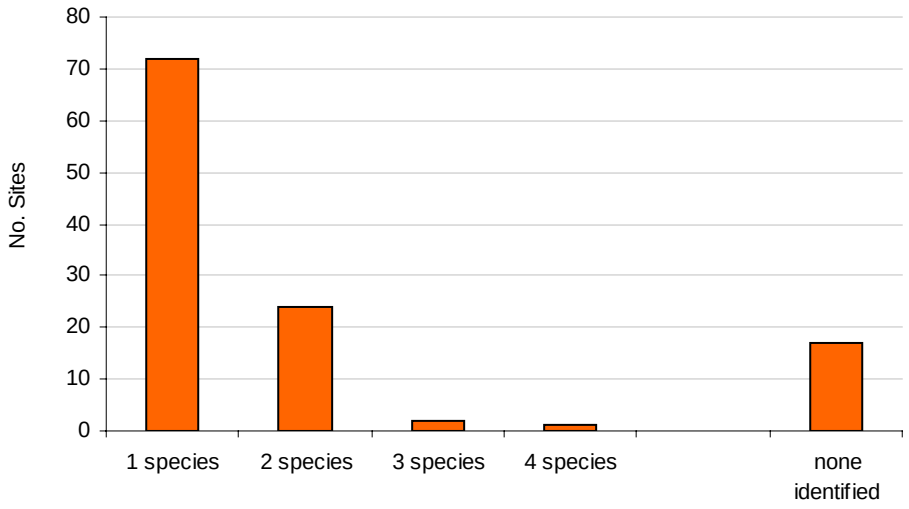


Fig. 3.13 The number of grazing species identified from surveyed woodlands

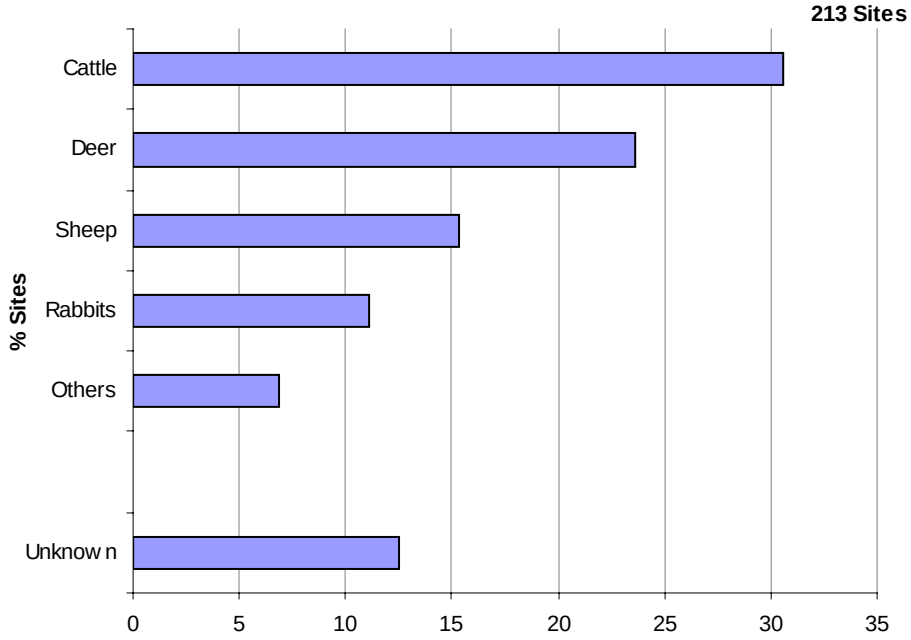


Fig. 3.14 The occurrence of grazing species at surveyed woodlands

Generally, woodlands were grazed to only a low or moderate level, allowing for good development of the field and shrub layers, and the growth of saplings and young trees. This pattern reflects the relatively low densities of deer populations in this part of Ireland, the predominance of mixed/arable farming over the area (as opposed to grazing of commonage which is predominant in some upland and western parts of Ireland), and the enclosed nature of many woods.

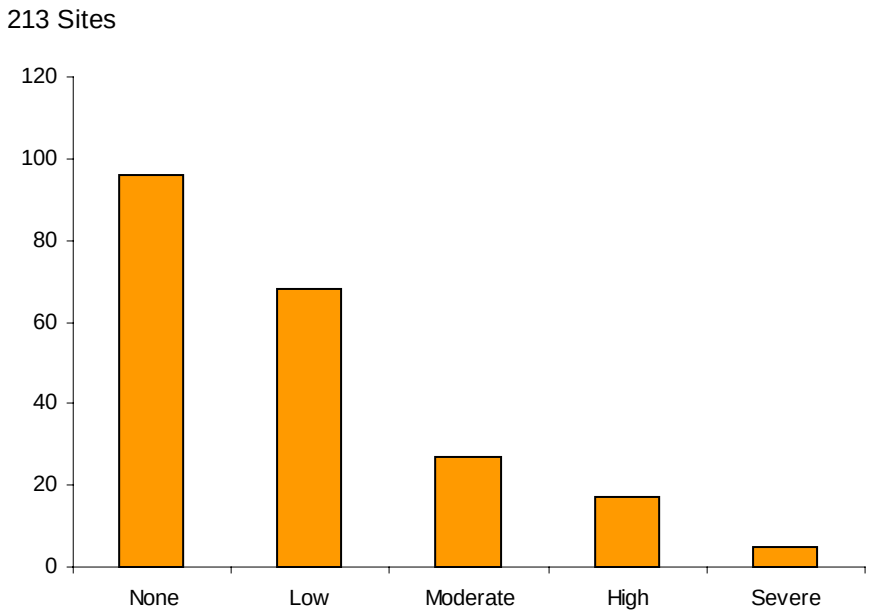


Fig. 3.15 Grazing level at surveyed woodlands

All counties however, contained some sites where the grazing level was found to be high or severe, restricting the shrub layer and natural regeneration of the canopy species. Offaly and Carlow had the highest percentage of such sites. The high grazing pressure exerted on some sites was the result of use as winter shelter and grazing for cattle.

Invasive shrub species

Nine invasive shrub species were recorded during the field survey of woodland sites. These were cherry laurel (*Prunus laurocerasus),* common rhododendron (*Rhododendron ponticum*), snowberry (*Symphoricarpos albus*), Japanese knotweed *(Fallopia japonica),* flowering nutmeg *(Leycesteria formosa),* red osier dogwood *(Cornus sericea),* Cotoneaster (*Cotoneaster* spp.) and fuschia *(Fuschia magellanica).* Cherry laurel, rhododendron and snowberry were the most frequent invasive shrub species, reflecting the fact that these species were often planted into demesne woodlands as shelter for game in the past. Sites where an invasive species scored frequent or higher (3, 4 or 5) were rated as High (H) for that species, and Low (L) if the species was described as scattered (2) (Fig. 3.16).

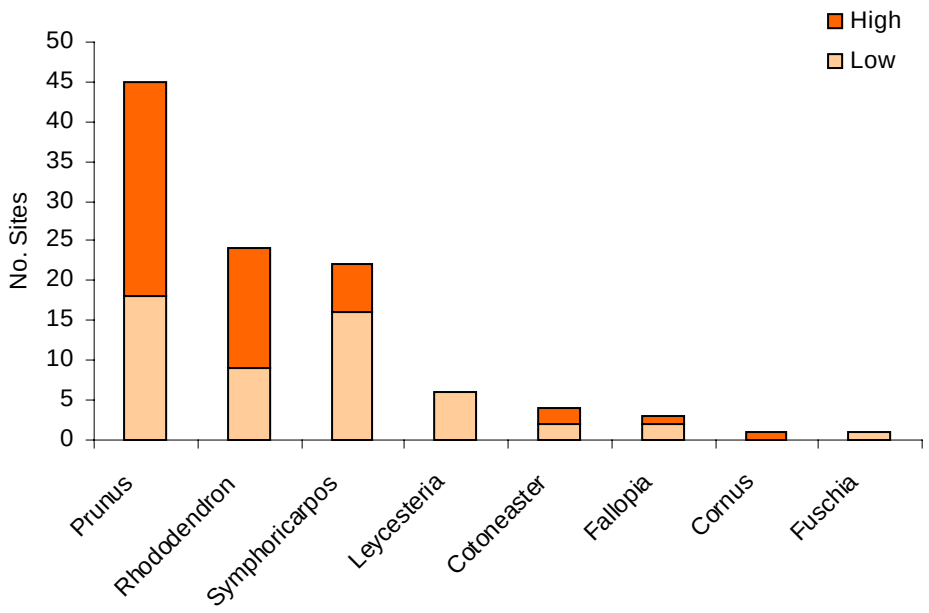


Fig. 3.16 The number of surveyed woodlands containing invasive shrub species

Approximately 40% of woodlands surveyed contained invasive rhododendron, laurel or snowberry (Fig. 3.17). In most cases, infestation is relatively light. In 25% of surveyed woods however, there is heavy infestation by at least one of these species.

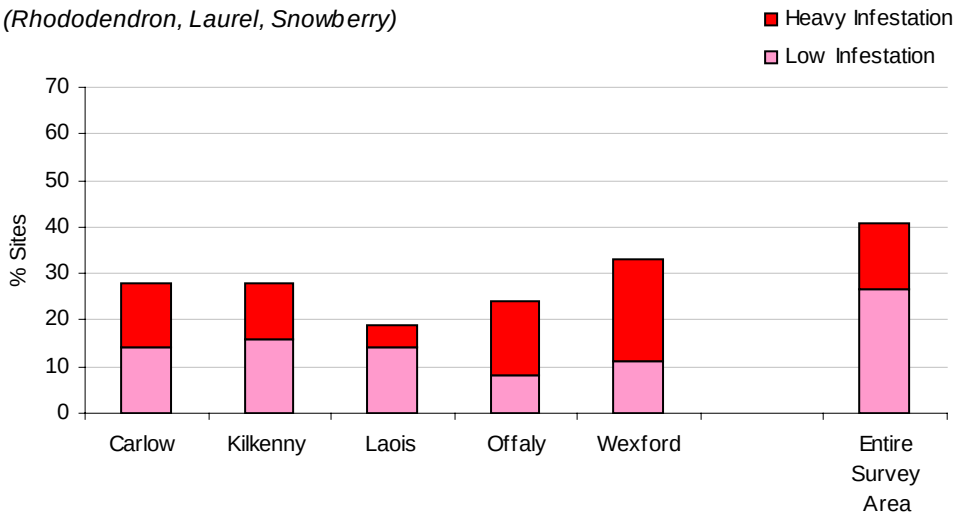


Fig. 3.17 Woodland sites affected by invasive rhododendron, laurel or snowberry

Invasive canopy species

As this survey was concerned with native woodland stands areas dominated by non-native species were generally avoided during site selection. However, two broadleaved species, beech (*Fagus sylvatica*) and

sycamore (*Acer pseudoplatanus*), which have become naturalised in Ireland, were found to be abundant, sometimes dominant, in many woods in the survey area, and so some of these woods were included in the survey.

Acer was recorded from 163 (76%) sites, and DAFOR was assigned to regeneration (plants less than 2 m) and juveniles/mature specimens (>2 m) for 140 sites (Fig. 3.18). *Fagus* was recorded at 155 (72%) sites and DAFOR assigned to regeneration and mature classes at 147 sites (Fig 3.19). *Fagus* was more frequently recorded as a canopy dominant than *Acer*, though mature trees of both species were often frequent or abundant in the woods in which they were present. Regeneration (<2 m tall) of both species was less frequent than mature individuals. Nonetheless, some regeneration was present in most sites at which each species was recorded.

Fig. 3.18 Abundance of *Acer* in surveyed woodlands

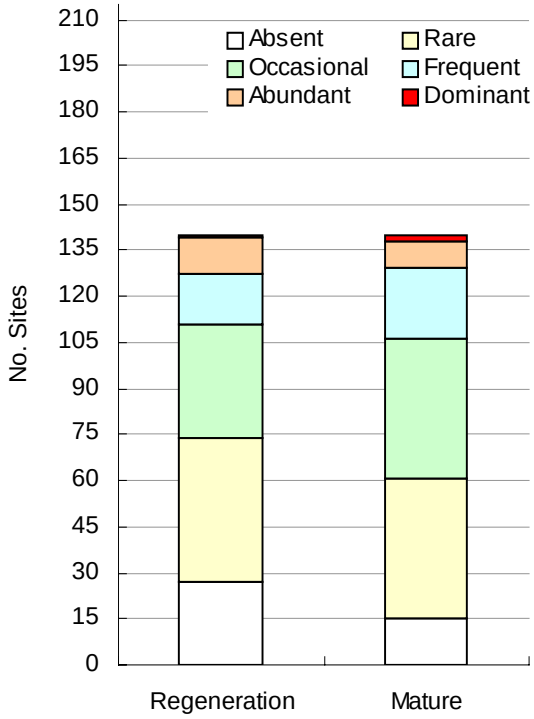
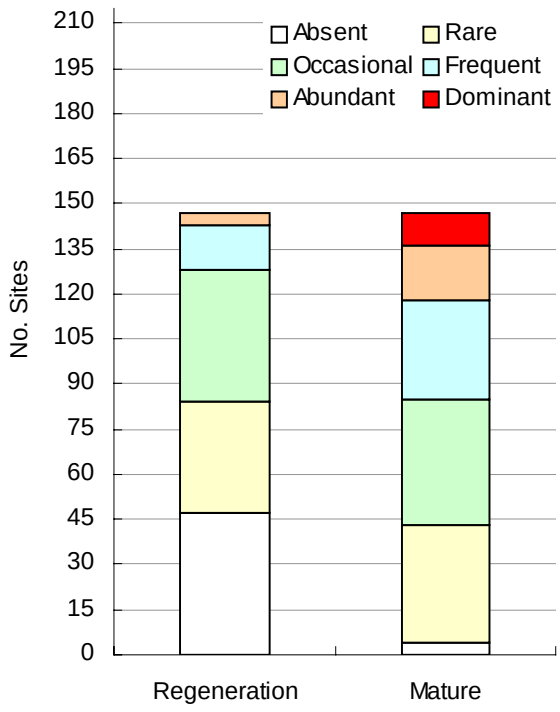


Fig. 3.19 Abundance of *Fagus* in surveyed woodlands



Species diversity

A full list of vascular plants was recorded for each surveyed wood (Appendix 7). While bryophytes were also recorded, the necessity for laboratory identification of some taxa resulted in this group being comprehensively covered only from relevés, and so bryophyte data are not included in species totals generated for woodland sites, unless specifically stated. Four hundred and twenty-one taxa of vascular plant, 65 mosses and 18 liverworts were identified during the field survey. Of the vascular plants, 83 are definitely or probably introduced within the survey area and the rest are considered to be native. The most frequently encountered species was *Rubus fruticosus*, which was present in more than 96% of sites. Species occurring in more than 20% sites are listed in Table 3.11. Rarer species from this survey are given in Table 3.12. The bryophytes recorded are listed in Table 3.13. Lichen data was collected by referral to a check-list of species of interest (*c.f.* section 2.21).

Table 3.11 Species recorded from ≥20% of sites

Species names are given as species codes used for data analysis – see Appendix 8.

Species	% Sites	Species	% Sites	Species	% Sites	Species	% Sites
Rubu frut	96.7	*Betu pub*	58.1	*Alnu glut*	41.9	*Lysi nemo*	31.6
Hede heli	95.3	*Fili ulma*	57.7	*Gali apar*	40.9	*Dact glom*	30.2
Ilex aqui	87.0	*Junc effu*	57.7	*Dryo f-m*	40.0	*Luzu sylv*	29.8
Crat mono	85.6	*Dryo affi*	56.7	*Chry opp*	39.5	*Athy f-f*	27.9
Frax exce	85.6	*Brac sylv*	55.3	*Viol sp*	39.1	*Cirs pal*	27.0
Dryo dila	84.7	*Agro stol*	54.9	*Desc cesp*	38.1	*Ment aqua*	27.0
Loni peri	82.8	*Phyl scol*	53.0	*Ajug rept*	38.1	*Euon euro*	27.0
Gera robe	76.3	*Samb nigr*	53.0	*Poly vulg*	37.2	*Prun laur*	24.7
Acer pseu	75.3	*Oxal acet*	52.6	*Ange syl*	36.3	*Frag vesc*	24.2
Geum urba	74.9	*Care rem*	52.6	*Rosa can*	36.3	*Stel holo*	24.2
Sali cine	73.5	*Blec spic*	51.6	*Viola rivi*	35.8	*Sali capr*	24.2
Fagu sylv	72.1	*Rume san*	51.2	*Ulex euro*	34.9	*Iris pseu*	23.3
Cory avel	70.7	*Care sylv*	51.2	*Card flex*	34.4	*Prun vulg*	22.3
Pter aqui	66.0	*Arum macu*	49.3	*Gali palu*	34.4	*Tara offi*	22.3
Urtic dioi	64.2	*Vero mont*	46.5	*Glec hede*	34.4	*Digi purp*	21.9
Quer robu	64.2	*Holc lana*	44.2	*Vero cham*	34.0	*Cham angu*	21.4
Hyac nons	60.5	*Sorb auc*	44.2	*Pinu sylv*	33.5	*Vibu opul*	21.4
Pols seti	59.5	*Hera spho*	43.7	*Epil mont*	33.0	*Epil hirs*	20.9
Circ lute	59.1	*Vicia sep*	43.7	*Ulmu glab*	32.6	*Hype andr*	20.5
Prun spin	58.6	*Pote ster*	43.3	*Sani euro*	32.1	*Vacc myrt*	20.5
Ranu repe	58.1	*Prim vulg*	42.8	*Stac sylv*	32.1	*Quer petr*	20.0

Table 3.12 Less frequent species found during this survey

Species	**Irish Distribution** (Webb *et al*. 1996)	**% Sites**
Anem nem	Local outside of northern areas	6.05
Betu pend	Rare	5.12
Camp trac	Very rare, mainly south-east	0.93
Care acut	Rare & local	0.93
Care aqua	Rare	0.47
Care bine	Rather rare outside of mountains	0.93
Care divu	Occasional in south-east	0.93
Care elat	Rare except in Centre	0.47
Care flav	Rare	0.47
Care otru	Rare inland	0.47
Care palle	Rare outside of north-west	0.47
Care pilu	Rare in lowlands	0.47
Care ripi	Rare	1.86
Care sero	Rare in east	0.47
Care strig	Rare	1.40
Care viri	Sub species of *Carex flava*	0.47
Corn sang	Rather rare	3.72
Dact maja	Rare outside of north-west	0.47
Dryo aem	Occasional in East (more frequent West)	1.86
Dryo cart	Occasional	1.86
Epip hell	Rare outside of north-west	1.40
Equi sylv	Rare outside of northern areas	5.58
Equi telm	Local	6.05
Gera colu	Rare	0.47
Leuc aest	Rare	0.47
Ligu vulg	Rare as native	7.44
Meli unif	Occasional	4.65
Merc pere	Rare	3.26
Ophi vulg	Occasional	0.47
Orob hede	Occasional in southern half	0.47
Popu trem	Rare in south-east	4.20
Prim veri	Rare	0.93
Prun padu	Rare outside north-west	1.86
Rham cath	Very rare outside of centre and west	5.12
Sali pent	Rare - in south	0.93
Scen squa	Rare, chiefly associated with railways	0.47
Sola nigr	Rare	0.47
Sorb hib	Occasional - mainly centre	0.93

Table 3.13 Bryophytes recorded from woodlands during the survey.
Nomenclature follows the Census Catalogue of the British Bryological Society.
Recent synonyms are given in brackets.

Mosses (Musci)	
Amblystegium serpens	*Pseudoscleropodium purum*
Atrichum undulatum	*Pseudotaxiphyllum (Isopterigeum) elegans*
Brachythecium rivulare	*Rhizomnium punctatum*
Bracythecium rutabulum	*Rhytidiadelphus loreus*
Bryum sp	*Rhytidiadelphus squarrosus*
Calliergonella cuspidata	*Rhytidiadelphus triquetrus*
Campylopus introflexus	*Sphagnum capillifolium*
Campylopus pyriformis	*Sphagnum cuspidatum*
Climacium dendroides	*Sphagnum palustre*
Cryphaea heteromalla	*Sphagnum recurvum*
Ctenidium molluscum	*Sphagnum* sp
Dicranella heteromalla	*Sphagnum squarrosum*
Dicranoweisia cirrata	*Thamnobryum alopecurum*
Dicranum majus	*Thuidium tamariscinum*
Dicranum scoparium	*Tortula sp.*
Eurhynchium praelongum	*Ulota bruchii (U. crispa* var *norvegica)*
Eurhynchium striatum	*Ulota crispa*
Fissidens adianthoides	*Ulota phyllantha*
Fissidens bryoides	*Zygodon viridissimus*
Fissidens taxifolius	
Fontinalis antipyretica	**Liverworts (Hepaticae)**
Homalothecium sericeum	*Calypogeia muelleriana*
Hookeria lucens	*Conocephalum conicum*
Hylocomium brevirostre	*Diplophyllum albicans*
Hylocomium splendens	*Frullania dillatata*
Hypnum andoi	*Frullania tamarisci*
Hypnum cupressiforme	*Lepidozia reptans*
Hypnum cupressiforme var resupinatum	*Lophocolea bidentata (including cuspidata)*
Hypnum jutlandicum	*Lophocolea heterophylla*
Isothecium alopecuroides (myurum)	*Marchantia polymorpha*
Isothecium myosuroides	*Metzgeria fruticulosa*
Leucobryum glaucum	*Metzgeria furcata*
Mnium hornum	*Pellia endivifolia*
Neckera complanata	*Pellia epiphylla*
Nekera crispa	*Plagiochilla asplenoides*
Orthotrichum affine	*Plagiochilla porelloides*
Orthotrichum sp.	*Porella platyphylla*
Philonotis fontana	*Radula complanata*
Plagiomnium undulatum	*Scapania irrigua*
Plagiothecium denticulatum	
Plagiothecium undulatum	
Pleurozium schreberi	
Polytrichum commune	
Polytrichum formosum	

A list of 32 lichen species that were indicative of native woodland in the south-east of Ireland was provided by Howard Fox (Appendix 9). In total, 461 recordings were made from 184 of the 248 relevés. *Graphis scripta, Lepraria incana* and *Parmelia prelata* were the three most frequently recorded species in the indicative group (Table 3.14) and six lichens from the list were not recorded in a relevé during the 2003 field season, these were *Leptogium sp., Peltigera horizontalis, Phaeophysica orbicularis, Physconia distorta, Ramalina fraxinea* and *Sticta sp*. The most lichen species recorded from any one relevé from the indicative list was seven species in 27/01 a WN4 (wet pedunculate oak-ash woodland), and generally it was observed that the wet woodland types had the highest levels of lichen cover.

Table 3.14 Thirty-two lichen species indicative of native woodland in the south-east of Ireland.

Species	No. of relevés	Most frequent host species	Main substrate
Graphis scripta	172	*Fraxinus excelsior*	Trunk/bark
Lepraria incana agg.	64	*Quercus* sp.	Trunk/bark
Parmelia perlata	52	*Salix* sp.	Twig/bark
Thelotrema lepadinum	28	*Fraxinus excelsior*	Trunk/bark
Enterographa crassa	17	*Fraxinus excelsior*	Trunk/bark
Lecidella elaeochroma	16	*Fraxinus excelsior*	Trunk/bark
Cladonia coniocraea	15	*Betula pubescens*	Trunk/bark
Arthonia cinnabarina	14	*Fraxinus excelsior*	Trunk/bark
Parmelia caperata	13	none	Trunk/bark
Ramalina farinacea	11	*Crataegus monogyna*	Twig/bark
Dimerella lutea	6	none	Trunk/bark
Pyrenula macrospora	6	*Fraxinus excelsior*	Trunk/bark
Usnea subfloridana	6	*Alnus glutinosa*	Trunk/bark
Cladonia chlorophaea	5	*Alnus glutinosa*	Trunk/bark
Evernia prunastri	5	none	Trunk/bark
Lecanora chlarotera	5	none	Trunk/bark
Normandina pulchella	5	none	Trunk/bark
Xanthoria parietina	5	Salix sp.	Twig/bark
Chrysothrix candelaris	4	*Quercus* sp.	Trunk/bark
Lecanactis abietina	2	none	Trunk/bark
Parmelia sulcata	2	none	none
Physcia tenella	2	none	none
Ramalina fastigiata	2	none	Twig/bark
Peltigera praetextdata	1	*Salix* sp.	Twig/bark
Physcia aipolia	1	*Crataegus monogyna*	Twig/bark
Leptogium spp.	0	none	none
Peltigera horizontalis	0	none	none
Phaeophysica orbicularis	0	none	none
Physconia distorta	0	none	none
Ramalina fraxinea	0	none	none
Sticta sp.	0	none	none

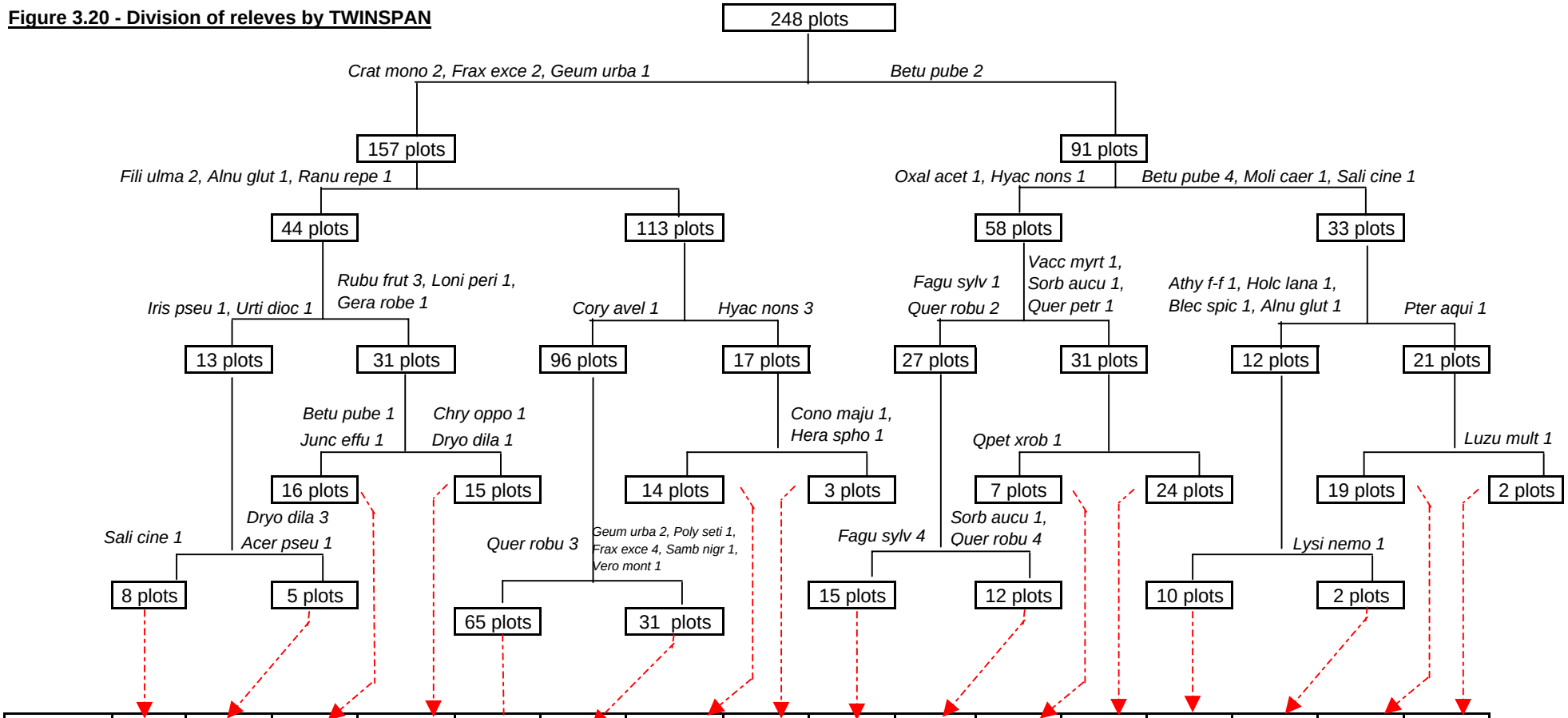
3.2.3 Vegetation classification

Data from 248 relevés were collected during the field survey. These data were stored in MS Access and exported to MS Excel for manipulation and summary analysis (means, standard errors etc.). Ordination and grouping techniques were carried out using PCORD (McCune & Metford 1999). Correlation coefficients were calculated using SPSS. Because of the specialist nature of bryophyte identification, many bryophyte records were based on identification or verification in the laboratory rather than in the field. As a result, it was impractical to assign cover values for individual bryophyte species in the field and so bryophyte data were collected only on a presence/absence basis. Initial tests on the data found that the comparison of presence/absence data including bryophyte species with the same dataset excluding bryophytes, did not result in significantly different outputs from the analytical tools used (Two way species indicator analysis (TWINSPAN) and non-metric multidimensional scaling (NMS)). In order to see patterns in vegetation more clearly it was then decided to use quantitative species data, (which therefore excluded bryophytes) for subsequent analyses. Bryophyte data for each site are available in the database and a general list of those recorded during the field survey is given in Table 3.13 (above).

TWINSPAN uses reciprocal averaging to classify samples (in this case, relevés) and then divides the dataset into a 'positive' and 'negative' group, depending on the relative abundances of certain 'indicator' species in the samples. This process is carried out repeatedly on the dataset in such a way that the original group is divided into two, then these two groups are each further divided, producing four groups, and so on. In this analysis, TWINSPAN divisions to three levels (i.e. 16 groups) are presented. Initial examination of further levels did not reveal meaningful results. The results of the TWINSPAN analysis are illustrated in Table 3.15 and Figs 3.20-3.22. The relevés within each TWINSPAN group are listed in Table 3.16.

The initial TWINSPAN dichotomy separated relevés with generally higher pH values (group means ranged from 6.44 to 7.70) from those with lower pH values (group means ranged from 4.00 to 5.64) (Fig. 3.20). Further group divisions repeated this so that a general trend of decreasing pH and, consequently soil fertility is observed as one moves across the groups from 1 to 16. This is indicated by a general decrease in soil phosphate and an increase in loss on ignition with increasing group number. Groups 1-8 comprise mostly nutrient rich sites over neutral or base rich soils, with wet woodlands and WN2 well represented among the groups. Groups 9-16 comprise mostly acid oak woods and bog woodlands. The relevés in Groups 1-8 tended to occur at lower altitudes (group means ranged from 26.6 m to 94.1 m) compared with Groups 9-16 (group means ranged from 63.7 m to 104.0 m). This is probably explained by the distribution of base rich alluvium and limestone substrates in the lowlands, contrasted with granites, sandstones etc. in the uplands rather than by any direct climatic effects of altitude. Groups in the middle of the dataset (Groups 7 to 9 inclusive) contained many relevés from modified woodland types (WD1, WD2). These types were distributed across the initial pH related dichotomy.

Figure 3.20 - Division of releves by TWINSPAN



Group	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
pH	7.65	6.67	6.86	6.44	6.67	6.84	7.09	7.7	5.03	4.54	4.47	5.53	5.46	5.64	5.38	4
	5.19-8.30	5.69-7.03	5.25-7.59	4.50-7.06	4.04-7.98	4.49-7.06	4.84-8.11	5.90-7.90	3.81-5.68	4.18-4.94	3.60-4.91	3.81-6.70	4.51-5.93	5.40-5.80	3.50-6.35	3.80-6.18
LOI %	24.88	30.60	22.19	33.07	17.34	14.30	14.93	16.33	14.73	16.92	24.86	34.17	55.00	47.50	85.28	91.50
	3.68	6.62	3.87	6.26	1.97	1.10	3.67	3.18	1.26	1.97	12.52	5.68	8.38	40.50	3.37	3.50
P %	0.13	0.17	0.07	0.09	0.06	0.09	0.09	0.11	0.05	0.06	0.07	0.06	0.10	0.04	0.06	0.09
	0.01	0.02	0.01	0.01	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.00	0.02
Sp. Count	21.80	21.00	27.60	26.50	19.00	19.30	12.80	17.30	12.90	14.10	10.10	14.10	19.20	30.00	12.10	14.50
(xl bryos)	2.50	3.10	1.60	1.70	0.60	0.80	0.80	3.50	0.80	0.80	2.20	1.20	0.80	2.00	0.80	3.50

Table 3.15 Relevés listed by TWINSPAN group

The affinities list the Braun-Blanquet et Tüxen association that most closely corresponds to each TWINSPAN group. Three groups were not classified due to problems in assigning a woodland association (see pp. 64-65).

Twinspan Group	Quadrats	Affinities
1	1001 1502 2201 2701 17501 20901 21102 28701	Carici remotae-Fraxinetum
2	11401 14501 19101 19901 24201	Carici remotae-Fraxinetum
3	403 3101 5101 5301 13501 15402 20001 22502 25001 25701 26003 26501 26902 27301 31601 32801	Carici remotae-Fraxinetum
4	1503 2002 3301 3701 10001 12601 15103 19001 19201 20801 20902 27001 27601 30701 32201	Carici remotae-Fraxinetum
5	1801 2801 3501 3601 4801 6101 6501 7401 8001 8301 8501 8601 8602 9601 9602 10801 10901 11601 12401 13001 13102 13601 13701 13802 15501 15601 16601 17401 17601 18301 18701 18901 19701 20101 20301 20401 20402 21101 21301 22101 22501 22601 22901 22902 23001 23401 23601 25101 25201 25402 25901 26001 26502 26901 28101 28201 28302 28401 28601 29401 30201 30301 30401 30501 31101	Corylo-Fraxinetum
6	402 1201 1701 1802 7901 9101 10002 11201 11301 12701 12802 13101 13703 13901 14101 15301 16201 17701 22301 22701 24601 24901 25002 25301 25602 26201 26301 27701 28001 29601 32102	Corylo-Fraxinetum
7	301 501 1002 3001 7801 11001 11701 11702 13702 13801 18401 18601 19801 29001	Corylo-Fraxinetum
8	1702 3102 24501	Corylo-Fraxinetum
9	801 901 1401 1501 1901 4901 7301 12201 14701 15101 17001 17301 18002 32202 32701	Not classified
10	201 6902 10201 12301 12801 15401 16701 21001 22801 24101 26002 28301	Not classified
11	10601 16301 17201 17901 18001 31001 32001	Blechno-Quercetum
12	101 401 701 2001 2601 5801 7601 8901 12501 14801 15102 15701 15801 16901 17801 17802 25501 25601 25801 30001 30202 30801 31301 32101	Blechno-Quercetum
13	3801 6901 7501 10301 16801 20501 20601 21901 21902 32401	Not classified
14	25401 32901	Betuletum pubescentis
15	3401 8101 8201 8401 8603 9501 16001 20602 23701 23801 26601 26801 27401 27801 28901 29701 29702 30901 32601	Betuletum pubescentis
16	24001 27501	Betuletum pubescentis

Species richness was generally highest among the wet woodland types that make up groups 1-4. Acid oakwoods and woods with a high cover of exotic species, such as Group 7, generally had lower species diversity.

Table 3.16. Distribution of field assigned vegetation types (after Fossitt 2000) among TWINSPAN groups.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Total
WN4	2	1	2	2	1	1											9
WN5	4		3	4	2	1							3				17
WN6	2	4	9	6	2								4		1		28
WD1			1		8	2	9	2	4	1		1					28
WD2				1	5	2			2								10
WN2				2	42	25	5	1	2	5		4					86
WN1					2				7	6	7	13		1			36
WN7			1		2							3		1	17	2	26
WS1					1							2	1				4
WS2													1				1
WSO												1			1		2
WDO													1				1
All Types	8	5	16	15	65	31	14	3	15	12	7	24	10	2	19	2	248

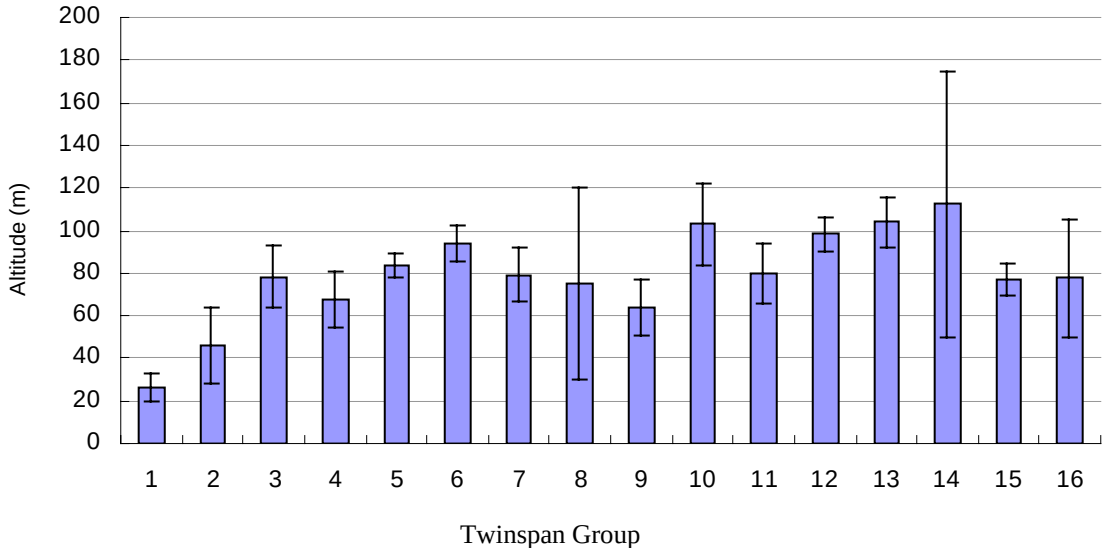


Fig. 3.21 Mean Altitude in Twinspan Groups

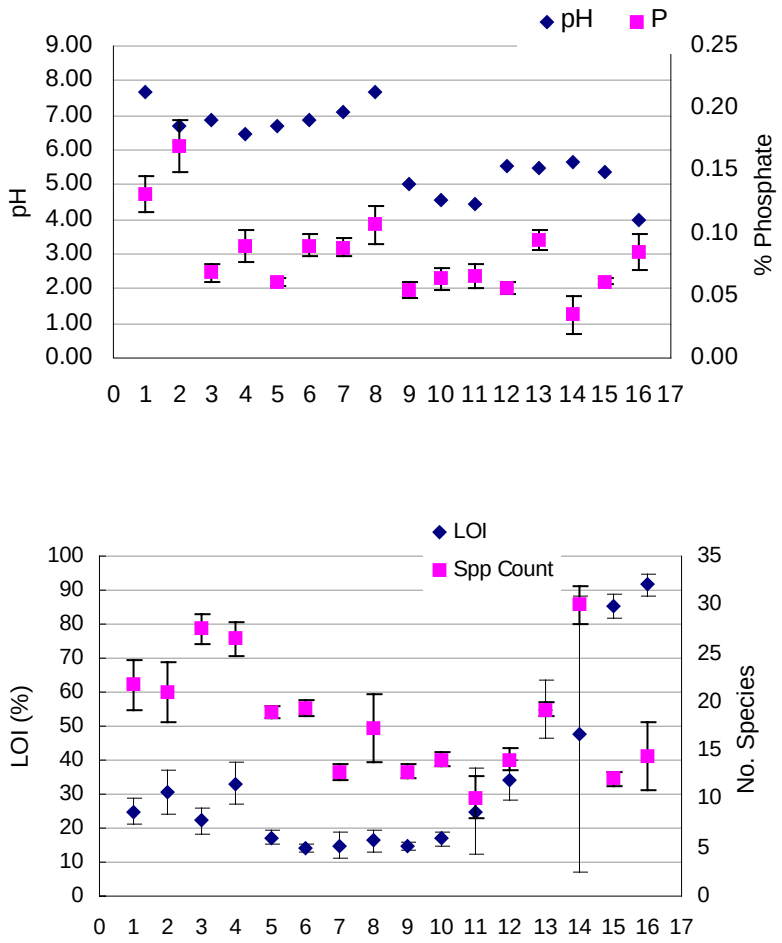


Fig. 3.22 Soil characteristics and species diversity within TWINSPAN Groups. No error bars were included for pH value as pH range was considered to be more informative (Fig. 3.20)

NMS plotted relevés in two dimensions such that relevés with similar vegetation were plotted close to each other. The options chosen when running NMS and the results obtained are given in Tables 3.17 & 3.18. Initial investigation suggested that a 2-dimensional solution offered the best arrangement of relevés in sample space. Together the axis scores for the first two axes accounted for 0.699 (~70%) of the variance in the data set.

Table 3.17 Options chosen before running NMS in PCORD (McCune & Metford 1999).

Ordination of plots in species space: 248 plots, 232 species
ANALYSIS OPTIONS
1. SORENSEN = Distance measure
2. 6 = Number of axes (max. = 6)
3. 400 = Maximum number of iterations
4. RANDOM = Starting coordinates (random or from file)
5. 1 = Reduction in dimensionality at each cycle
6. 0.20 = Step length (rate of movement toward minimum stress)
7. USER-SUPPL = Random number seeds (use time vs. user-supplied)
8. 40 = Number of runs with real data
9. 50 = Number of runs with randomized data
10. NO = Autopilot
11 0.0001 = Stability criterion, standard deviations in stress over last 10 iterations.
12 VARIMAX = Yes

Table 3.18 Results of NMS

		Stress in real data			Stress in randomised data			Monte Carlo Test 100 runs
Axis	R^2	Min	Mean	Max	Min	Mean	Max	p
1	0.324	41.156	47.809	53.884	51.960	53.539	58.384	0.0196
2	0.375	24.910	27.083	38.025	34.702	36.418	39.337	0.0196

R^2 denotes the Coefficient of determination for the correlations between ordination distances and distances in the original n-dimensional space. p = proportion of randomized runs with stress < or = observed stress.

NMS scores were plotted (Fig. 3.23) and relevés were colour coded according to TWINSPAN group. Groups with broadly similar woodland types have been assigned similar colours so that wet woodland types are shown in shades of blue, oak/ash woods in green, woods with high cover by exotic canopy species have a purple border, acid oakwoods are coloured pink and red, and bog woods are indicated in gold.

As can be seen from the distribution of groups in Fig. 3.23, relevés did not fall neatly into clearly defined groups. This reflects the high amount of variation present in Irish woodland and also the fact that many stands are transitional between more than one defined woodland type. However, broader trends in woodland type are clearly visible here. Wet woodlands with high base status (TWINSPAN Groups 1-4) were located at the higher end of axis 1. The overlap between these groups and also the highly scattered nature of their distribution reflects the complexity and variety of wet woodland types present in the survey area. Bog woodlands are separated from the other wet woodland types, and are distributed at the upper end of axis 2, contrasting with low values for other wet woodland types on this axis.

Many bog woodlands contained elements of WN1 (acid oak woods) and are probably an early successional stage of this woodland type. This is reflected in the proximity of these two woodland types on the NMS plot.

Oak/ash (WN2) was the woodland type most frequently assigned to relevés in the field, accounting for 86 of the 248 relevés taken. These relevés were heavily concentrated in TWINSPAN Groups 5 and 6, which together contained 67 WN2 relevés. These relevés are tightly clustered on the NMS ordination, generally having low values on Axes 1 and 2. Relevés from Groups 7 and 8 frequently overlap with those from Groups 5 and 6, and generally consisted of relevés that would have been classified as WN2 were it not for the high canopy cover by non-native species, which therefore resulted in WD categories being assigned. Similarly, acid oakwood relevés that had high infestation of canopy exotics were concentrated in Groups 9 and 10, and these are situated on the NMS plots between the uninfested acid oakwoods (WN1 – Groups 11 and 12) and the oak ash woods of Groups 5 to 8.

Spearman rank correlation found that NMS axes were significantly correlated with various environmental variables (Table 3.19). Axis 1 was most significantly positively correlated with soil pH, soil total % P, bare soil and vascular plant species diversity. Axis 1 was most significantly negatively correlated with rock cover, litter cover, canopy cover and the basal density of non-native canopy species. Axis 2 was most significantly positively correlated with %LOI, litter cover and bryophyte diversity, and negatively correlated with soil pH, soil total %P, bare soil, vascular plant species diversity, basal density, and the basal density of non-native canopy species.

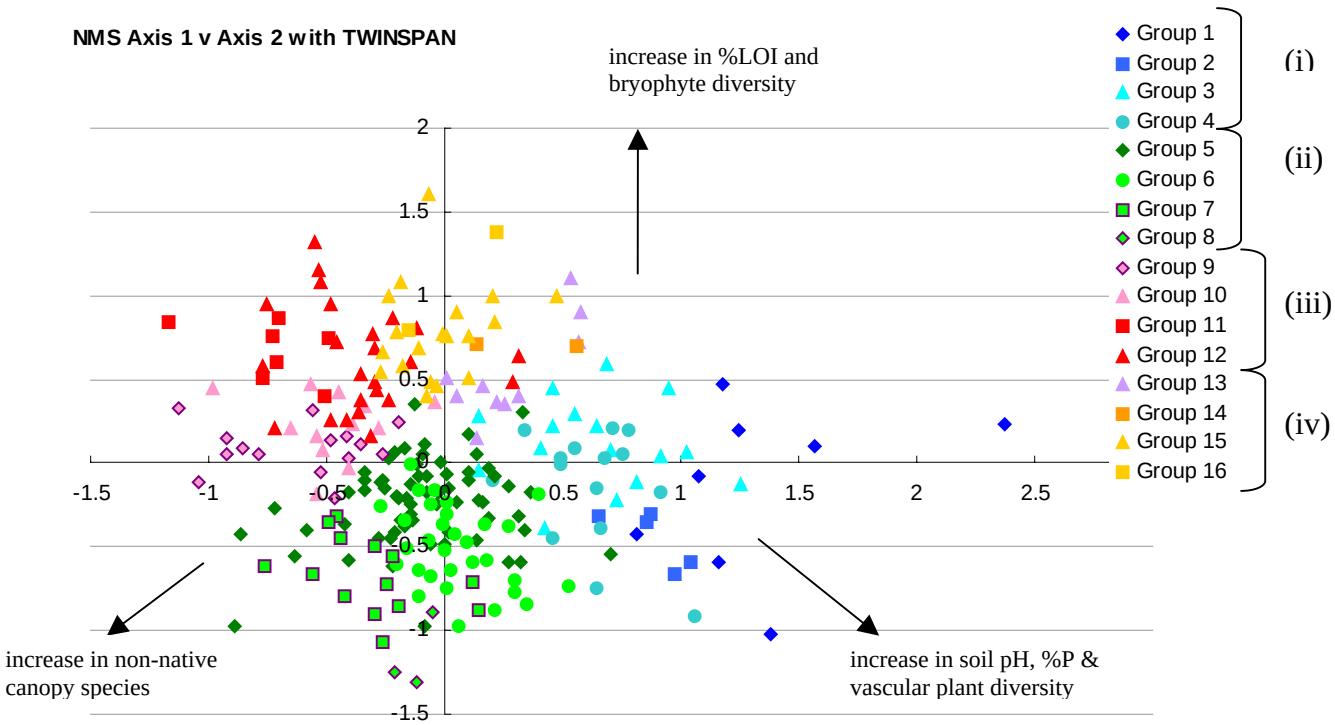


Fig. 3.23 NMS Ordination of relevés with TWINSPAN Groups and significant correlations with environmental variables overlain

(i) Wet woodland types (WN4, WN5 & WN6) are shown in shades of blue (ii) Oak-ash-hazel woods (WN2) are in green, (iii) Oak-birch-holly woods (WN1) are coloured pink and red, (iv) Birch woods are indicated in gold and lilac. Woods with high cover by exotic canopy species have a purple border

All environmental variables shown were correlated with the NMS axis using the Spearman rank correlation coefficient (Table 3.19). Only a summary of the most informative correlations are shown on this figure.

Table 3.19 - Spearman Rank Correlation

	Altitude	Soil pH	Bare soil	Rock	Litter	Dead wood	Ground layer	Field layer	Shrub layer	Canopy layer	LOI %	Total P (%)	Basal density	*Fagus* as % TBA	*Acer* as TBA	*Fagus* & *Acer* %TBA	Bryophytes	No. tree & shrub spp.	No. field spp.	No. vascular spp.	NMS Axis 1
Soil pH	-	.																			
Bare soil		++	.																		
Rock				.																	
Litter		--	--		.																
Dead wood		++				.															
Ground layer	+					+	.														
Field layer	-		--	--	--		-	.													
Shrub layer			+				++	-	.												
Canopy layer					++			--		.											
Loss of ignition (%)	--	--				-	+	+		-	.										
Total P (%)	--	++	+		-			+			++	.									
Basal density				+			--				--		.								
Fagus as % TBA			--		++		--			+	--		++	.							
Acer as % TBA		+								+		++			.						
Fagus & *Ace*r as % TBA			-		++		--			++	--		++	++	++	.					
No. bryophytes spp.					--		++	--				-	--	--	--	--	.				
No. tree & shrub spp.						+	+		++			--						.			
No. field spp.		++	++		--			+			-			--		--	+	+	.		
No. vascular spp.		++	++		--		+		+		--			--		--	+	++	++	.	
NMS Axis 1		++	++	--	--		+	+		--		++	-	--		--		+	++	++	.
NMS Axis 2		--	--		++	-					++	--	--	--	--	--	++		--	--	-

Characteristics of woodland types found in this survey

Groups 1 and 2

(8 & 5 relevés respectively)

Both of these groups consisted of woodland on flat ground over brown earths, gleys or basin peat, usually at relatively low altitudes (Group 1 mean: 26.6 +/- 6.6 m; Group 2 mean: 46.0 +/- 17.6 m). All relevés in Group 1 were subject to at least seasonal flooding, and all relevés in Group 2 showed some degree of impeded drainage. *Alnus* was usually the dominant canopy species in both groups, and *Fraxinus* was often abundant. *Cardamine flexuosa, Filipendula ulmaria, Ranunculus repens, Urtica dioica* and *Iris pseudacorus* were common components of the field layers in both groups. The major difference between these 2 groups were: a) the presence of *Salix cinerea* in all but one of the Group 1 relevés and its absence from most relevés in Group 2; (b) the presence of *Acer pseudoplatanus* in the majority of the Group 2 relevés and its absence from all of the Group 1 relevés. TWINSPAN separated these two groups on the basis of these two factors

These groups had high pH values recorded, 7.65 (range 5.19-8.30) and 6.67 (range 5.69-7.03) respectively, and also had the highest total phosphorous values, 0.13% (+/- 0.01) and 0.17% (+/- 0.02) respectively, recorded. They were relatively species rich with 21.8 (+/- 2.5) and 21.0 (+/- 3.1) species per relevé on average.

Both of these groups comprised relevés that, in the field, had been described as WN4, WN5 and WN6. As the NMS plot (Fig. 3.23) shows Groups 1 and 2 are not particularly well defined groups and although overall these groups correspond most closely to the Carici remotae-Fraxinetum there are relevés that correspond to the *Salix cinerea* subtype (relevé 145/01) and the Salicietum albae association (relevé 22/01).

Groups 3 & 4

(14 relevés in each)

Relevés in these groups occurred on flat ground, mid or lower slopes over gleyed or brown earth soils. In Group 3 drainage was usually impeded, often because of flushing or seasonal flooding. In Group 4, most relevés were situated in the floodplains of streams or rivers. In both groups, relevés typically had high cover in the field layer (> 7 Domin scale) and were rich in species diversity. Group 3 relevés had an average of 27.6 species (+/- 1.6) per relevé, and Group 4 had an average of 26.5 (+/- 1.7) species per relevé. The relevés in these two groups were usually dominated by a combination of *Alnus* and *Fraxinus*, but *Fraxinus* was generally present in higher amounts in Group 4. *Betula, Corylus, Salix cinerea* and *Crataegus* were common in both groups. Field layer species commonly found in both groups were *Rubus fruticosus* agg., *Angelica sylvestris, Carex remota* and *Filipendula ulmaria*. Group 4 relevés commonly contained *Chrysoplenium oppositifolium, Lysimachia nemorum, Oenanthe crocata, Athyrium felix-femina* and *Dryopteris dilatata*, all of which were less common in Group 3 relevés. *Juncus effusus* and *Polystichum setiferum* were more common in Group 3 relevés. Groups 3 and 4 had slightly lower pH values, 6.86 (range 5.25-7.59) and 6.44 (range 4.5-7.06) than for Groups 1 and 2. Also the total phosphorous values for Groups 3 and 4, 0.07%(+/- 0.01) and 0.09% (+/- 0.01) respectively, were lower than for Groups 1 and 2. In the field, relevés from this group had been defined as WN6, WN5 or WN4

and less frequently as WN2, WD1, WD2 and WN7. Most relevés from both these groups correspond closely to the Carici remotae-Fraxinetum.

Group 5

(65 relevés)

This large group comprised relevés on a variety of topographies including flat ground, mid and upper slopes. These were mostly situated on brown earth soils but some occurred on gleys and, rarely, on peat. Soil moisture regimes were generally more freely draining here than in previously described groups. Woodland canopies were usually composed of *Quercus robur* and *Fraxinus*, with *Corylus avellana* and *Crataegus monogyna* common in the understorey. *Ilex aquifolium* was common and *Salix cinerea, Acer pseudoplatanus* and *Fagus sylvatica* were occasional at varying abundances in the group. The field layer typically comprised *Hedera helix, Rubus fruticosa* and *Lonicera periclymenum*, with *Viola* spp., *Carex sylvatica* and *Circaea lutetiana* also being common. Relevés in this group were moderately species rich with an average of 19.0 (+/- 0.6) species per relevé. The mean pH for this group was 6.67 (range 4.04-7.98), LOI was 17.3% (+/- 2.0) and total phosphorous in the soil was quite low (0.06% +/- 0.01). In the field, most of the relevés in this group were assigned to WN2 oak-ash-hazel woodland, but thirteen relevés were also assigned to WD1 and WD2. The relevés in Group 5 correspond closely to the Corylo-Fraxinetum association.

Group 6

(31 relevés)

As in Group 5, the relevés assigned to Group 6 occurred over a variety of topographies (flat ground, lower, mid and upper slopes and summits) and were mostly situated on brown earth soils, or more rarely, gleys. Woodland canopies were usually dominated by *Fraxinus*, but at higher abundances than those recorded for Group 5 relevés. As with Group 5, *Q. robur* and *Corylus* were common components of the tree flora. *Sambucus nigra* was also a common feature of relevés in this group, and is an indication of the higher fertility of the soils here compared with those from Group 5. The average pH was 6.84 (ranging from 4.49-7.06), LOI was 14.3% (+/- 1.1) and mean total phosphorous in the soil was 0.09% (+/- 0.01). The most common Fossitt category assigned to Group 5 relevés in the field was WN2 (for 25 relevés). Generally, the relevés in Groups 5 and 6 were not dramatically different from each other, and there is some mixing among these groups on the NMS plot. Group 6, like Group 5, corresponds most closely to the Corylo-Fraxinetum association.

Groups 7 & 8

(14 & 3 relevés)

These groups mostly comprised relevés on flat ground with brown earth soils, high canopy cover and often high litter cover. Relevés in these groups were characterised by high cover values for *Fagus* and, to a lesser extent, *Acer*, however *Fraxinus* was also very abundant in both groups. These groups are closely related to Groups 5 and 6 (see Figs. 3.19 & 3.23), and are likely to be similar communities (i.e. WN2) but ones in which the non-natives *Fagus* and *Acer* have become significant components of the

canopy. *Hedera* and *Hyacinthoides non-scripta* were common in both groups. *Rubus* was frequent in Group 7 but absent from Group 8; possibly this is due to higher levels of grazing in the latter group.

Species diversity values in these groups were among the lowest recorded for groups on base rich soils. Group 7 had an average of 12.8 (+/- 0.8) species per relevé and Group 8 had 17.3 (+/- 3.5). Soils in these groups were quite fertile, with the mean total phosphorous level 0.09% (+/-0.01) and 0.11% (+/- 0.01) for groups 7 and 8 respectively. Mean pH values were 7.09 (range 4.84-8.11) for Group 7 and 7.70 (range 5.9-7.90) for Group 8, the highest group average recorded. LOI was low in both groups at 14.9% (+/- 3.7) and 16.3 % (+/- 3.2) for groups 7 and 8 respectively. In the field, most relevés from these groups were assigned to WD1 and WN2. Although non-native tree species are a significant component of the canopy in this group it is still aligned most closely to the Corylo-Fraxinetum association.

Group 9

(15 relevés)

The relevés in Group 9 are similar to those described from Groups 7 and 8 in that they contained high cover values for *Fagus* and *Acer*, but differ in the low pH, 5.03 (range 3.81-5.68) and soil phosphorous (0.05% +/- 0.01) recorded. In fact, Group 9 belongs to the set of TWINSPAN groups (with lower pH values) that was split at the first dichotomy from all those previously considered here. Group 9 relevés occurred mostly over moderate slopes and on freely draining brown earth soils. Common tree species included *Q. robur, Ilex, Betula pubescens, Fraxinus* and *Crataegus*. *Rubus* was almost constant in the field layer in this group and *Hyacinthoides, Lonicera, Oxalis* and *Dryopteris dilatata* were common. In the field, most relevés from this group were assigned to WN1 (7 relevés), or WD1 (4 relevés). With the high *Fagus* cover values in this group it was not closely aligned to any of the native woodland associations listed for Ireland.

Group 10

(12 relevés)

Group 10 included relevés over acid brown earths. Mean pH was 4.54 (range 4.18-4.94) with quite low fertility (soil total P was 0.06% +/- 0.01 and LOI was 19.9% +/- 2.0) and low species diversity (14.1 +/- 0.8). The canopies of the woods in this group were dominated by *Q. robur*, with *Corylus* and *Ilex*. *Dryopteris dilatata* and *Lonicera* were constant in the field layer and *Hedera*, *Rubus* and *Hyacinthoides* were also common. Hence, the general vegetation of the relevés in this group was similar to that found in Group 9. TWINSPAN separated the two groups on the basis of higher *Fagus* cover in Group 9; *Fagus* occurred in only two of the sixteen relevés in Group 10. Group 10 relevés were classified in the field as either WN1 (6 relevés) or WN2 (5 relevés), and are distributed towards the more 'acid' part of the NMS plot, but also near to Groups 5 and 6 reflecting the transition from WN2 to WN1 with decreasing pH. Due to the transitional nature of these woods between WN1 & WN2, they were not classified into one of the native woodland associations

Group 11

(7 relevés)

All of the relevés in this group were dominated by *Quercus robur x petraea* hybrids, *Ilex* was also constantly present, usually at high abundance and *Sorbus aucuparia* was common in the canopy. *Hedera, Rubus, Vaccinium myrtillus, D. dilatata* and *Pteridium aquilinum* were all common in the field layer. This group had the lowest recorded species diversity with an average of only 10.1 species (+/- 2.2) per relevé and frequently had high litter cover. Most of the relevés were recorded on acid brown earths and all were on a slope, soil fertility was quite low with average pH 4.47 (range 3.6-4.91), soil phosphorous at 0.07% (+/- 0.01) and LOI at 24.86% (+/- 12.52). In the field these relevés were all assigned to WN1 and this group can be classified in the Blechno-Quercetum association.

Group 12

(24 relevés)

These relevés are similar to those in Group 11 but were dominated by *Q. petraea* with *Betula, Sorbus* and *Ilex*. *Hedera, Rubus,* and *Lonicera* were common, as were *Oxalis acetosella, Luzula sylvatica, Blechnum spicant* and *D. dilatata*. Group 12 had a relatively high species diversity, in the context of the other acid oak groups with 14.1 species (+/- 1.2) on average per relevé. These relevés occurred on mid or lower slopes, mostly over acid brown earths; a single relevé was situated on gleyed soil. The soil pH was 5.53 (range 3.81-6.70), soil phosphorous at 0.06% +/- 0.01 and loss on ignition was 34.2% +/- 5.7. Relevés in this group were mostly described as WN1 in the field and this group can be classified in the Blechno-Quercetum association.

Groups 13 and 14

(10 & 2 relevés)

These relevés were dominated by *Betula* or *Betula* and *Alnus*. *Fraxinus, Ilex* and *S. cinerea* were also common. These tended to represent fairly open woods on flat ground or lower slopes, with moderately high litter cover and with high cover (8 or 9 on the Domin scale) in the field layer. Both had high species diversity: Group 13 had an average of 19.2 species (+/- 0.8) per relevé and Group 14 had the highest vascular plant species diversity observed from any group, with an average of 30.0 species (+/- 2.0) per relevé. While species such as *Lonicera, D. dilatata*, and *Hedera* were common in both groups, *Viola palustris* was occasional in Group 13 but absent from Group 14, and *Lysimachia nemorum, Viola riviniana* and *Anthoxanthum odoratum* were present in both Group 14 relevés but absent from Group 13. Of the birch woods (Groups 13-16) Groups 13 and 14 had a higher pH, 5.46 (range 4.51-5.93) and 5.64 (range 5.40-5.80) respectively, and lower % LOI at 55.0 (+/- 8.4) and 47.5 (+/- 40.5). In the field, relevés from Groups 13 and 14 were assigned various vegetation types ranging from WN1 and WN7 for Group 14, to WN5, WN6 and WS for Group 13. The close relationships between these woodland types are illustrated in the distribution of relevés for these groups on the NMS graphs. There are relevés in Groups 13 and 14 that are mostly closely aligned with the Betuletum pubescentis association e.g. 254/01,

however it was not possible to assign one woodland association that was generally applicable to the two groups.

Groups 15 & 16

(19 and 2 relevés)

These final two groups contain closely related relevés, always on flat ground with peat as the main soil type. These relevés have low pH at 5.38 (range 3.50-6.35) for Group 15 and 4.00 (range 3.80-4.13), the lowest recorded) for Group 16 and the highest % LOI at 85.3 (+/- 3.4) and 91.5 (+/- 3.5). These relevés typically had moderately high bryophyte and field covers, low amounts of bare soil and were dominated by *Betula pubescens* with *Ilex* in the understorey. Relevés in Group 15 often contained *S. cinerea*. Similarly, *Molinia caerulea* was often a major component of the field layer in Group 15 relevés but was absent from Group 16. *Hedera, Rubus* and *Lonicera* were common in both of these groups.

These relevés were almost all classified as WN7, bog woodland, in the field. These 2 groups contained almost 70% of all relevés classified as bog woodland. The 19 relevés in Group 15 could be placed in the Betula pubescens-Molinea caerulea community described by Rodwell (1991) and in Ireland by Browne *et al.* (2000). Again these relevés fall into Betuletum pubescentis association.

While wet woodland types were generally well separated from other types by these analyses, the distribution of Fossitt's categories across different groups reflects the highly diverse and variable nature of wet woodlands, as recently noted by Cross & Kelly (2003). Bog woodland types (Fossitt's WN7 and Cross and Kelly's Types E-H) are quite clearly separated from the other wet woodland types (WN4, WN5 & WN6) which in this survey proved difficult to separate into distinct groups on floristic grounds.

The relevés that fell into TWINSPAN groups 5-12 generally occurred over dry soils and were differentiated on the basis of soil acidity and the abundance of exotic species in the canopy. Fossitt's WN1 and WN2 were reasonably well separated (although some intermediates between the two were evident), and these correspond quite clearly to the Blechno-Quercetum and Corylo-Fraxinetum (Braun-Blanquet et Tüxen, 1952). Although some of the vegetation groupings produced were discussed in the context of sub associations further analysis than time allowed here would be required to differentiate all sub associations defined by Kelly & Moore (1975) and Kelly & Kirby (1982). The various categories of modified woodland (WD1, and WD2) tended to be variants of semi-natural vegetation types.

Bog woodland (WN7) was the most distinctly clustered group identified from this analysis. It was found to be closely related to scrub and to WN1, to which it may be transitional, given time and appropriate management. Most of the bog woodland in this survey could be categorised as Cross & Kelly's Type E – birch woodland on cutaway bog.

3.2.4 Woodland structure

Information about stand structure was chiefly recorded on a relevé basis, with all stems of 7 cm diameter and greater being counted and measured (*c.f.* 2.22). Structural data was gathered for 244 relevés in 204 sites. The data collected are contained in the attached Native Woodland Access Database (See Releve_Timber and Releve_tree_size_classes).

In total, data for 10,483 stems (7639 individual trees) was collected. Forty-six taxa of tree and large shrub were recorded from within relevés and extended relevés, which covered an area of 81,180 m^2 (Table 2.22). Table 3.20 lists the species sampled, the total number of stems and trees recorded for each species and the basal density for each species.

Thirteen taxa each represented more than 1.5% of the total number of stems counted. However, owing to the close biological and structural relatedness of *Quercus petraea*, *Quercus robur* and the hybrid between the two, these were grouped together as one *Quercus* category for almost all of the analyses. The data pertaining to these 11 most abundant taxa have been analysed on a species by species basis. The remaining species were grouped together into the category 'other'. Nine of these taxa were native species and the two most abundant non-native species were *Fagus sylvatica* and *Acer pseudoplatanus*. The abundance of the 11 most abundant tree taxa is shown in Fig. 3.24 (stems) and Fig. 3.25 (trees).

Fraxinus was the most abundant tree species encountered during the field survey, and together with *Quercus* and *Betula pubescens*, accounted for half of all stems recorded, and 63.4% of the basal area measured. The largest stem diameter recorded in the timber relevé data was a 250 cm *Tilia cordata* and the largest native tree was a *Quercus robur* with a diameter of 137 cm.

Table 3.20 A list of the tree species recorded in the timber data survey. The total number of stems (dbh ≥ 7 cm), trees and basal area is recorded for each species. The species are listed according to the total number of stems recorded during the survey.

Tree Species	Total no. of stems	% of all stems	Total no. of trees	% of all trees	Total basal area (m^2)	% of basal area
Fraxinus excelsior	2031	19.37	1677	21.95	49.61	15.50
Betula pubescens	1591	15.18	1211	15.85	28.59	8.93
Corylus avellana	1370	13.07	549	7.19	10.42	3.26
Quercus robur	992	9.46	824	10.79	80.36	25.10
Alnus glutinosa	843	8.04	553	7.24	22.18	6.93
Salix cinerea	780	7.44	473	6.19	11.12	3.48
Fagus sylvatica	576	5.49	561	7.34	31.15	9.73
Crataegus monogyna	490	4.67	338	4.42	5.27	1.65
Ilex aquifolium	385	3.67	295	3.86	3.82	1.19
Quercus petraea	338	3.22	276	3.61	25.78	8.05
Quercus hybrid	293	2.80	243	3.18	18.59	5.81
Acer pseudoplatanus	204	1.95	154	2.02	9.95	3.11
Sorbus aucuparia	182	1.74	135	1.77	2.86	0.89
Salix caprea	56	0.53	42	0.55	0.97	0.30
Ulmus glabra	47	0.45	39	0.51	0.75	0.23
Pinus sylvestris	42	0.40	42	0.55	3.69	1.15
Picea abies	30	0.29	30	0.39	1.35	0.42
Sambucus nigra	25	0.24	23	0.30	0.21	0.07
Larix deciduas	24	0.23	24	0.31	1.32	0.41
Salix fragilis	23	0.22	14	0.18	0.45	0.14
Salix alba	21	0.20	19	0.25	2.00	0.63
Pseudotsuga menziesii	19	0.18	19	0.25	0.37	0.12
Prunus laurocerasus	15	0.14	13	0.17	0.30	0.09
Malus sylvestris	11	0.10	8	0.10	0.36	0.11
Rhamnus catharticus	11	0.10	5	0.07	0.08	0.03
Populus sp.	10	0.10	10	0.13	0.65	0.20
Picea sitchensis	10	0.10	10	0.13	0.22	0.07
Taxus baccata	9	0.09	3	0.04	0.49	0.15
Prunus avium	7	0.07	7	0.09	0.14	0.04
Abies alba	6	0.06	6	0.08	0.58	0.18
Euonymus europaeus	6	0.06	6	0.08	0.04	0.01
Salix aurita	5	0.05	1	0.01	0.04	0.01
Populus deltoides x P.nigra	4	0.04	4	0.05	0.65	0.20
Aesculus hippocastinum	4	0.04	4	0.05	0.21	0.07
Prunus padus	3	0.03	3	0.04	0.02	0.01
Salix purpurea	3	0.03	3	0.04	0.02	0.01
Buxus sempervirens	3	0.03	1	0.01	0.02	0.01
Tilia cordata	2	0.02	2	0.03	4.94	1.54
Eucalyptus sp.	2	0.02	2	0.03	0.22	0.07
Carpinus betulus	2	0.02	2	0.03	0.06	0.02
Salix pentandra	2	0.02	2	0.03	0.05	0.02
Prunus spinosa	2	0.02	2	0.03	0.01	0.00
Picea sp.	1	0.01	1	0.01	0.11	0.04
Salix viminalis	1	0.01	1	0.01	0.03	0.01
Salix sp.	1	0.01	1	0.01	0.01	0.00
Rhododendron ponticum	1	0.01	1	0.01	0.00	0.00
All Species	**10483**	**100**	**7639**	**100**	**320.08**	**100.00**

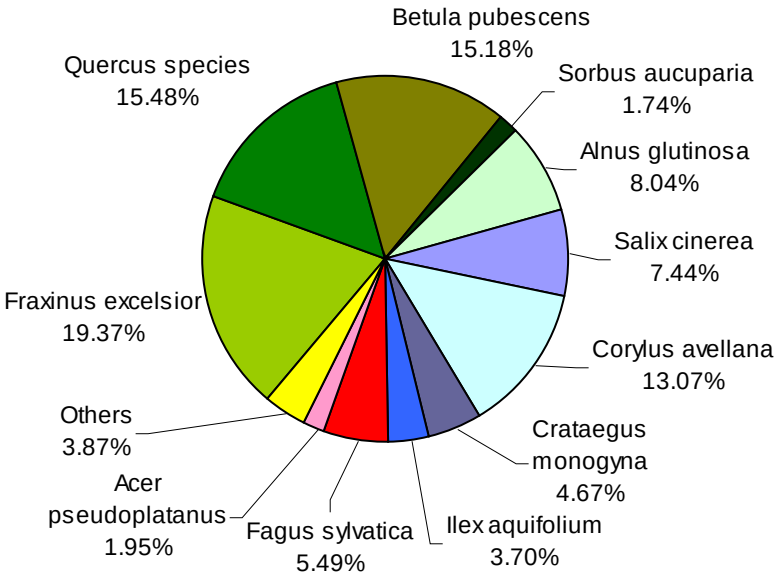


Fig. 3.24 The 11 most abundant tree species shown as a percentage of the total number of stems recorded during the 2003 native woodland survey.
Relative abundance ranges from *F. excelsior* (19.37%) to *S.aucuparia* (1.74%).

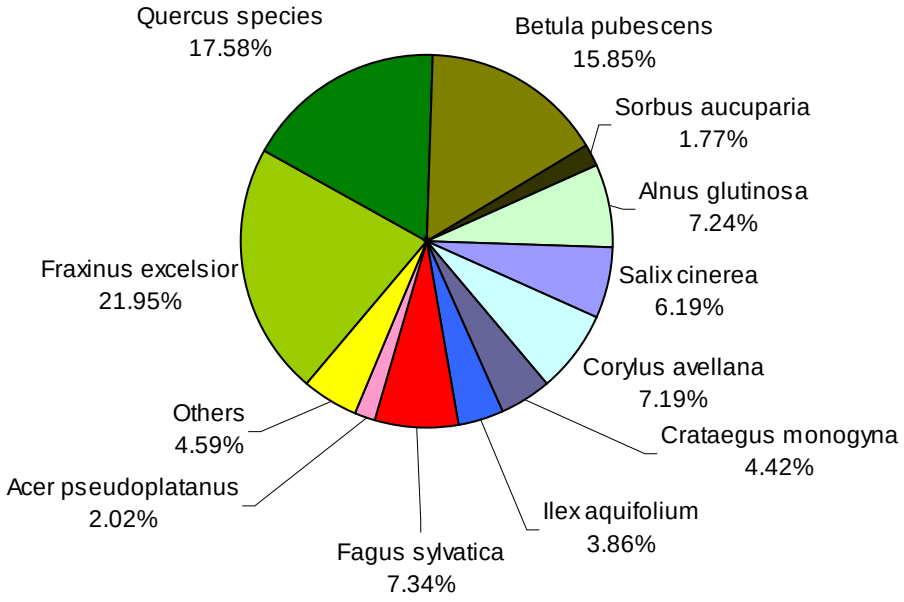


Fig. 3.25 The 11 most abundant trees shown as a percentage of the total number of trees recorded during the 2003 native woodland survey.
Relative abundance ranges from *F. excelsior* (21.95%) to *S.aucuparia* (1.77%).

Figure 3.26 illustrates the distribution of the eleven most abundant taxa within different diameter size classes. Eighty-two percent (8,604) of the 10,483 stems measured were less than 22 cm in diameter. *Quercus* was the most abundant taxon in all size classes over 22 cm. *Quercus*, *Fraxinus* and *Fagus* dominated the larger size classes.

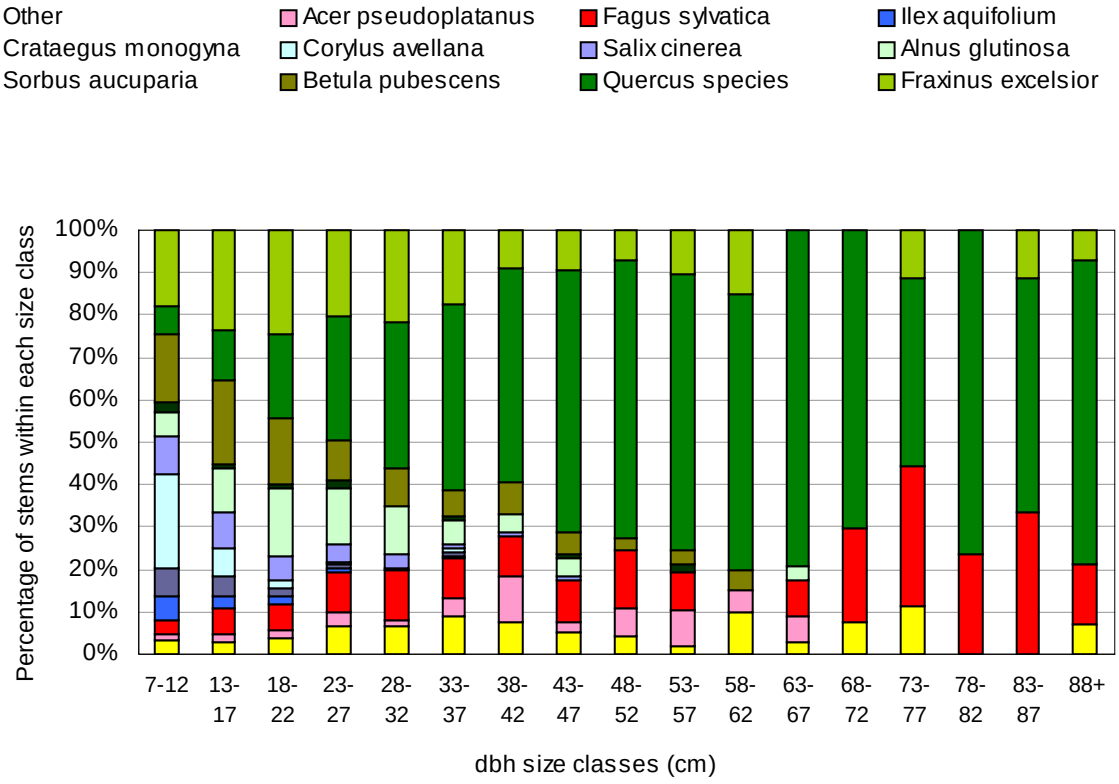


Fig. 3.26 Distribution of tree species within diamater size classes

Vertical stand structure was assessed by recording the stratum occupied by each individual (*cf* 2.22). Fig. 3.27 shows that *F. excelsior, Quercus, B. pubescens, Sorbus acuparia, Alnus glutinosa, Salix cinerea, Fagus sylvatica* and *Acer pseudoplatanus* are canopy species with the majority of individuals recorded as dominant or co-dominant in the woods where they were located. The majority of *Corylus avellana, Crataegus monogyna* and *Ilex aquifolium* trees were intermediate or suppressed and can be defined as sub-canopy or shrub layer species. *Ilex* was most commonly observed under shade, with 55.1% of all trees recorded as suppressed.

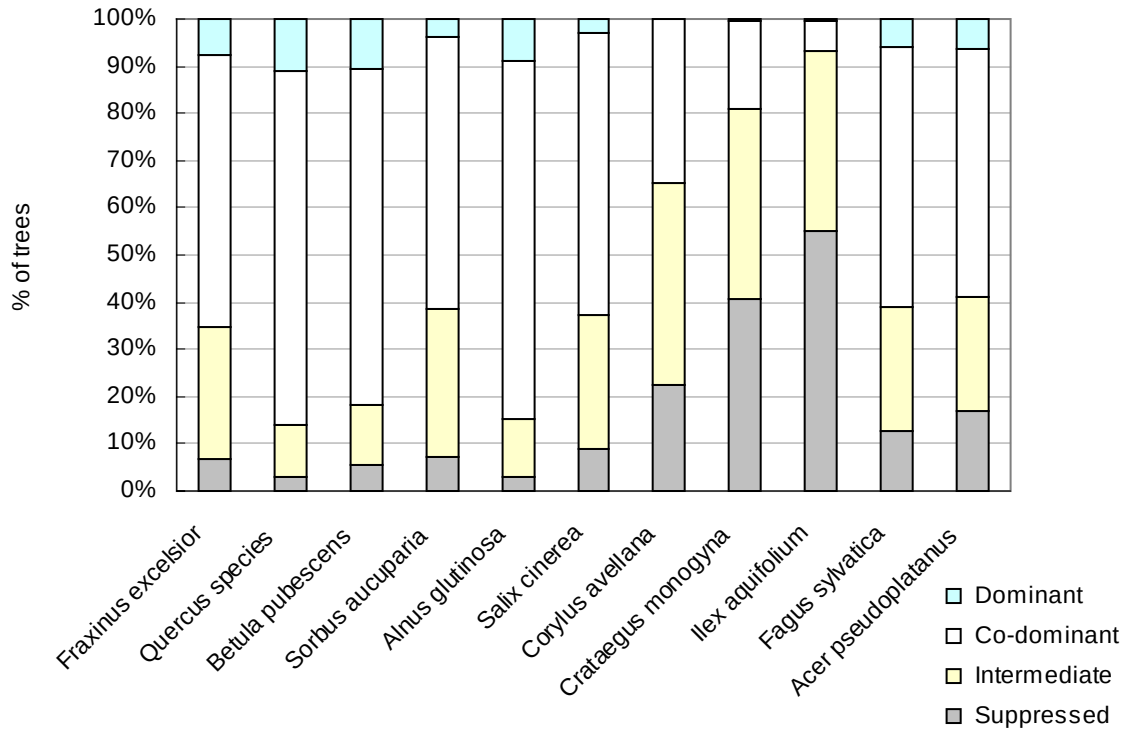


Fig. 3.27 Distribution of individuals among the 4 vertical strata

The average height of tree species measured is shown in Fig. 3.28. *Ilex* was the smallest tree with a mean height of 7.72 m (+/- 0.13) and *Quercus robur* was the tallest tree species with a mean height of 17.33 m (+/- 0.16). ANOVA found a significant ($p \leq 0.001$) difference between the height of different species. A Bonferroni post hoc test was carried out to see where the significant differences lay. *Ilex* was significantly ($p \leq 0.001$) smaller than all other species. Although *Corylus* and *Crataegus* were not significantly different to each other in height, they were significantly ($p \leq 0.001$) smaller than all other species except *Ilex*. *Q. robur* was the tallest species but although it was significantly ($p \leq 0.001$) taller than *F. excelsior*, it was not significantly taller than the other *Quercus* taxa.

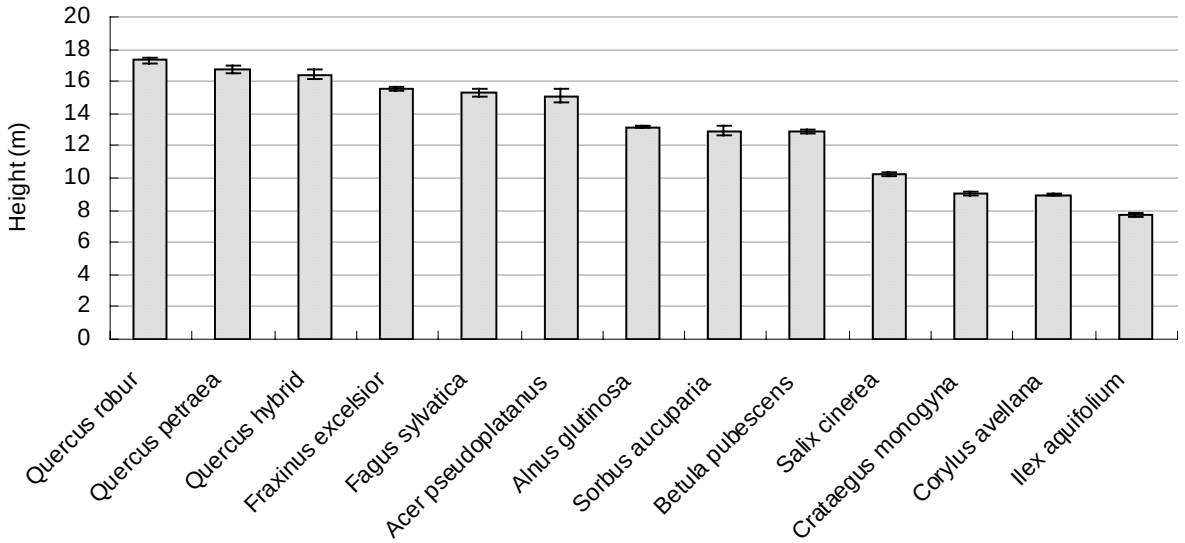


Fig. 3.28 Mean stem height by species
Error bars denote standard error on the mean

Merchantable timber

Merchantable timber was defined as stems with a dbh $\geq$ 40 cm (*c.f.* 2.22). Of the 10,483 stems recorded 455 (4.3%) were of a merchantable size. *Quercus* was the most abundant merchantable taxon: 63.1% of stems greater than 40cm in diameter were *Quercus* (Fig. 3.29). Almost one fifth (17.7%) of all *Quercus* stems recorded were found to be of a merchantable size. *Acer* and *Fagus* were the next most abundant merchantable taxa, with 12.7% and 10.1% of stems of these species being of suitable diameter for sale. For the remaining five frequently recorded native tree species the percentage of merchantable stems was very low (Fig. 3.30).

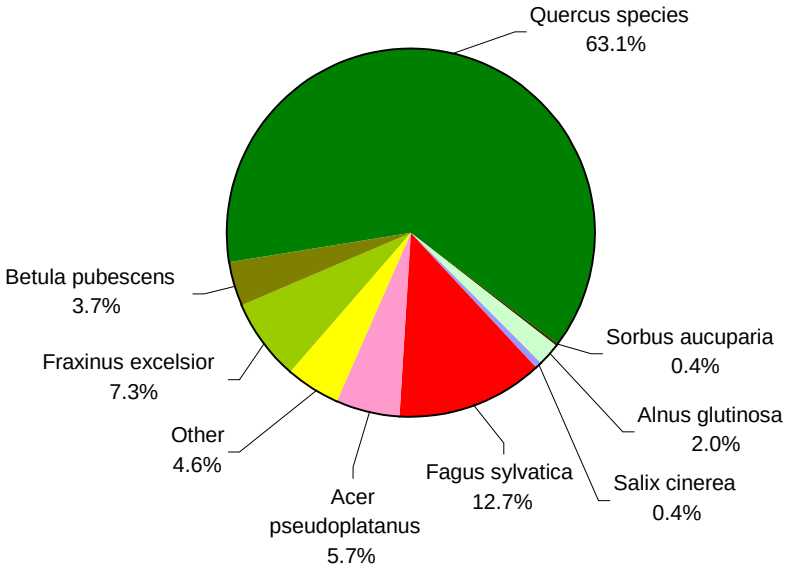


Fig. 3.29 Proportion of stems that are of merchantable size (dbh≥ 40cm)

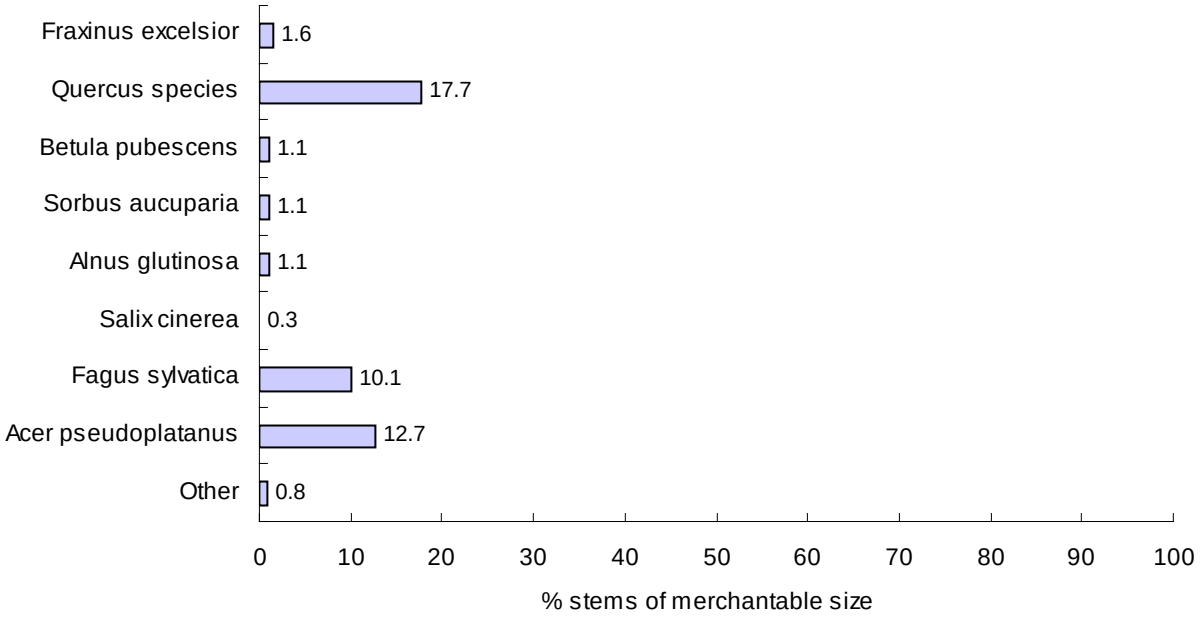


Fig. 3.30 Proportion of stems counted that were of merchantable size (≥ 40 cm dbh)

To assess the quality of the merchantable timber the frequency of various stem defects were recorded (Table 3.21). The most common defects were heavy branches, heavy ivy, forks, kinks/bends and epicormic sprouting, and together these accounted for 86% of stem defects encountered. Often more than one defect was recorded per stem, with the maximum of 5 different defects recorded on one stem.

Table 3.21 The frequency of stem defects on stems of a merchantable size.

Stem defect	No.	Stem defect	No.
Heavy branches	129	Fluted/Buttress	23
Heavy Ivy	112	Damaged	11
Forks	110	Stem galls	4
Kinks/Bends	93	Stem disease	2
Epicormic sprouting	60	Excess taper	1
Lean >10%	39	**All Defects**	**584**

Woodland structure and habitat type

Each relevé was defined according to one of the Fossitt Habitat categories (Fossitt, 2000). Nineteen woodland and scrub habitat categories are defined by Fossitt and eleven of these are relevant to native woodland. The woodland habitat types that had a timber survey carried out during the 2003 field season are listed in Table 3.22.

Table 3.22 The number of relevés surveyed for structural data in 8 habitat types (after Fossitt, 2000).
WS1 and WS2 were combined as only 5 scrub/transitional woodlands were surveyed.

Habitat Type	No. relevés
Oak-birch-holly (WN1)	36
Oak-ash-hazel (WN2)	84
Wet pedunculate oak-ash (WN4)	8
Riparian (WN5)	17
Wet willow-alder-ash (WN6)	29
Bog woodland (WN7)	27
Mixed broadleaved - non-native broadleaf component and maximum 25% conifers (WD1)	28
Mixed broadleaved/conifer - non-native broadleaf component and maximum 75% conifers (WD2)	10
Scrub/transitional woodland (WS1 & WS2)	5
All Types	**244**

Of the eleven native woodland categories, only one, Yew woodland (WN3) was not recorded in the field survey area. The field study was organised so that examples of all woodland types in the area were surveyed, however due to the relative abundance of Oak-ash-hazel woodland (WN2), this type represented 34% of all woodlands surveyed. The structural component of the different woodland types is represented as trees per ha in Fig. 3.31 and basal density (m^2/ha) in Fig. 3.32. Because *Quercus robur* and *Quercus petraea* are used to define some habitat types, the genus *Quercus* was split into the two species and the hybrid for this analysis. Also, as willows are used to help define another category all members of the *Salix* genus, excluding *Salix cinerea*, were included as a single category here, while *S. cinerea* was treated separately.

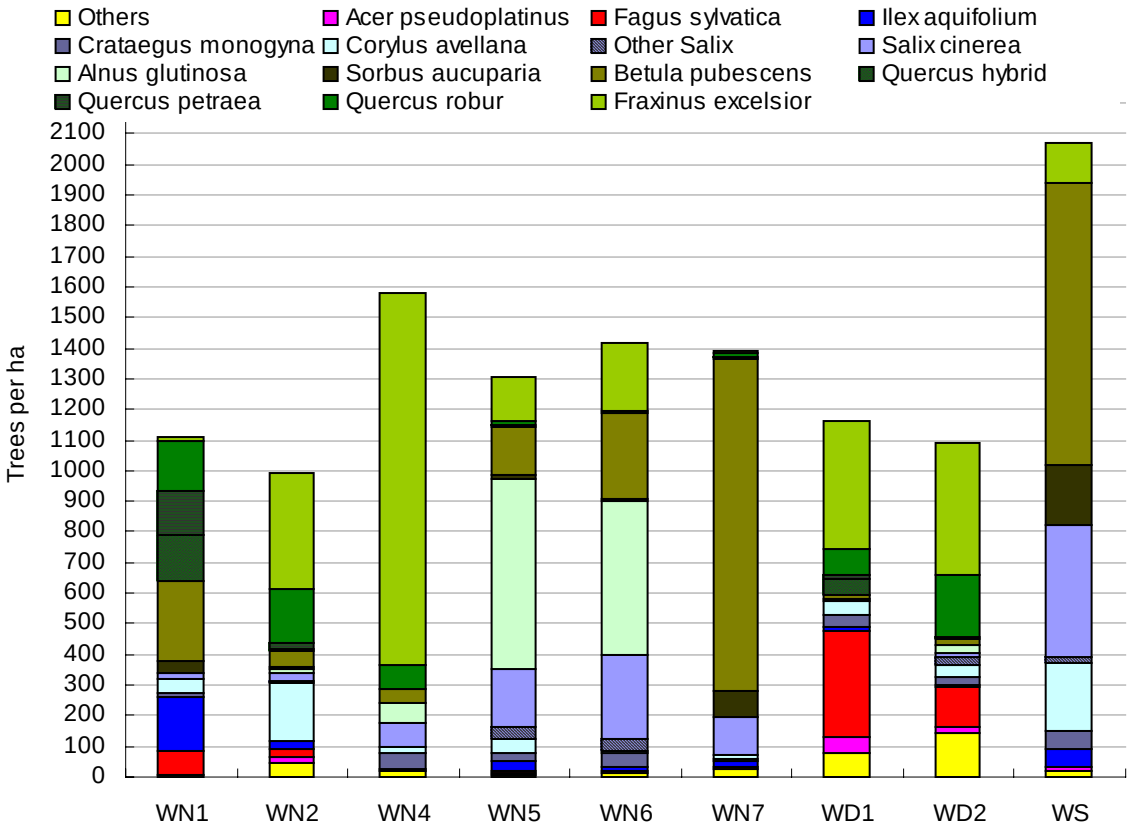


Fig. 3.31 Abundance of tree species in 9 habitat types (after Fossitt, 2000)

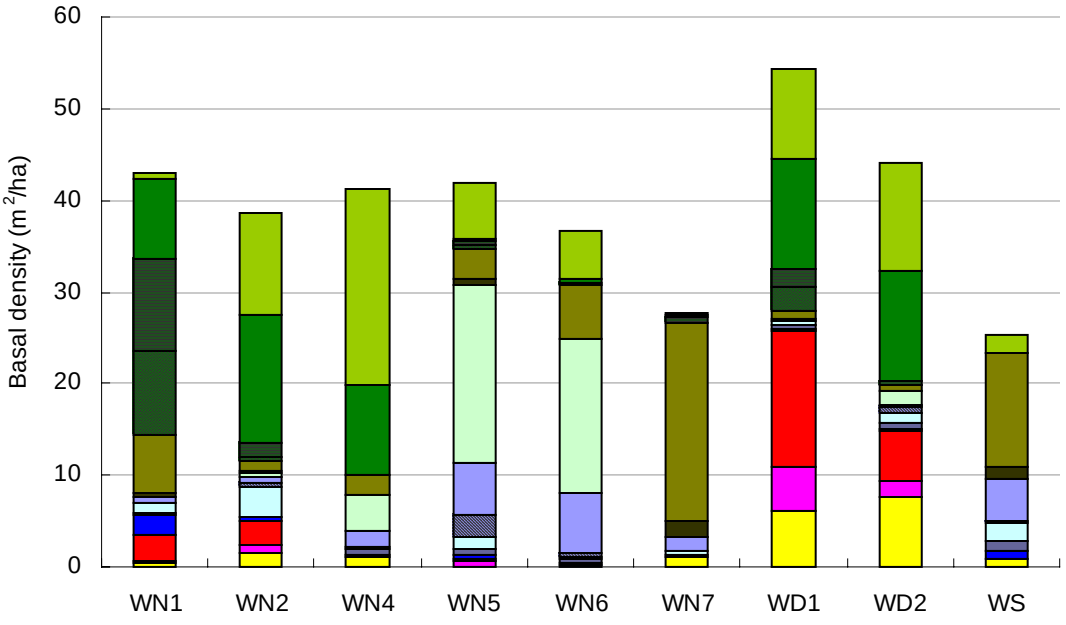


Fig. 3.32 Basal Density of tree species in 9 habitat types (after Fossitt, 2000)

Figures 3.31 and 3.32 illustrates that scrub/transitional woodland (WS1 and WS2) had the highest density of trees with 2070 trees per ha. Oak-ash-hazel woodland (WN2) had the lowest tree density with 995 trees per ha. Basal density shows the opposite trend, with WS1 and WS2 combined having the lowest basal density at 25.3 m^2/ha and mixed broadleaved woodland (WD1) the highest basal density at 54.3 m^2/ha.

Table 3.23 Main tree species (number of stems and basal area) in habitat types (after Fossitt 2000)

Habitat Type	Most abundant tree species	Species with highest basal area
WN1	*Betula pubescens, Ilex aquifolium*	*Quercus robur, Quercus petraea*
WN2	*Fraxinus excelsior, Corylus avellana*	*Quercus robur, Fraxinus excelsior*
WN4	*Fraxinus excelsior, Quercus robur*	*Quercus robur, Fraxinus excelsior*
WN5	*Alnus glutinosa, Salix spp.*	*Alnus glutinosa, Fraxinus excelsior*
WN6	*Alnus glutinosa, Salix spp.*	*Alnus glutinosa, Salix spp.*
WN7	*Betula pubescens, Salix spp*	*Betula pubescens, Sorbus aucuparia*
WD1	*Fraxinus excelsior, Fagus sylvatica*	*Fagus sylvatica, Quercus robur*
WD2	*Fraxinus excelsior, Quercus robur*	*Fraxinus excelsior, Quercus robur*
WS	*Betula pubescens, Salix spp.*	*Betula pubescens, Salix spp.*

3.2.5 Natural regeneration

In each 10 x 10m relevé, all stems of tree and woody shrub species were counted (*c.f.* 2.22, 3.2.4). Stems with diameters (dbh) less than 7 cm were considered to be 'regeneration', and the number of each was counted within 5 height classes for each species. For the analysis the size classes were combined into 2 height categories: < 2 m were considered seedlings; $\geq$ 2m were considered saplings. Shrub species such as *Rhododendron ponticum* and *Prunus laurocerasus* were not included in this analysis. Four relevés contained more than 500 regenerating stems. These high numbers were owing to the fact that hundreds of seedlings of one or more species were present in these relevés. While this is not an uncommon occurrence in woodlands generally, it did not reflect the usual regeneration found in the woodlands surveyed, and so these relevés were not included in the general analysis here. However, details of the regeneration present in these relevés are given in Table 3.24.

Table 3.24 Relevés containing more than 500 regenerating stems, and therefore excluded from the natural regeneration analysis

Relevé	*Species*	*<25 cm*	*26-100 cm*	*101-200 cm*	*201-400 cm*	*>400 cm*	**Total no. regenerating stems**	**No. Seedlings**	**No. Saplings**
096/01	*Acer pseu*	*0*	*2*	*0*	*0*	*0*	**627**	**614**	**13**
	Cory avel	*0*	*0*	*3*	*6*	*0*			
	Crat mono	*0*	*0*	*3*	*7*	*0*			
	Frax exce	*400*	*50*	*6*	*0*	*0*			
	Vibu opul	*100*	*50*	*0*	*0*	*0*			
137/02	*Acer pseu*	*275*	*0*	*0*	*0*	*0*	**641**	**626**	**15**
	Cory avel	*1*	*0*	*0*	*0*	*0*			
	Crat mono	*50*	*0*	*0*	*0*	*0*			
	Frax exce	*30*	*0*	*0*	*0*	*14*			
	Fagu sylv	*0*	*0*	*0*	*0*	*1*			
197/01	*Cory avel*	*1*	*0*	*2*	*1*	*0*	**1124**	**1122**	**2**
	Crat mono	*0*	*2*	*1*	*1*	*0*			
	Fagu sylv	*0*	*5*	*4*	*0*	*0*			
	Frax exce	*1000*	*100*	*0*	*0*	*0*			
	Ilex aqui	*1*	*3*	*2*	*0*	*0*			
	Vibu opul	*0*	*1*	*0*	*0*	*0*			
265/02	*Betu pube*	*5*	*0*	*0*	*0*	*0*	**2024**	**2012**	**12**
	Cory avel	*0*	*1*	*1*	*1*	*7*			
	Frax exce	*2000*	*1*	*0*	*0*	*0*			
	Ilex aqui	*4*	*0*	*0*	*0*	*3*			
	Sorb aucu	*0*	*0*	*0*	*0*	*1*			

Regeneration was generally abundant in most of the woods surveyed. Thirty-five regenerating species were found in total. These are listed in Table 3.25 below, in order of decreasing frequency. Eighteen species occurred in less than 5% of relevés; these are in the right-hand columns of Table 3.25. These species were generally less common, even as mature specimens, in the survey.

Table 3.25 Frequency of regenerating tree species in relevés

Species	% Relevés	Stems	Seedlings	Saplings	Species	% Relevés	Stems	Seedlings	Saplings
Fraxinus excelsior	59	7303	6523	780	*Salix aurita*	4	66	24	42
Ilex aquifolium	54	1852	1486	366	*Pseudotsuga sp*	3	19	6	13
Crataegus monogyna	48	707	382	324	*Q. petraea x robur*	3	40	15	25
Corylus avellana	39	2552	405	2147	*Salix capraea*	2	91	75	16
Betula pubescens	25	801	132	669	*Betula pendula*	1	71	0	71
Acer pseudoplatanus	25	773	700	73	*Picea abies*	1	3	0	3
Fagus sylvatica	19	242	153	89	*Picea sitchensis*	1	2	2	0
Salix cinerea	19	274	22	252	*Prunus avium*	1	3	2	1
Quercus robur	19	116	83	33	*Prunus padus*	1	39	20	19
Sorbus aucuparia	18	307	128	179	*Rhamnus cathartica*	1	6	0	6
Euonymus europaeus	8	507	276	231	*Taxus bacatta*	1	4	4	0
Prunus spinosa	8	184	161	23	*Tilia cordata*	1	11	0	11
Alnus glutinosa	7	169	64	105	*Abies Alba*	<1	1	0	1
Sambucus nigra	7	77	50	27	*Aesculus hippocastanus*	<1	1	1	0
Quercus petraea	6	89	14	75	*Malus sylvestris*	<1	1	1	0
Ulmus glabra	6	202	79	123	*Pinus sylvatica*	<1	3	0	3
Viburnum opulus	6	277	255	22	*Populus deltoides x nigra*	<1	3	3	0
					Ulmus procera	<1	2	1	1

Seventeen species occurred in 5% or more relevés. These are shown in Fig. 3.43. The most frequent species was *Fraxinus*, being present in 59% of plots. *Fraxinus* was also the most abundantly regenerating species, accounting for more than 43% of stems counted. It was more abundant as a seedling than as a sapling (Fig. 3.34). The other common native canopy dominant recorded in this survey was *Quercus robur*; however, regeneration of this species was found in only 19% of relevés, making it as frequent as the introduced *Fagus sylvatica* and less frequent then the introduced *Acer pseudoplatanus* (25% of relevés) (Fig. 3.33). *Quercus petraea* regeneration was also less abundant than that of either *Fagus* or *Acer* (Fig. 3.34).

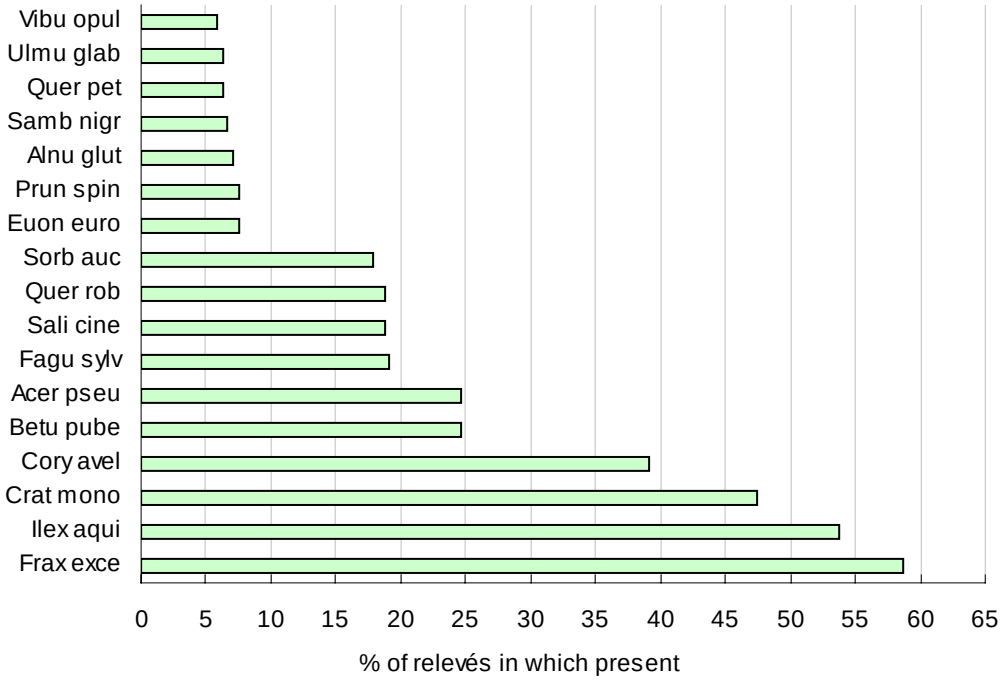


Fig. 3.33 Frequency of tree regeneration in relevés

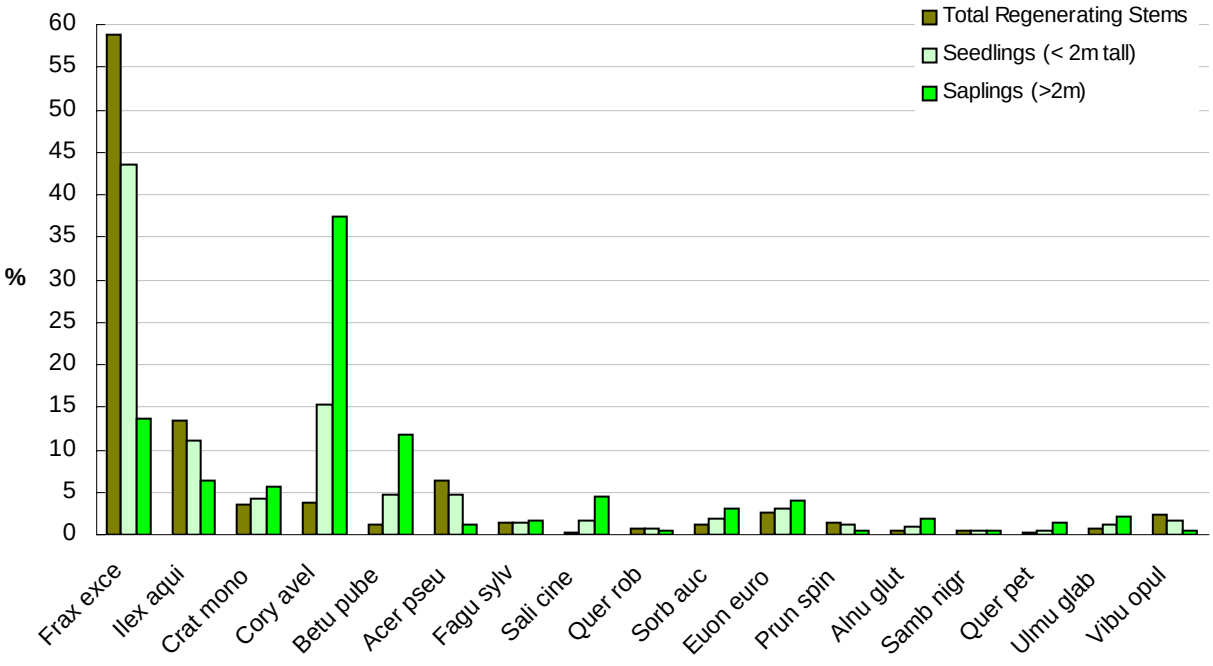


Fig. 3.34 Proportion of natural regeneration as seedlings and saplings

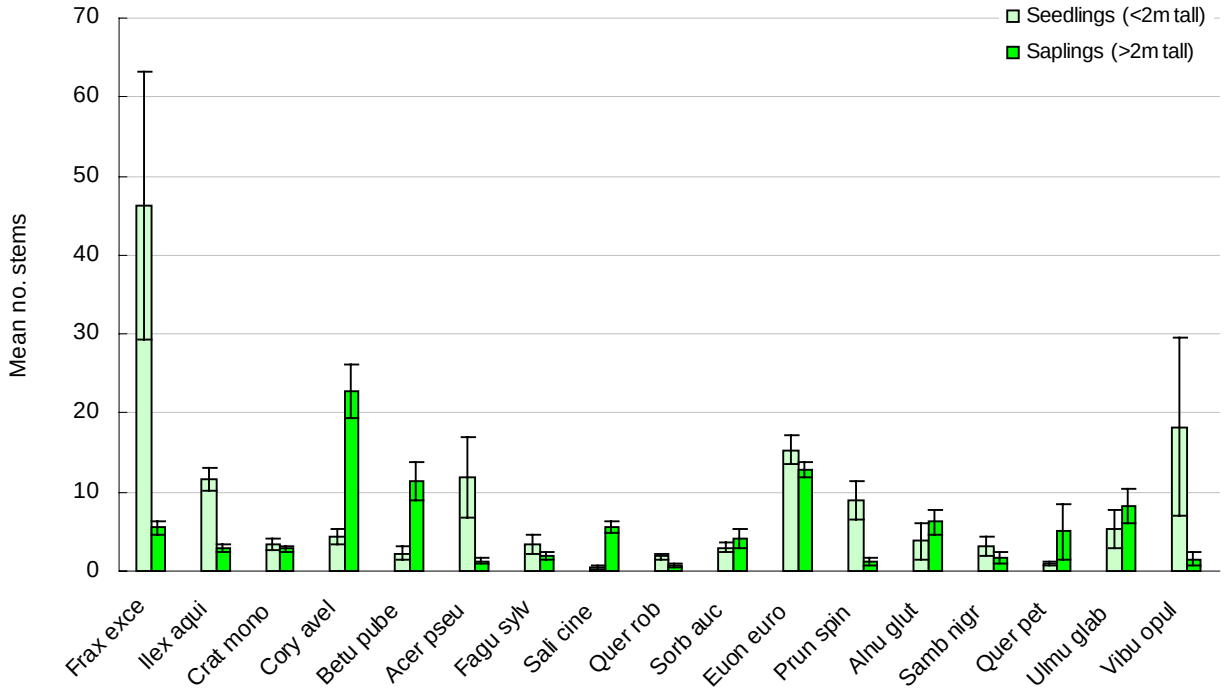


Fig. 3.35 Density of regenerating stems – mean no. stems per 10 x 10 m relevé.
Error bars denote standard error on the mean.

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For many species, there were more seedlings (<2 m tall) present than saplings (Fig. 3.35). This indicates the high mortality usually observed among the seedlings of most plant species. The reverse is true, however for several other species. For *Salix* and *Corylus*, this is explained by the multi-stemmed growth of these species as the data here refer to stem numbers. The large ratio of *Betula* saplings to seedlings probably derives from the large numbers of tall, small diameter stems of this species counted from bog woods. The generally high numbers of saplings counted from relevés throughout the survey are an indication of the low grazing pressure observed at most sites, and also suggest that natural regeneration is proceeding successfully in these woodlands.

The number of regenerating species present within a relevé (10 x 10 m) varied between none and ten. Most relevés had 3, 4 or 5 regenerating species present (Fig. 3.36).

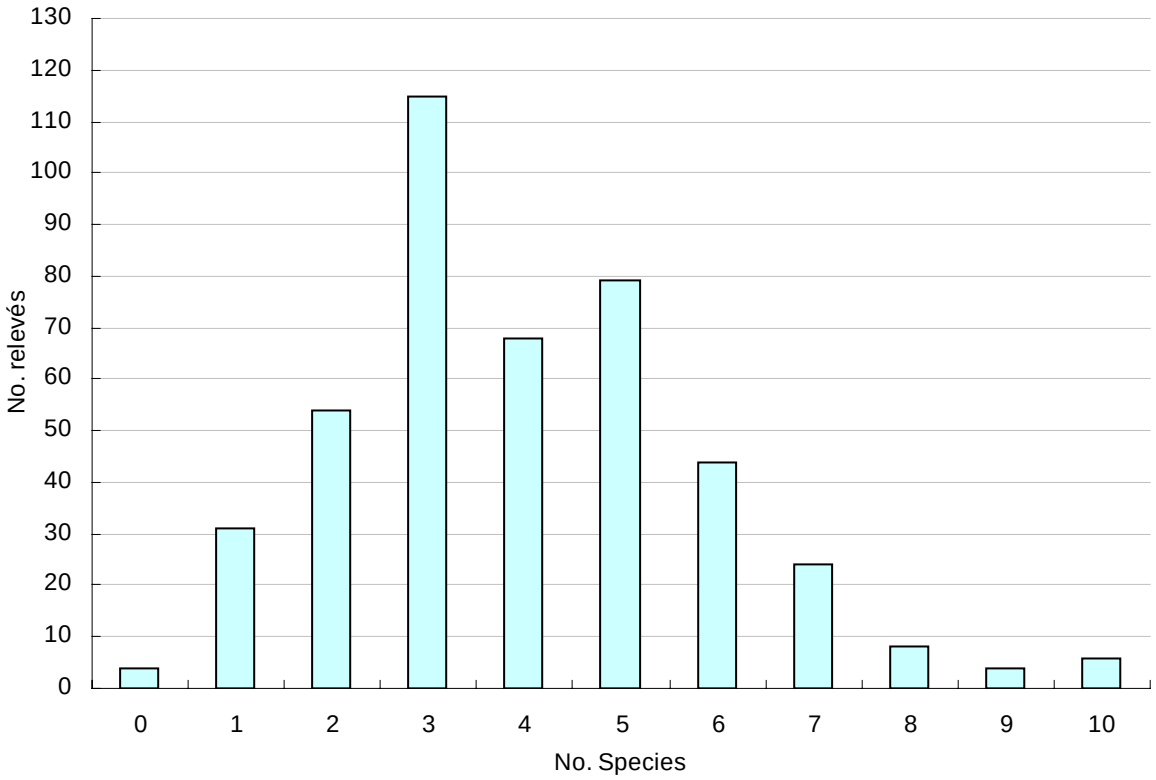

Fig. 3.36 Number of regenerating species present within relevés

The regeneration status of individual species

Stem counts are presented by species in Table 3.26. These data are the combined totals per species, over all relevés recorded. Occurrences of more than 100 stems of a given species in a single relevé have been omitted.

Table 3.26 The abundance of regeneration classes over all relevés for the main tree & shrub species. Counts of >100 for any individual regeneration class have been omitted.

No. Relevés	Species name	<25 cm	26-100 cm	101-200 cm	201-400 cm	>400 cm	Total Stems
94	*Corylus avellana*	79	161	165	561	1586	**2552**
127	*Fraxinus excelsior*	918	197	174	257	470	**2016**
128	*Ilex aquifolium*	568	557	347	218	148	**1838**
59	*Betula pubescens*	31	53	48	129	540	**801**
113	*Crataegus monogyna*	127	120	132	153	168	**700**
57	*Acer pseudoplatanus*	229	133	61	37	33	**493**
42	*Sorbus aucuparia*	49	49	30	41	137	**306**
45	*Salix cinerea*	0	6	16	73	179	**274**
46	*Fagus sylvatica*	97	36	20	28	61	**242**
15	*Ulmus glabra*	1	40	38	62	61	**202**
18	*Prunus spinosa*	53	65	43	19	4	**184**
17	*Alnus glutinosa*	25	28	11	25	80	**169**
18	*Euonymus europaeus*	26	60	34	20	17	**157**
44	*Quercus robur*	37	32	11	11	22	**113**
12	*Viburnum opulus*	4	36	30	19	3	**92**
4	*Salix caprea*	0	75	0	4	12	**91**
15	*Quercus petraea*	5	6	3	6	69	**89**
10	*Salix aurita*	4	4	16	23	19	**66**
5	*Q. petraea x robur*	0	8	6	9	16	**39**
2	*Taxus baccata*	0	2	2	0	0	**4**

The proportionate abundances of the different regeneration classes give some insight into the population structure of each species within the study region.

Long lived high canopy species

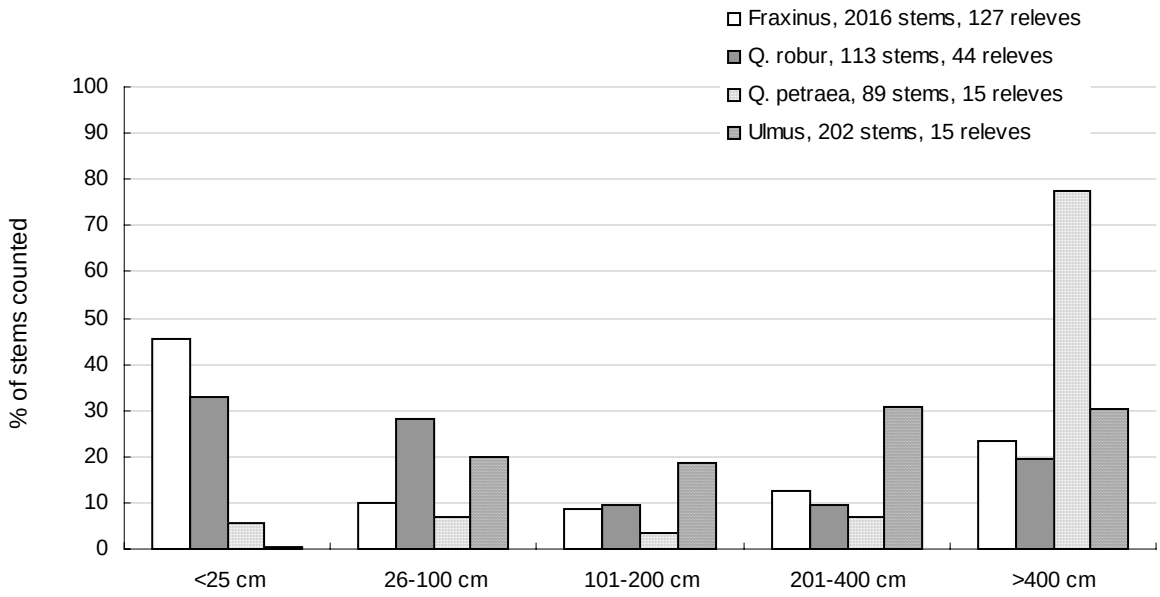

Fig. 3.37 Distribution of regenerating stems of long-lived native canopy species among 5 height classes

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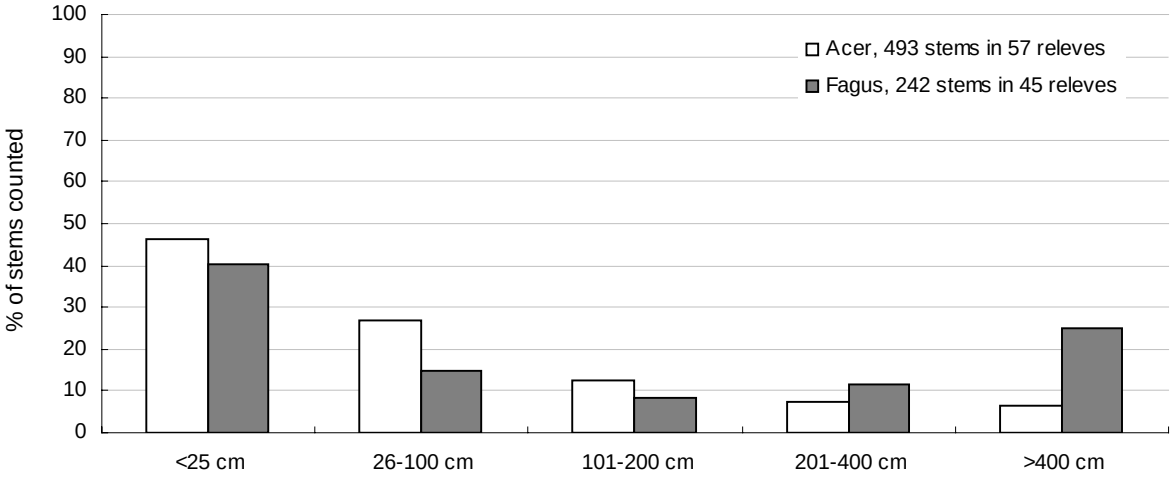


Fig. 3.38 Distribution of regenerating stems of *Acer* & *Fagus* in 5 height classes

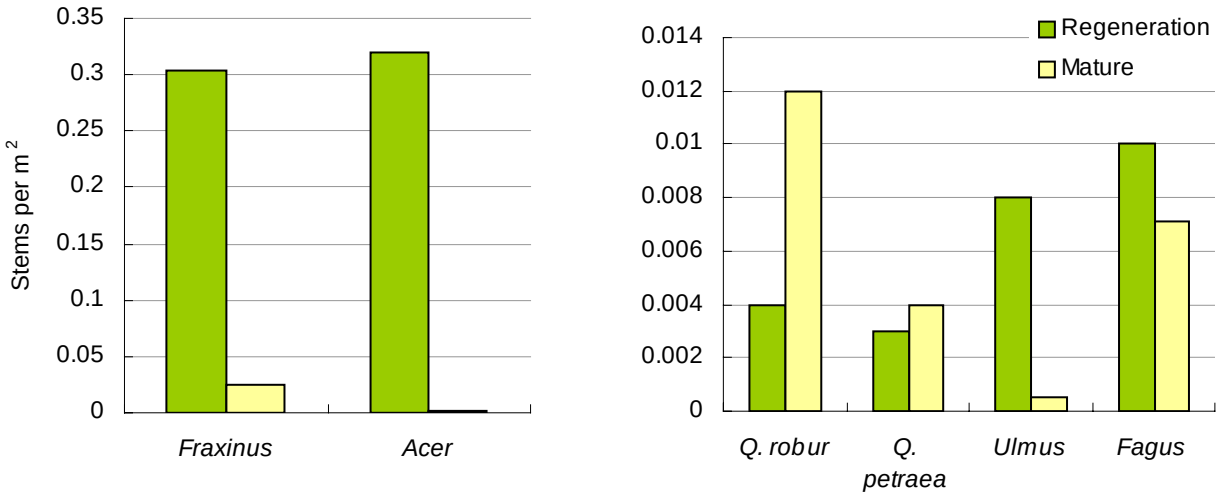


Fig. 3.39 Densities of mature (dbh>7cm) and regenerating (dbh<7cm) stems of the main canopy dominants. *Densities were calculated from the total area from which each group was recorded i.e. 2,400m^2 for regeneration and 18,180m^2 for mature stems.*

Figs. 3.37, 3.38 and 3.39 illustrate the abundance of regeneration of the main canopy species recorded during this survey. *Acer* and *Fagus* were more common than all of the native canopy dominants, except *Fraxinus*. All species were represented in every regeneration class, but both oak species were more frequent as mature individuals than as regeneration. *Ulmus* was very rare as a small seedling, only one individual < 25 cm tall being recorded (Fig. 3.37), however regenerating stems were much more abundant than mature specimens (Fig. 3.39).

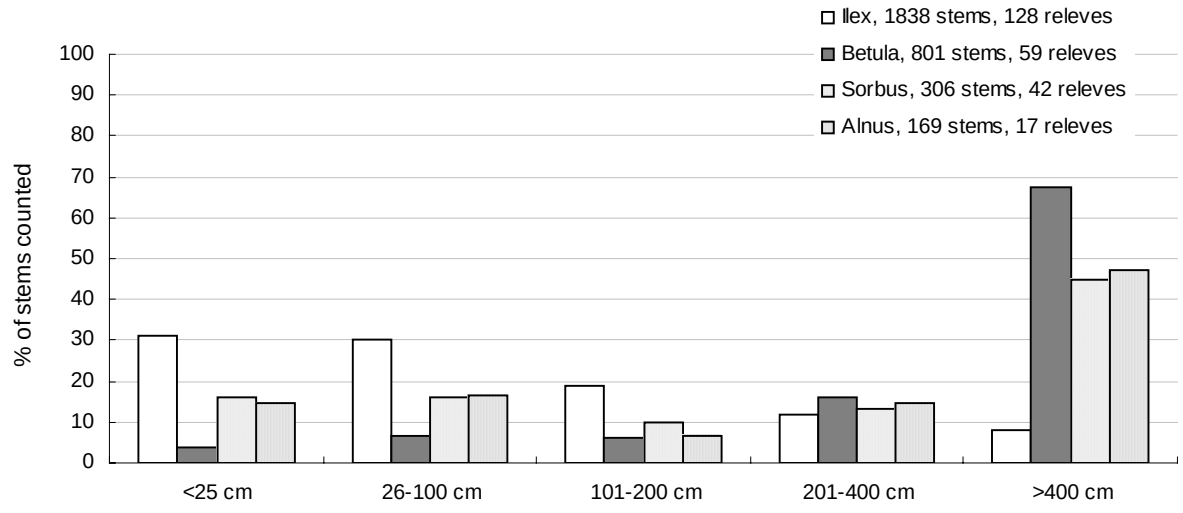


Fig. 3.40 Distribution of regeneration of other tree species among 5 height classes

Ilex is a constant prodigious producer of seed and has a high germination rate. This is reflected in the large proportion of seedlings (up to 1m) counted in relevés. This species is a common feature of the understorey and can survive suppressed light levels below intact canopy.

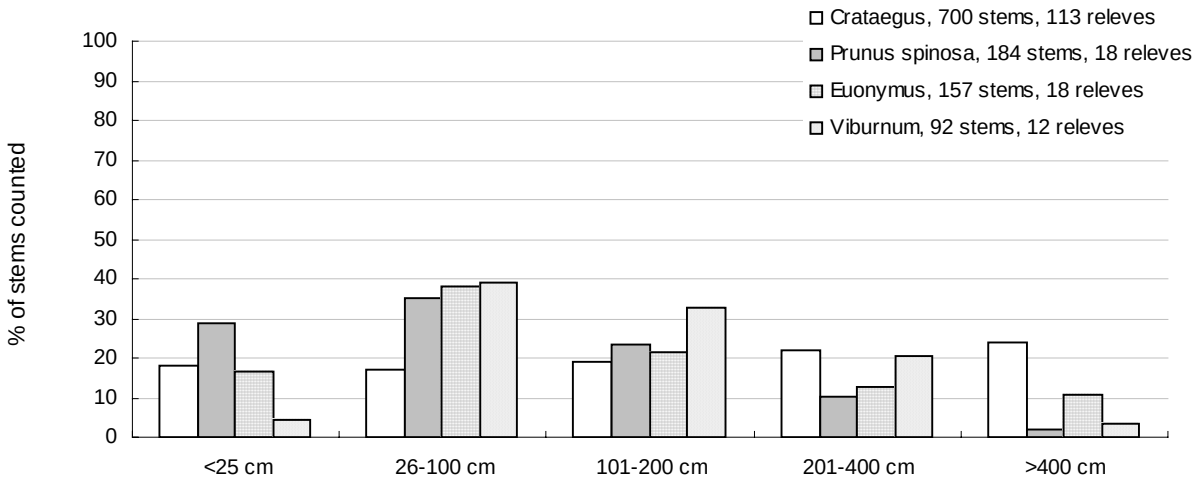


Fig. 3.41 Distribution of regenerating stems of subcanopy species among 5 height classes

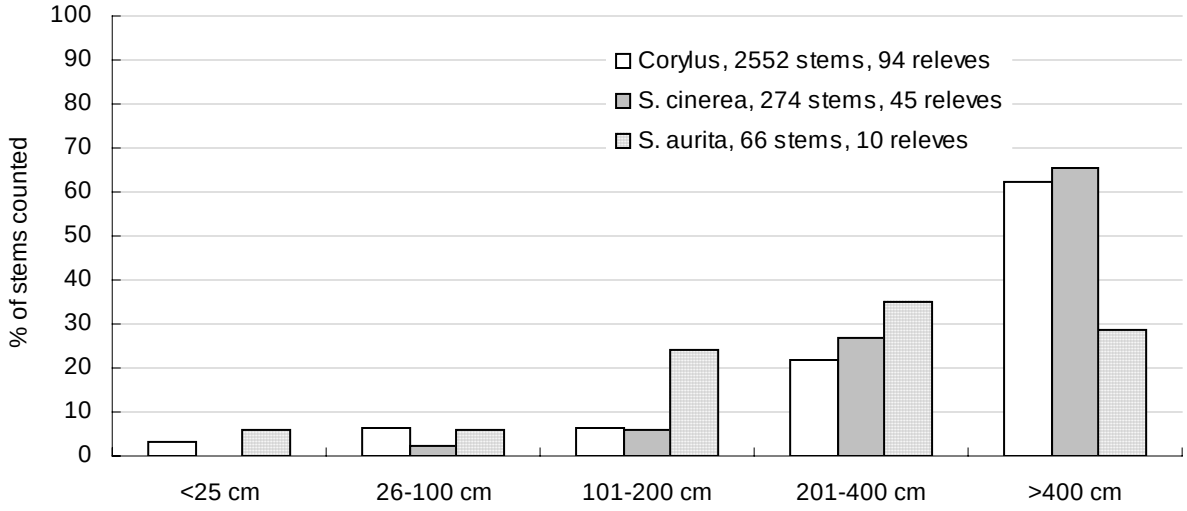


Fig. 3.42 Distribution of regenerating stems of multi-stemmed tree species among 5 height classes

Regenerating stems of shrub species such as *Crataegus, Viburnum* and *Euonymus* were distributed fairly evenly among the height classes used, illustrating ongoing recruitment of new individuals in these species (Fig. 3.41). The tall shrubs/small trees illustrated in Fig. 3.42 are naturally multi-stemmed and rely on vegetative reproduction more so than seed production, hence the small number of seedlings compared to taller stems. Coppicing was often observed for these species with up to 30 poles growing from a single stool.

4 Conservation of Native Woodland

This section brings together key elements of the field data (Section 3) in order to assess the conservation value of the woodlands surveyed and to investigate the factors that affect this. Many factors contribute to the conservation value of a woodland site. Three important indicators of conservation value are species diversity, naturalness in terms of species composition, and naturalness in terms of stand structure. The relationships between some woodland features and these status indicators are investigated here.

4.1 Relationships between woodland characteristics

4.1.1 Species diversity

A full species list of vascular plants and bryophytes was produced for each woodland site surveyed (Appendix 7). Species that were found only in man-modified situations *e.g.* maintained tracks and car parks are omitted from diversity scores, so that only the more 'natural' parts of the sites are considered. Both tree and shrub diversity and vascular plant diversity in general were found to increase with woodland area in this study (Fig. 4.1).

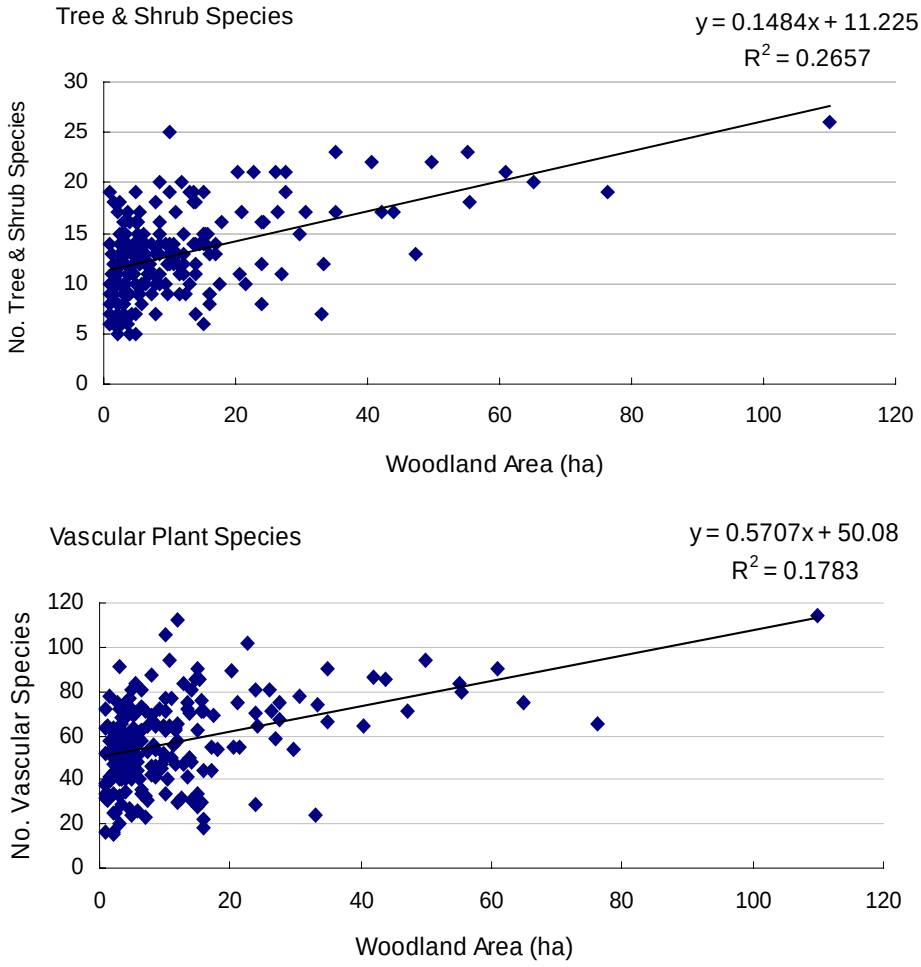


Fig. 4.1 The relationship between woodland area and species

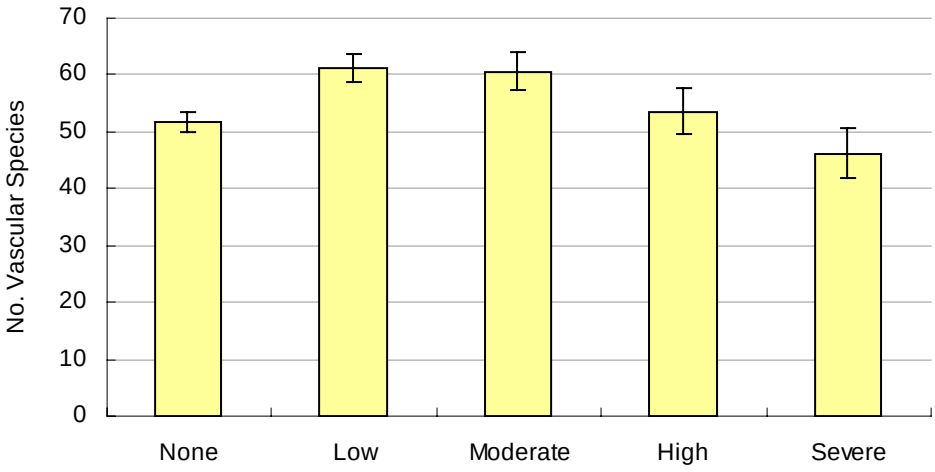


Fig. 4.2 Variation in species diversity with grazing level

There was some variation in species diversity with grazing level. Severely grazed woods had fewer species of vascular plant. On average, higher plant diversity was recorded from sites that were lightly or moderately grazed (Fig. 4.2).

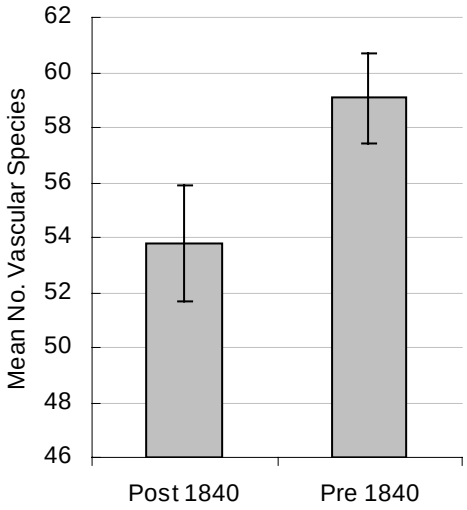


Fig. 4.3 Variation in species diversity with woodland age

Older woodlands were found to be only slightly more species rich than more recent stands (Fig. 4.3).

4.1.2 Native species composition

All woodland surveyed in this study contained a higher number of native species than non-native. Nine sites (out of 204) were composed entirely of native species. Ninety percent of the flora of a further 139 sites was native and in total 197 of the 204 sites surveyed had a flora that was 80-100% native. No site contained less than 69% native species. However, the actual cover by native species was often less. Fig. 4.4 compares the nativeness of woods that were mapped on the first edition Ordnance Survey maps (1840) with later woods. Older woods contained proportionately more non-native species. This probably reflects the fashion for planting of exotic species in demesne woods in the 18th and 19th centuries. *Acer* and *Fagus* were the two most frequently occurring non-native species recorded in the survey, and were listed at 162 and 154 sites respectively.

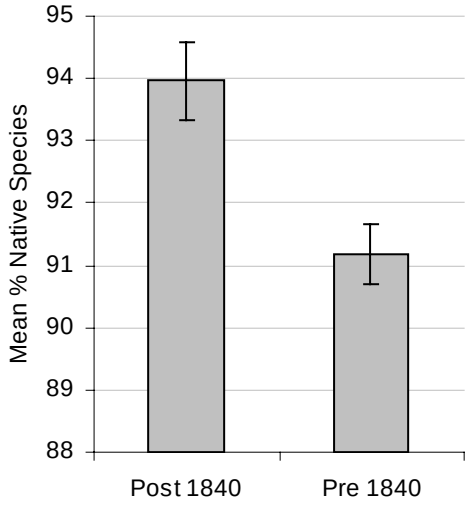


Fig. 4.4 Variation in proportion of native species in flora, with woodland age

4.1.3 Structural Diversity

Diversity in tree size (diameter) reflects diversity in tree composition and in age structure. This was evaluated by calculating the standard deviation (σ) of stem diameter from the mean value within each relevé (or expanded relevé *c.f.* 2.22). Higher standard deviations reflect greater heterogeneity of structure. Standard deviation of stem diameter was found to vary from 1.4 to 42 cm. Values were assigned to three classes with σ <10cm described as low diversity, 10-20cm as medium diversity and >20cm as high structural diversity. However, an examination of the data did not show vascular plant species diversity to change significantly with structural diversity. One reason for this could be that the relevé size (10 x10 m) used for measuring species abundance was too small to record the effect of structural diversity on vascular plant diversity. Another reason could be that structural diversity has a more important effect on the diversity of taxonomic groups other than vascular plants such as beetles.

Another important component of semi-natural woodland is successful natural regeneration. This was also assessed on a relevé basis (*c.f.* sections 2.22, 3.2.5).

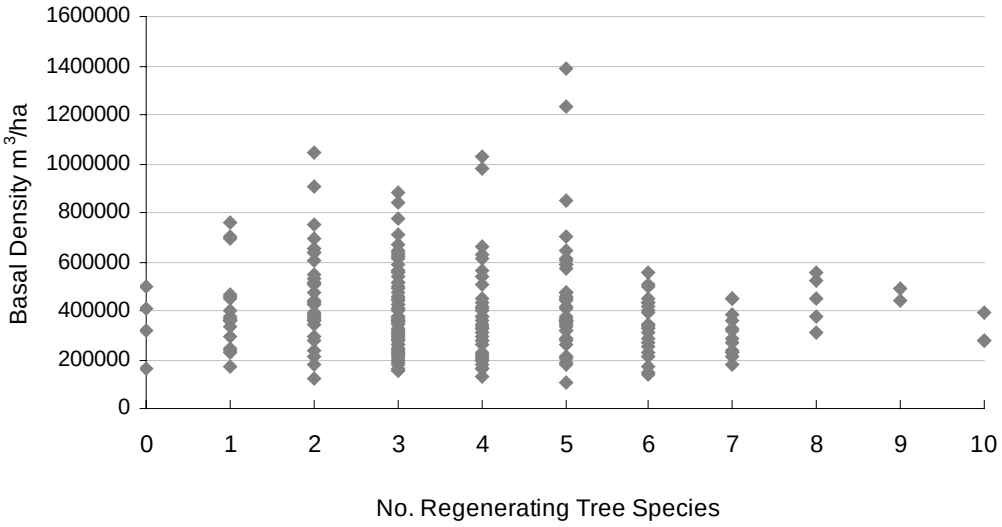


Fig. 4.5 Variation in number of regenerating species per relevé with basal density

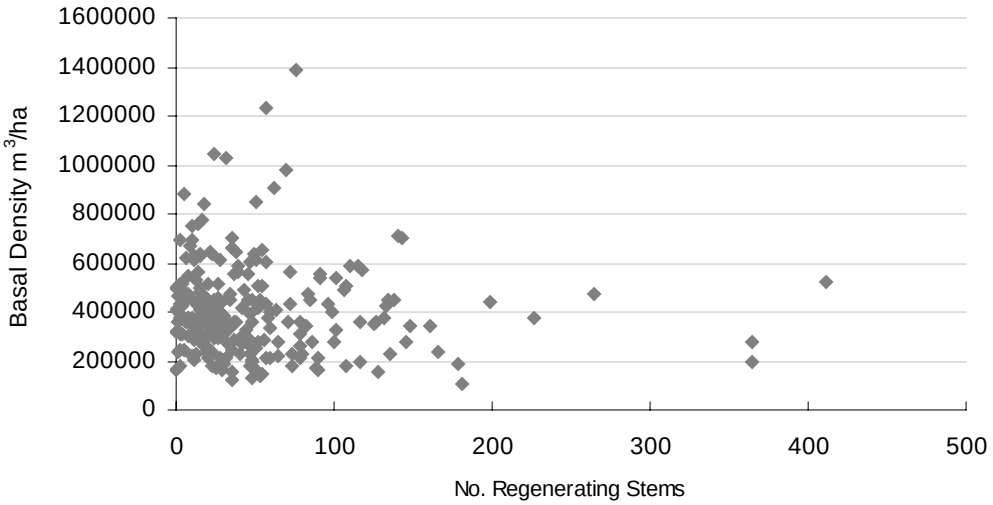


Fig. 4.6 Variation in the abundance of regenerating stems with basal density

There was no clear relationship between diversity or abundance of regeneration and canopy density (Figs. 4.5 & 4.6). However, both high abundances and high diversity of regeneration were found in relevés with lower basal density *i.e.* less dense canopy. When canopy cover by *Fagus* and *Acer* are considered (Fig. 4.7), it is found that the abundance generally decreases as cover of these species increase.

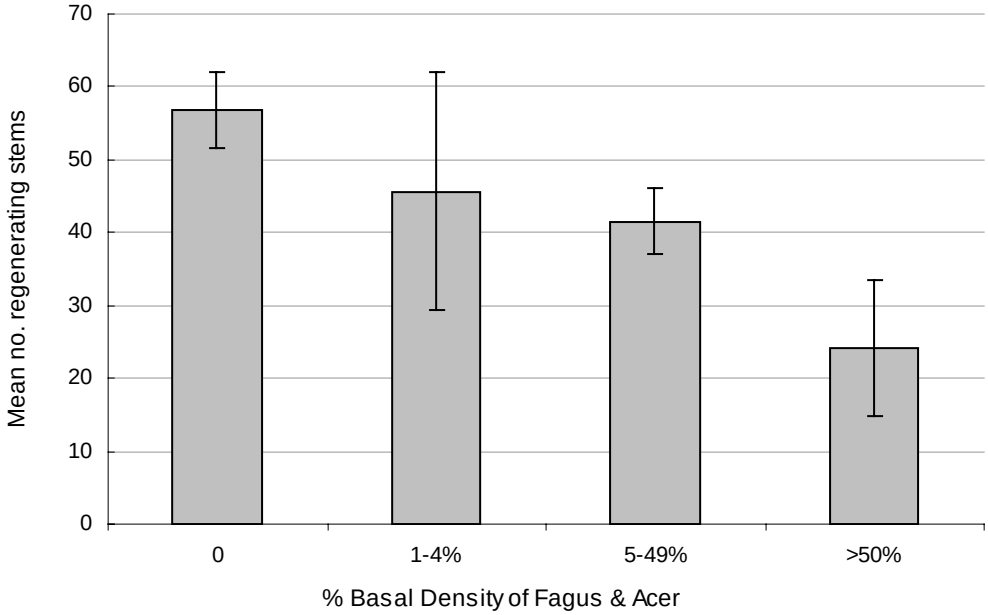


Fig. 4.7 Variation in mean number of regenerating stems with the basal density of Fagus and Acer expressed as percentage of the total basal density recorded in a wood.

4.2 Evaluating the Conservation Status of surveyed woods

Conservation of habitats is often best achieved on a site by site basis, with specific management plans based on the individual characteristics of a given habitat at a particular site (management, history, rarity etc.). However, it is also useful to be able to evaluate sites in the context of others, and to make general comparisons regarding status. In the longer term, this is also important for monitoring individual sites, so that the effects of any management (conservation orientated or otherwise) may be objectively assessed. The present survey was designed in order to collect baseline data from semi-natural woods in Ireland. These data were intended to provide deeper insight into the range of types of native woodland that exists in this country, and equally importantly, into the issues that affect their conservation. To this end, the site survey procedure demanded data collection on a number of specific factors that are intrinsic parts of the woodland ecosystem, and which may be used to help to evaluate woodland condition. Perhaps the most important of these is naturalness. The data used to assess naturalness of woodland sites in this survey were:

- native species diversity;
- natural regeneration potential;
- heterogeneity of structure;
- the presence of dead wood.

In addition to these basic indications of woodland status, other features that may contribute to conservation value were recorded. These were:

- area (ha);
- longevity (as deduced from presence of the stand on the first edition Ordnance Survey maps;
- diversity of woodland (and other semi-natural habitat) types within the site;
- the presence of hydrological and other landscape features;
- the proximity of semi-natural habitats;
- other features of interest such as the presence of old coppice stools or rare/notable species.

Certain factors (often the legacy of previous management) can detract from the conservation status of a site, and these must also be evaluated. This survey sought to identify such issues, and for evaluation purposes these are regarded as threats to the woodland here. Factors that were regarded as potential threats to the woodland were:

- the presence of invasive shrub species;
- sub-optimal grazing pressure;
- a high proportion of naturalised non-native species in the canopy;
- a high proportion of non-native species in the flora;
- damaging activities such as dumping, felling of natives etc.

The raw data pertaining to all of these has been summarised and presented in preceding sections. Site by site data are contained within the accompanying database and summarised in Appendix 9. There follows an attempt to bring these data together in such a way that comparisons may be made between sites as to

their current condition (*i.e.* how good a native woodland is this?) and their threats (*i.e.* what threatens this site, and how severely?).

The key elements of woodland data listed above and in Section 3 were used to produce 15 categories of data (sub-scores) that can be used to calculate a conservation score for each site surveyed. A similar approach has been used previously by Van der Sleesen & Poole (2002) and by the working group on biodiversity assessment in forests (Neville, 2002). In addition the approaches taken by Ratcliffe (1977), Kirby (1988) and Cross (1990b) were considered when approaching this problem.

While the overall conservation score of a site may be useful for making comparisons between sites, examination of the values for the different categories scored (sub-scores) will give clearer insight into the status and issues that affect each site.

The listing of key data types presents a simplified protocol for the monitoring of native woodlands that will allow the biodiversity and conservation value of a wood to be assessed and any changes in these over time to be monitored. It should be noted that the conservation value of any wood must also be judged in the context of the threats that it is exposed to and therefore the conservation score presented for each woodland (Appendix 10) must be considered in the context of its threat score (Appendix 11).

The 15 sub-scores that were used to calculate the conservation score can be divided into two groups. They are listed below (Table 4.1) with details of how each was calculated. Rows 1-6 represent the naturalness/development of a wood. Rows 7-15 represent features that can enhance the naturalness/biodiversity of the wood. Because the data in rows 1-6 directly represent naturalness they were allocated some of the highest scores in the table with the highest score being 4 for the number of native vascular plant species. Rows 1-6 can contribute a maximum score of 19. It should be noted that canopy height was originally included in the conservation assessment of a site but due to the fact that important woodland types such as wet woodland and bog woodland tend to have lower canopies than other woodland types it was decided not to include it in the final table as it would bias any conservation score in favour of woodland types with higher canopies. Rows 7-15 represent 9 of the 15 categories and due to the larger number of categories the weighting of each was generally expressed as 1/0 to try and ensure that this section of the table would not contribute more to the final conservation score than the naturalness/development section. The two sub-scores in this section of the table that are more heavily weighted are area, which ranges from 1-6 and the number of native habitats in a wood, which ranges from 1-4. Area scores above 3 are reserved for the 12.5% of field sites that had an area greater than 20 ha and the lack of higher scores reflect the rarity of large areas of native woodland in Ireland. A score of greater than 2 for ‘number of native habitats’ is reserved for the 14% of field sites that had greater than 2 habitat types again to reflect the conservation value and rarity of such native woodland sites in Ireland. The maximum score that rows 7-15 can contribute to the conservation score is 17.

Table 4.1 Factors used to assess the conservation value of each site.

Factor/Sub-score	Calculation of score	Max.
Naturalness/Development categories		
No. of native vascular plant species	1=<40 species, 2=40-59 species, 3=60-80 species, 4=>80 species	4
No. of bryophyte species	1=<5 species, 2=5-10 species, 3=>10 species	3
No. notable lichen species	0=0 species, 1=1-3 species, 2=4-5 species, 3=>5 species	3
[1]Regeneration of tree species	0=0 saplings, 1=1-4 saplings, 2=5-10 saplings, 3=>10 saplings	3
[2]Horizontal diversity	1=σ of <10 cm, 2=σ of 10-20 cm, 3=σ >20 cm	3
[3]Notable species	0=0 species, 1=1 species, 2=2 species, 3=≥3 species	3
Contributing categories		
Area (ha)	1=<5, 2=5-9.9, 3=10-19.9, 4=20-49.9, 5=50-99.9, 6=≥100	6
[4]Native habitat types	1= 1 habitat, 2=2 habitats, 3=3 habitats, 4=≥4 habitats	4
Presence in the 1840s	0=woodland not mapped, 1=woodland mapped	1
Adjacent semi-natural habitats	0=no adjacent s-n habitats, 1=≥1 adjacent s-n habitats	1
Natural hydrological features	0=none of the hydro. features (excluding ditches) listed in the methods 1=≥1 of the hydro. features (excluding ditches) listed in the methods	1
Standing dead/damaged wood	0=none of the dead wood categories of standing dead/damaged & snags recorded at a level of frequent or higher 1=one of the dead wood categories of standing dead/damaged & snags recorded at a level of frequent or higher	1
Woody debris	0=none of the woody debris categories recorded at a level of frequent or higher 1=one of the woody debris categories recorded at a level of frequent or higher	1
Coppiced/pollard	0=neither coppice or pollard recorded, 1=coppice or pollard recorded	1
Man made features	0=no notable man made features recorded 1=ditches, walls, ruins, exclosures, lazy-beds or other notable feature	1
Maximum Score		**36**

[1]Regeneration of tree species refers to the total number of saplings (> 2m) recorded in each relevé - when 2 or more relevés were recorded at a site the highest value was used. [2]Horizontal diversity as described above is the standard deviation (σ) of tree diameter (dbh) for each site, when 2 relevés or more were recorded the highest value was used. [3]These are listed in Table 4.2. [4]All native habitats listed in Fossitt (2000) could contribute to the number of native habitats, as long as the area the habitat covered represented at least 5% of the woodland, but the majority recorded habitat types were woodland

Table 4.2 Notable vascular plant species associated with woodland. The list of species is adapted from van der Sleesen & Poole (2002), with the removal of 2 species which are not considered woodland species and the addition of two rare species that are associated with woodland habitats

Species	Species
Anemone nemorosa	*Lamiastrum galeobdolon*
Bromus racemosus	*Melica uniflora*
Campanula trachelium	*Milium effusum*
Carex depauperata	*Monotropa hypopitys*
Cephalanthera longifolia	*Neottia nidus-avis*
Dryopteris aemula	*Orobanche hederae*
Festuca sylvatica	*Primula veris*
Frangula alnus	*Prunus padus*
Galium odoratum	*Pyrola media*
Gymnocarpium dryopteris	*Pyrola minor*
Hordelymus europaeus	*Rhamnus cathartica*
Hypericum hirsutum	*Stachys officinalis*
	Trichomanes speciosum

As stated above, a conservation score can be a useful tool when monitoring native woodland sites, but it can also be used to rank sites which have been surveyed in a similar manner to each other. However, the ranking is based only on the conservation importance of the site as native woodland and does not take account of individual species, such as protected mammals or birds, for which a native woodland site may be an important habitat. In such cases a native wood that may be of low conservation value in itself, will have an overall importance, due to the protected animal species for which the woodland is providing habitat. The sites from this survey that scored highest according to this evaluation system are listed below (Table 4.3).

Table 4.3 Sites from the present study ranked by their conservation score. For the full scores for each of these sites refer to appendix 10. The maximum possible score is 36 and the minimum possible score is 4. All of these sites scored highly on most of the categories that contribute to the score and all have an area of 10 ha or more.

Site No	Site Name	Score	Rank
15	Borris	27	1
4	Killoughrum Forest	26	2
176	Cushcallow	24	3
86	Clooneen	23	=4
151	Bricketstown House	23	=4
154	Ballyboggan Lower	23	=4
211	Newtown Lower	23	=4
254	Knockbawn	23	=4
255	Mortons Grove	22	=10
256	Coolnamony	22	=10
296	Corbally	22	=10
321	Brownstown	22	=10

As stated above it is important to assess the conservation value of a wood in terms of its threats. (Appendix 11). In establishing threat scores for the native woodland sites 5 factors were used.

Table 4.4 Five factors used to assess the threat level to native woodland. The maximum threat score is 13 and the minimum threat is 0. The 8 invasive shrub species are listed in Fig. 3.16 and the threat score for the site was calculated from the highest level of invasiveness. The four main damaging activities recorded in this survey were dumping, felled native tree species, new broadleaf exotic planting and new conifer planting.

Threat Category	Calculation of Sub-score	Max.
Invasive shrub species	0=none recorded, 1=low level invasiveness, 2=high level invasiveness	2
Grazing	0=low/moderate grazing, 1=no grazing, 2=high grazing, 3=severe grazing	3
Non-native canopy	0=no non-native species recorded in the canopy 1=a non-native species recorded in the canopy as abundant or dominant	1
Damaging activities	0=no damaging activities, 1=1 damaging activity, 2=2 damaging activities, 3=≥3 damaging activities	3
% of non-native species	0=0%, 1=1-5%, 2=6-10%, 3=11-20%, 4=≥20%	4
Maximum Score		**13**

It is interesting that if the conservation score is now discussed in the context of the threat score, more informative comparisons can be made. For example the top ranking site in terms of conservation score is Borris (Site Code 15) but this site also has the second highest threat score due to the high level of invasive shrub species, the high percentage of non-native vascular plants and high number of damaging activities.

5 Discussion

5.1 Inventorying & data collection

The primary objective of the national survey was to identify and demarcate existing stands of native woodland in Ireland. It was felt that the most rational approach to take to achieve this was to identify existing relevant datasets and to make maximum use of these. During the course of this study the GIS platform FIPS was identified as the main data set on which the Native Woodland Survey would be based and additional information was incorporated into it from the Coillte database, NPWS database and the Parent Material Classification Project.

GIS are now routinely used around the world to create inventories and aid the management of natural resources, as they allow a level of spatial analysis that was difficult previously. Although there are some problems associated with their use, which are outlined below, their relevance to the conservation of natural habitats is increasing (Wadsworth & Treweek 1999, Yli-Kojola 1995). GIS is already widely used in the commercial and public sectors in Ireland *e.g.* Coillte, Teagasc, Dept. Marine & Natural Resources. During this study the use of a GIS platform allowed native woodlands to be analysed at a spatial scale that had not been possible for the native woodland pilot study (van der Sleesen & Poole 2002). However, during the course of the study some of the problems in using GIS data sets were also encountered.

Two problem areas were recognised when trying to utilise the relevant GIS data sets. The first of these came from the fact that the different GIS platforms have used data from different sources, some of which was remotely sourced from aerial photographs and satellite images and some which came from ground based surveys. Remotely sourced data has the advantage of allowing large areas to be surveyed but the disadvantage that it tends to have a lower level of resolution than data collected on the ground. An additional problem is that some remotely sourced data sets have been more extensively verified on the ground than others. All these differences can result in the same polygon being defined at different levels of detail, making the combination of data sets that hold information on this polygon difficult. The second of the two problems is that the accuracy of the digitisation process varies depending on the personnel involved and the end use of the data e.g. legal designation requires a greater level of accuracy than the designation of a forestry management parcel.

This study required the modification of one data set (FIPS) to suit our specific objective, and also the addition of information from three other data sets (Coillte, NPWS and Parent Material Classification Project). When combining these GIS data sets there was a problem with a lack of consistency in the digitised boundaries for the same site in different data sets. As Purdy & Ferris (1999) point out, this problem is difficult to avoid as different data sets will have often been digitised by different people in different organisations and with different objectives. As a result of this, while the woodland cover assessment may match between data sets at the larger spatial scale, variation in the digitisation of data and the verification process may make the merging of data at a site level difficult.

In addition, the basic unit used by FIPS (parcel) was often only a component of what was considered as an area of contiguous woodland by ground surveyors. This problem was partially overcome by merging all parcels of the same woodland type and retaining all associated attribute data. However, for larger, more complex sites, such as Camolin, that had large felled areas and conifer areas in addition to sections of native woodland, such a simplistic approach was not possible. In such cases the situation can be partially resolved using aerial photography but the only accurate resolution will be obtained by carrying out a site visit.

It should be noted that this project does not present a review of GIS and its applications in forestry in Ireland but represents a phase of starting to bring GIS data sets together to assess the state of native woodland in Ireland. Currently the Forest Service is working to harmonise the different GIS data sets that are relevant to the management of woodland in the State. Also as stated in National Biodiversity Plan (2002) FIPS must continue to be adapted and updated to maintain the accuracy of the system. Where surveyors working on projects such as this one visit FIPS sites, any refinements in the mapping details or attribute data at a site should be passed on to those responsible for updating the system.

Collation and integration of all existing native woodland data sets was an important part of the national survey. In addition to the GIS data sets discussed above, various data relating to native woodland in Ireland exist as many disparate sources, such as unpublished reports and theses, field notes, relevé data etc. Initially it had been a stated aim of this project to assimilate all of the data into the newly created native woodland database; however this task proved unrealistic at this stage. The main problem encountered was attempting to match mapped FIPS polygons with the study areas variously described in the relevant sources. This reiterates the need for a national biological data management system that would be co-ordinated by the national biological records centre: action 41 of the *National Biodiversity Plan* (Anon 2002).

Requesting that data are submitted and stored digitally (in database or spreadsheet form) would increase the ease with which different datasets could be combined, as would a system that would allow databases to be updated online. This latter procedure has been proposed for the survey of ancient and long-established woodland in Northern Ireland (Y. McElarney, pers. comm.). The publication of otherwise unpublished reports on the web in PDF format would also increase accessibility of data.

At a national scale, time did not allow for specific research into the histories of individual sites. There is particularly important information contained within estate records and survey maps (*c.f.* Jones 1986, Rackham 1995, Nicholls 2001). However, all relevant references were stored in an Endnote database that is shown in its printed form in Appendix 6. Accessing and interpreting these data sources requires time and expertise, however it is a worthwhile investment if we are to achieve a depth of understanding of our landscape comparable with that for England (Rackham 1980).

5.1.1 National inventory of native woodland

Analysis of the existing FIPS database confirmed previous estimates (at *c*. 80,000 ha) for the cover of native woodland in Ireland (Neff 1974, Cross 1987a). However, this figure does not include stands less than 1 ha in extent and so may actually be a slight underestimate. Conversely, these 77,047 ha do include mixed stands, some of which will certainly not be native woodland. The 77,047 ha of native woodland currently accounts for 13.5 % of the 571,344.5 ha of land utilised for forestry.

During this project a survey of aerial photographs (2000) was undertaken to test the accuracy of FIPS and in particular, to see if it was missing significant areas of native woodland. The accuracy of FIPS was shown to be 88.7% which is very close to the overall accuracy of 88 % published by Gallagher *et al.* (2001). The most frequent woodland type that FIPS did not record was scrub, which was probably due to its less distinct physical structure than other woodland types. In total the aerial photograph study estimated that up to 10,251 ha of mostly woody scrub $\geq$ 1 ha was missing from FIPS. However, it should be noted that in addition to testing the accuracy of FIPS the analysis of aerial photographs was also recording the changing landscape from 1995 (the aerial photograph set used to produce FIPS) to 2000 with areas felled and scrub areas having developed over the period.

A true value for the area of native woodland in Ireland cannot be arrived at until a more complete field survey has been carried out, and as Purdy & Ferris (1999) state 'GIS data are useful for assessing woodland and landscape parameters at the broad scale, but do not eliminate the need for more detailed ground surveys'.

The high proportion of sites in private ownership (Fig. 3.5) is a clear endorsement of the emphasis of recent conservation schemes on non-state owned lands (SACs and Native Woodland Scheme). As only approximately 5,500 ha of woodland is conserved in National Parks and Nature Reserves that are owned by the State (Heritage Council 1999), designated areas represent a chance to conserve much larger areas of woodland. Although few areas are established for woodland alone, analysis carried out during this study show that 15,179.9 ha of woodland are located within SACs, and according to Higgins (1999) this figure is increased to 30,252 ha when NHAs are also included. It is important to recognize however, that some sites containing large areas of woodland, *e.g.* East Burren SAC (Code 1926) have been designated for other habitat types, in this case turlough and limestone pavement habitats, and the development of hazel woodlands may be seen as conflicting with the over-riding conservation objectives here.

This is a timely inventory as the emphasis on native woodland and its conservation has probably never been greater (*c.f.* 1.4.2). It is planned to increase the national forest cover to 17% by 2030 and the proportion of broadleaved species to be contained will be increased to 30% (Anon. 2002). Specific plans to increase the area occupied by native woodland are also underway (Forest Service 2001). All of these schemes are best enacted with as deep an understanding of the current resource as possible. Any increase in the area of native woodland is probably best achieved by the restoration of former sites (see Smith *et al.* 2003), however, the spontaneous development of scrub and woodland on abandoned grazing lands

following CAP reform will also help to achieve this aim, and is to be generally welcomed, the protection of important grazing dependent habitats notwithstanding.

Within this general increase in the area of broadleaf woodland the majority of the newly planted broadleaf species will be native and of local provenance if actions 65 and 66 of the National Biodiversity Plan are adhered to (Anon 2002). With the current fragmented nature of native woodland in Ireland (Fig. 3.1) it is important for the future management and conservation of the resource that the new or restored areas of native woodland are strategically planned to increase the area and also reduce the fragmented nature of this habitat. With areas of woodland > 100 ha only representing 0.1% of all FIPS polygons and 4.1% of the total native woodland area there is a need to try and increase the number of large areas of native woodland in the State. Where the planting or restoration of native woodland will not adversely affect the status of other sensitive habitats it would enhance the protection of these new areas if they could be used to extend the area of native woodland types within SACs. County Kerry, with 49.9% of the native woodland in the county contained within SACs, is an example that could be applied across the whole country ensuring that half of all the native woodland in the state was provided with some protection. However, it should be noted that designation is only an initial phase in the conservation of any habitat and management policies would also need to be implemented with the restoration of native woodland as their primary aim.

Within the National Biodiversity Plan (Anon. 2002) the proposed aim of restoring 15,000 ha of existing native woodland could include a plan to reverse the fragmentation of native woodland in Ireland, in particular ancient and long-established woodland. Such a plan has already been put forward in the UK (Purdy & Ferris 1999, Gkaraveli *et al.* 2004). Purdy & Ferris (1999) have also put forward a methodology for using a GIS platform to help chose where new native woodland planting is carried out to reduce woodland fragmentation and produce networks of native woodland. Although they also provide an argument against aiming for large continuous areas of native woodland as they point out that many small woods covering the same total area as a single large wood could contain more species as they span a wider range of soils, slopes and aspects. If a strategy of reducing woodland fragmentation is adopted in Ireland the status of woodland edge species e.g. *Campanula trachelium* would have to be monitored to ensure that any expansion in woodland is not done to the detriment of these species.

5.2 Field survey in five counties

5.2.1 Methodology

This survey involved the testing and refinement of a two-tiered field methodology that was designed with a national scale survey in mind. The adoption of a two-tiered approach is useful as, in general terms, a less intensive survey is often required owing to the limitation of time and resources. By identifying key factors that are of relevance to general woodland conservation (*e.g.* grazing level, regeneration, invasive species) and applying some standardised but quickly applied method to the assessment of these, a good overall evaluation of the status of a site and the threats present may be gained. The recording of detailed floristic and structural data on a relevé basis can then add extra depth to the data, when time allows.

Ideally, a relevé should be recorded for every site, but given that the most expensive part (both financially and time-wise) of field survey is often accessing the site, a minimum level of standard criteria should be assessed at all sites visited. The structural data recorded here proved useful in describing the naturalness of woodland stands.

It is of vital importance that as similar a method as possible be adopted for subsequent phases of the present inventory and for other woodland surveys where possible. The validity of drawing comparisons between results of different surveys decreases as methodology diverges. The data recorded in this survey are similar to those used by various others (Browne *et al.* 2000, Kirby *et al.* 2002, Neville 2002, van der Sleesen & Poole 2002) and should be suitable both for initial (baseline) woodland assessment and for monitoring purposes. The adoption of standard survey criteria would mean that even data sets gathered for different objectives could contribute, at least at the basic level, to the national woodland dataset.

5.2.2 Features of native woodland in the survey area

As this field survey was restricted to one geographical region of the country, most conclusions are only pertinent to woodland in this region and only limited statements can be made regarding the national native woodland resource on the basis of the data collected. Nonetheless, important information about the woodland of this region has been gathered. During this survey, 204 woodland sites covering ~ 2,400 ha were fully surveyed and a further 108 sites were visited but were not fully surveyed (Table 3.9). This means that over a quarter of the native woodland identified from FIPS (8, 037 ha – Table 3.2) in the survey area was surveyed.

In the survey area, as was the case nationally, the majority of sites were small (less than 5 ha) and very few sites extended over more than 100 ha (Fig. 3.4). The most significant woodland type encountered, both in terms of frequency and abundance, was oak-ash-hazel woodland (WN2) and this result is not surprising given the predominantly calcareous bedrock and brown earth soils in the region. It differs from the perceived national situation however. Acid oakwood (WN1, Blechno-Quercetum) is considered to be the most abundant native woodland type that remains in Ireland (Neff 1974, Poole *et al.* 2003) but this type was recorded from only one tenth of sites surveyed here. It should be noted that much of the published research in Irish woodlands has been based in woods of this type (*e.g.* Kelly various, Telford 1974, *c.f.* Poole *et al.* 2003). As the native woodland survey is extended, a more accurate description of the geographical distribution of the different woodland types will evolve. The survey as it is extended across the country will also provide information on a well documented network of woodlands that will hopefully be utilised by woodland ecologists when planning their research.

The high number of sites assigned to mixed broadleaved woodland (WD1) was the direct result of the widespread abundance of two exotic species *Acer pseudoplatanus* and *Fagus sylvatica* in the canopies of the woodlands surveyed. In terms of recorded timber data ($\geq$7 cm dbh), *F. sylvatica* was the 7th most

frequent tree species in the study area and had the 3rd highest total basal area, and *A. pseudoplatanus* was 12th most frequent tree species. The impact of these species has been noted by previous authors (Dierschke 1982, Quinn 1994), but they were more frequent and at higher abundances than we had expected. They also certainly have a negative impact on the native flora, and as the basal density of *A. pseudoplatanus* and *F. sylvatica* at a site increased the number of plant species significantly decreased (Table 3.19) and the level of native tree regeneration also decreased (Table 4.8). Despite the role of these species in commercial forestry in Ireland, on the basis of this evidence we conclude that they should not be planted within native woodlands. Many of the woods in the survey region classified as WD1 would have otherwise been classified as WN2 or WN1.

Wet woodlands were reasonably abundant in the survey area. Together they (WN4, 5, 6 & 7) accounted for almost one fifth of the area surveyed. The abundance of WN4, 5 & 6 can be attributed in part to the presence of major river systems (Barrow, Nore, Suir and Slaney) within the survey area. Bog woodland (WN7) was the most frequent of the wet woodland types, covering 5.6% of the surveyed area and all of these sites were associated with bogs in Counties Offaly and Laois.

Yew woodland (WN3) was the only semi-natural woodland type (after Fossitt 2000) that was not recorded during this survey. This was not unexpected as it is a very rare habitat type, usually associated with limestone pavement which is rare within the survey area.

5.2.3 Classification of native woodland

A comprehensive phytosociological classification of Irish woodland can only be completed once a systematic survey of broadleaved woodland in Ireland has been completed. Therefore this project did not attempt to provide a comprehensive classification of woodland type, but instead discussed the woodlands surveyed in the context of existing classification systems. The standard scheme of broad habitat classification presented by Fossitt (2000), and applied in the field during this survey, proved to be reasonably robust. Multivariate analysis of the relevé data gathered here resulted in groups that were largely compatible with the categories proposed by Fossitt (*c.f.* 3.2.3). As would be expected, transitional woodland types were more difficult to classify. Transitional types were most often observed between WN1 and WN2, WN7 and WN1 and this is reflected in the distribution of these types in the ordination analysis, and across the TWINSPAN dichotomies. Wet woodlands surveyed in this study proved to be a highly variable and diverse group. Overall, soil pH and water regime appeared to be the main environmental factors that determined woodland type. This trend is well documented for woods from other parts of Ireland (Cooper 1984, 1985; Cross & Kelly 2003; Kelly & Moore 1975; Kelly & Kirby 1982; Cross 1998). More detailed analysis of these and subsequent data in the future will allow for a deeper understanding of the factors that affect woodland composition on a range of scales.

5.2.4 Woodland structure

As WN2 was the most frequently recorded woodland type, it was not surprising that ash (*Fraxinus excelsior*) was the most frequently recorded tree and that pedunculate oak (*Quercus robur*) covered the largest basal area (Table 3.20). The most surprising result was the low number of merchantable stems ($\geq$ 40 cm) recorded during the survey with only 4.3% of all stems $\geq$7 cm being considered to be of merchantable quality. Of these the majority were oak. In addition, the majority of merchantable stems had at least one stem defect recorded and during the survey very little evidence of tree management such as pruning was observed, except for some removal of heavy ivy. It may aid the management of native woodlands if landowners are made aware of the value of their woods in terms of timber and non-timber forest products (NTFPs) and how to manage the woodland to conserve biodiversity and maximize economic returns. The Native Woodland Scheme is incorporating this measure, and the principle is also being taken on board by Coillte under their Sustainable Forest Management policy.

5.2.5 Threats to native woodland

Grazing & invasive shrubby species

Overgrazing and infestation with *Rhododendron ponticum* have been cited as the two main issues affecting Irish woodland (Neff 1974). Woodlands surveyed during this study were not subject to high or severe grazing, but were generally either lightly grazed or not at all. This is in marked contrast with the situation in most Irish woodlands that have been the subject of grazing studies (Telford 1974, Kelly various, Hayes *et al.* 1991, Higgins 2001, Higgins *et al.* 1996, 2001); however none of these previous studies had been carried out within this project's survey area. Similarly, natural regeneration was usually frequent in the woodlands surveyed here, and was lacking only in the few sites that were heavily grazed. The difference in grazing pattern between woodlands surveyed here and those elsewhere (chiefly in the west of Ireland) may be explained by (i) higher emphasis on arable and mixed farming in the south-east compared with sheep farming in the west; (ii) higher availability of quality grassland of pasture in the east compared with that (marginal heath and bog) in the west; (iii) expanding populations of deer species (particularly sika deer) especially in the west.

In some cases it was questionable whether the grazing pressure might have been too low. The highest species diversity was recorded at sites with some (low or moderate) grazing, and Mitchell & Kirby (1990) suggest that no grazing at all is not ideal for semi-natural woodland. Kirby (1998) found that where *Rubus fruticosus* agg. was allowed to dominate (*i.e.* in ungrazed situations) there was a corresponding decrease in biodiversity. However, in the same study the absence of bramble (associated with grazing pressure) was also correlated with lower species diversity. Such a comparison was not undertaken in this study.

Heavy grazing pressure in the woodlands surveyed here was usually associated with over-wintering of cattle within woodlands. Such woods were dominated by grassy species, and often had large amounts of bare soil present owing to severe poaching of the ground.

Rhododendron was neither as widespread nor as invasive in the woodlands surveyed here, compared with woods in the west, especially Killarney. This is likely to be a factor of soils and also grazing regime. The well developed field layer present in most of the surveyed woodlands would have eliminated suitable germination sites for the tiny seeds of rhododendron. The most frequent invasive shrubby species in the study area was cherry laurel (*Prunus laurocerasus*) and although *Rhododendron* and laurel could not be considered a widespread problem in the woods studied, where they had established dense thickets they shaded out much of the native vegetation beneath them. The same precautions are necessary in the south-east as in the west of Ireland. If woodland is to be managed with the conservation of native diversity as a priority, then rhododendron and laurel should be removed effectively. This will prevent further infestation and habitat damage if conditions for its expansion (e.g. increased grazing pressure) improve.

Other threats

Other more minor threats to woodland were observed during the survey, in particular the poaching of ash stems for hurley making. While this does not reduce diversity in the wood, it may alter the future canopy composition if ash is repeatedly removed before it is allowed to reach maturity. Most sites however had an abundance of ash stems, so if the level of poaching remains stable it is unlikely to cause any major change to the canopy composition. Dumping was observed at a number of sites. While this often does not have an obvious influence on the ecosystem function it is unsightly and detracts from the visual appearance of the wood and the wilderness value of the site.

5.3 The assessment and monitoring of native woodlands

Nature conservation by necessity will involve the trade-offs of the expenses of time, money and expertise against yields of information and the detail of experimental data (Palmer, 1987). The application of standard methodologies at a larger scale increases the usefulness of data and the efficiency of management. The application of such an approach is not new (AFF 1981, Lockhart *et al.* 1993, Kirby 1988) and development and application of an assessment scheme for native woodland would allow for rational decisions based on reliable compatible data sets. Such an assessment scheme would be of use both for initial evaluation and ongoing monitoring of sites. Most such schemes involve the scoring of a site on various criteria that are considered to be important *e.g.* size, rarity, typicalness (Ratcliffe, 1977).

This survey has attempted to identify the main factors pertinent to native woodland conservation and to summarise these by way of a scoring system. Such a system comes with provisos however; sites must be judged on their overall merit, and the application of a single number to a site could prove not to be useful

if used inappropriately. To avoid this, we attempted to summarise each of the factors that were considered to be of merit and retained these sub-scores (Appendix 10, 11). This means that the overall status of a given wood can be easily assessed, but more importantly, the factors that contribute to that status are also clearly understood. The woodland ecosystem is as complex, if not more-so, than any other and there are many interconnected factors that affect woodland status. When assessing a woodland site we have divided the criteria that state how valuable, in conservation terms, a site is (conservation score) from the factors that reduce this value (threat score). However, the two are very closely related, and it is important that the scores presented examined in the context of each other. It is hoped that by defining scores for important factors e.g. invasive shrubs, that data from other surveys, which may have been gathered in a somewhat different way can be used to calculate the conservation and threat scores for such sites.

5.4 General conclusion

This first phase of National Native Woodland Survey has brought together a range of data sets, both GIS and non-GIS based, that provide information on the many native woodland sites throughout the country. A native woodland database and associated GIS platform has been established. As GIS resources such as the Parent Material Classification Project and the digitisation of designated areas are completed these can be added to the database, increasing the accuracy and amount of relevant data.

The field survey of woodland in the south-east of Ireland has resulted in a network of 204 surveyed sites that have helped to define and increase the understanding of the woodland resource in this previously little studied region. In addition to supplying base-line data, the survey has highlighted management issues, most importantly that of invasive species and to a lesser extent grazing regimes. The impact of non-native canopy species, most importantly beech and sycamore, will require careful consideration when planning the future conservation management of native Irish woodland.

The native woodland database will provide an accessible and comprehensive foundation on which future native woodland research in Ireland can be based. An assessment and monitoring scheme has been proposed that should be adopted for the remainder of the native woodland project. It is vital that the survey be continued so that the necessary basic data will be available to ensure the successful conservation of the Irish native woodland resource. On completion of the survey a network of studied sites representing the heterogeneity of native woodland types in the country will be available as a conservation and research resource.

Appendix 1: Sample of Site Pack prepared for each site before field survey

KH. Sk. 128

BEC - Native Woodland survey

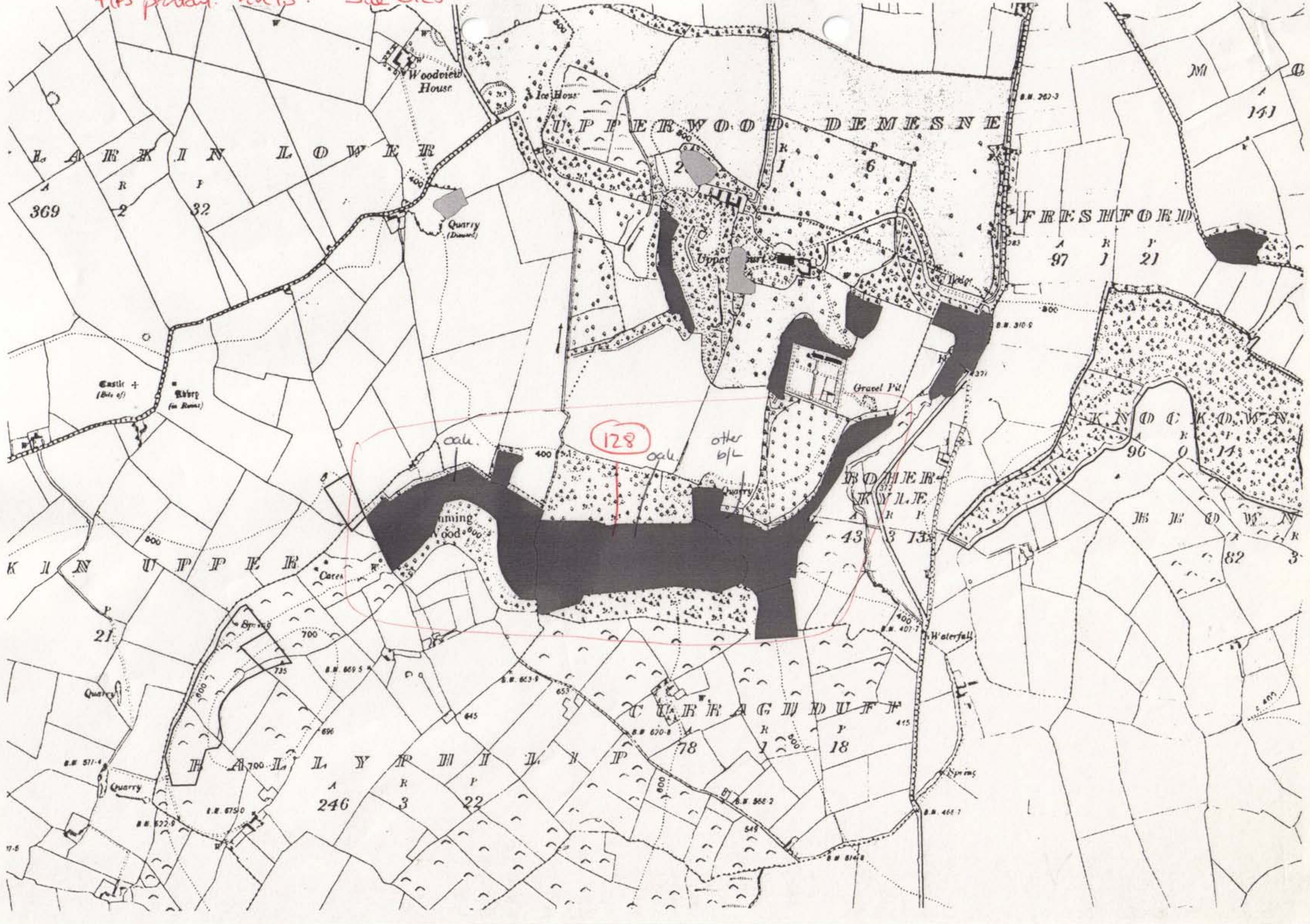
Data sheet for sites selected

SITE_ID	0128
Unique FIPS ID	1522
FIPS_ID (Parcel no)	62528
AREA (ha)	18.01 ha Broadleaves.
WOODLAND_NAME	Browns Wood.
TOWNLAND_NAME*	Curraghduff, Upperwood Demesne.
DED -TOWNLAND_ID	197-02, 197-04, 197-26,
NAT_GRID_LETTER	S
NAT_GRID_EAST	397
NAT_GRID_NORTH	632
DISCO_MAP_NO	60
6 INCH_SHEET	KH13
AERIAL PHOTO NO	3808
NHA/SAC_CODE	—
OWNERSHIP	90% CT. 10% Private.
Wood present in 1840s?	map not available on Duchas browser.
GUESS Woodland type	Deciduous.
FOREST_REGION	?

Checklist

2 copies aerial photo 398%	✓
2 copies 6 inch sheet	✓
2 copies of FIPS printout	✓

Fips printout. KK13. Site 0128



AP: 3808 24-8-00 398%. Site Code: 0128 (Browns Wood). ↑North

Appendix 2: Sample field sheets used in the 2003 survey

(A)

Site ID		Management		Veg. comm		%	Evidence of grazers		Regeneration (incl. exotic spp) dafor				
Team		Old native planting		**WN1** oak birch holly			Deer		**Sp.**	**Sd**	**Sp**	**P**	**M**
Date		Recent native planting		**WN2** oak ash hazel			Cattle						
Releves:		Recently felled natives		**WN3** yew woodland			Sheep						
General		Old b/l exotics planting		**WN4** wet oak ash			Rabbits						
Altitude range *m*		New b/l exotic planting		**WN5** riparian			Hares						
Slope		Old conifer planting		**WN6** willow alder ash			Goats						
Aspect		New conifer planting		**WN7** Bog			Invertebrate						
Site area (ha)		Recent exotic felling		**WD1** mixed b/l			Other:						
		Mature coppice		**WD2** mixed b/l + co			**Grazing Level**						
Topographical situation		Recently cut coppice		**WS1** scrub									
Flat		Pollards		Other			**Rhodo (etc)**						
Summit (angular)		Amenity					Sp.	Level					
Summit (rounded)				**Adj. Land Use**									
Upper slope		**Other**		FL	CW								
Mid-slope		Banks		FW	CS								
Terraced slope		Ditches		FP	WN								
Lower slope		Cultivation ridges		FS	WD								
Depression		Ruined buildings		GA	WS								
Other		Walls		GS	WL								
		Exclosures		GM	BC								
Geography				HH	BL								
Esker		**Dead Wood *(afor)***		HD	ER								
Drumlin		Standing dead		PB	EU								
Plateau		Standing damaged		PF	ED								
Valley		Uprooted/root plate		CD									
Other		Coarse wood/debris		CC									
		Fine Woody debris		CB									
Soil moisture regime		Snags/snapped											
Freely draining				**Boundary**									
Moderately free				River/Stream									
Impeded		**Surface Cover** *(dafor)*		Canal									
Strongly impeded		Rock & Boulders		Rail									
		Stones & gravel		Lake/Pond									
Hydrological features		Bare soil		Road/Track									
Seasonal flooding		Litter		Wall									
Springs		Bryophyte		Ditch									
Lakes/pools		Herb		Bank									
Rivers/streams		Low woody sp.		Fence									
Damp Clefts/ravines				None – Abrupt									
Other				None - Diffuse									

Site ID:
Date:
Team:

(B)

Trees etc.	F S C	Trees contd		Herbs		Herbs		Luzu camp		Poa prat		Mosses		Mosses				
Abie alba		Ulmu pro		Cono maju		Pote erect		Luzu pilo		Poa triv		Font anti		Sphag palu				
Abie proc		Vibu opul		Crep palu		Pote palu		Luzu mult				Funa hygr		Sphag quin				
Acer camp				Dact fuch		Pote ster		Luzu sylv		**Ferns**		Hete hete		Sphag recu				
Acer pseu		**Low woody**		Digi purp		Prim vulg				Aspl tric		Homa seri		Tetr peel				
Aesc hipp		Buxu semp		Epil mont		Pyro medi		**Sedges**		Athy f-f		Homa trich		Tham alop				
Alnu glut		Callu vulg		Epil obsc		Pyro mino		Care divu		Blec spic		Hook luce		Thui tama				
Betu pub		Corn sang		Epil palu		Prune vulg		Care echi		Botr luna		Hygr luri		Ulota crisp				
Betu pend		Cytis scop		Epip hell		Ranu acris		Care flac		Dryo aem		Hylo brevi		Ulota norv				
Carp betu		Eric cine		Eupa cann		Ranu auri		Care nigr		Dryo affi		Hylo splen		Ulot phyl				
Cast sati		Eric tetr		Euph hybe		Ranu fica		Care pani		Dryo dila		Hyoc armo		Zygo viri				
Cory avel		Hede heli		Fili ulma		Ranu flam		Care pend		Dryo f-m		Hypn cupr						
Crat mono		Ligu vulg		Frag vesc		Ranu repe		Care puli		Hyme tunb		Hypn jutl		**Liverworts**				
Euon euro		Myri gale		Gali apar		Rume ace		Care rem		Hyme wils		Hypn lind		Bazz tril				
Fagu sylv		Rhod pont		Gali odor		Rume obtu		Care ripi		Osmu rega		Isop eleg		Caly argu				
Fran alnu		Ribe rubr		Gali palu		Rumė san		Care strig		Phly scolo		Isot myos		Caly fissa				
Frax exce		Ribe u-c		Gali saxa		Sani euro		Care sylv		Poly aust		Isot myur		Caly muel				
Ilex aqui		Rosa arv		Gera robe		Scro nod		Care vesi		Poly inte		Leuc glau		Ceph bicu				
Lari deci		Rosa can		Geum urba		Scut gale				Poly vulg		Mniu horn		Chil poly				
Malu sylv		Rubu idea		Glec hede		Sene aqua		**Horsetails**		Pols acul		Neck comp		Cono coni				
Pice abie		Rubu frut		Herac spon		Sene jaco		Equi fluv		Pols seti		Neck crisp		Dipl albi				
Picea sitc		Rubu saxa		Hyac non s		Sile dioi		Equi hyem		Pter aqui		Orth affi		Frul dila				
Pinu cont		Symp albu		Hype andr		Sola dulc		Equi palu				Orth rivu		Frul tama				
Pinu sylv		Ulex euro		Hype perf		Soli virg		Equi sylv		**Mosses**		Phys pyri		Leje cavi				
Popu nigr		Ulex gali		Hype pulc		Stac palu		Equi telm		Ambl fluv		Pleu acum		Leje ulic				
Popu trem		Vacc myrt		Impa glan		Stac sylv				Ambl ripa		Pleu schr		Lepi rept				
Prun aviu				Iris pseu		Stel holo		**Grasses**		Ambl serp		Plth dent		Loph bid				
Prun laur		**Herbs**		Lami gale		Succ prat		Agro cani		Ambl vari		Plth undu		Loph cusp				
Prun padu		Ajug rept		Laps comm		Tara offi		Agro capi		Brac plum		Pmni undu		Lunu cruc				
Prun spin		Alli pete		Lath mont		Teuc scor		Agro stol		Brac riv		Pogo aloi		Marc mach				
Pseu menz		Alli urs		Lathr squa		Urtic dioi		Anth odor		Brac rut		Pogo urni		Marc poly				
Q.pet x rob		Anem nem		List ovat		Vale offi		Brach sylv		Call cord		Pohl carn		Metz frut				
Quer petr		Ange syl		Loni peri		Vero cham		Brom ramo		Call cusp		Poly comm		Metz furc				
Quer robu		Anth sylv		Lych fl-c		Vero mont		Dact glom		Cinc font		Poly form		Pell endi				
Rham cath		Aqui vulg		Lyco euro		Vero offi		Dant decu		Cirr pili		Poly long		Pell epip				
Sali alba		Arum macu		Lysi nemo		Vero serp		Desc cesp		Clim den		Pseu puru		Pell nees				
Sali auri		Calth palu		Lysi numu		Vicia sep		Desc flex		Crat fili		Raco acic		Radu comp				
Sali cine		Caly sepi		Lyth sali		Viola pal		Fest alti		Cryp hete		Rhiz punc		Ricc cham				
Sali capr		Card flex		Mela prat		Viola reic		Fest gigi		Cten moll		Rhyn ripa		Ricc mult				
Sali frag		Card hirs		Ment aqua		Viola rivi		Holc lana		Dich pell		Rhyt lore		Sacc viti				
Sali purp		Card prat		Mono hypo				Holc moll		Dicr maju		Rhyt squa		Scap grac				
Samb nigr		Cent nigr		Myce mura		**Rushes**		Meli unif		Dicr scop		Rhyt triq		Scap nemo				
Sorb aria ss		Ceph long		Myos scor		Junc acut		Mili effu		Eurh prae		Sphag auri		Scap undu				
Sorb auc		Chry opp		Neot n-av		Junc bufo		Moli caer		Eurh scop		Sphag capi		Schi apoc				
Sorb hib		Circ lute		Oena croc		Junc bulb		Phal arun		Eurh swar		Sphag fim		Trich tome				
Tili cord		Cirs arve		Orch masc		Junc cong		Phra aust		Fiss adia								
Taxu bacc		Cirs pal		Oxal acet		Junc effu		Poa annu		Fiss bryo								
Ulmu glab		Cirs vulg		Peta frag		Junc infl		Poa nemo		Fiss taxi								

Trees etc.	F S C	Trees contd		Herbs		Herbs		Luzu cam		Poa prat		Mosses		Mosses		Others	
Abie alba		Ulmu pro		Cono		Pote erect		Luzu pilo		Poa triv		Font anti		Sphag palu			
Abie proc		Vibu opul		Crep palu		Pote palu		Luzu mult				Funa hygr		Sphag quin			
Acer camp				Dact fuch		Pote ster		Luzu sylv		**Ferns**		Hete hete		Sphag			
Acer pseu		**Low woody**		Digi purp		Prim vulg				Aspl tric		Homa seri		Tetr peel			
Aesc hipp		Buxu semp		Epil mont		Pyro medi		**Sedges**		Athy f-f		Homa trich		Tham alop			
Alnu glut		Callu vulg		Epil obsc		Pyro mino		Care divu		Blec spic		Hook luce		Thui tama			
Betu pub		Corn sang		Epil palu		Prune vulg		Care echi		Botr luna		Hygr luri		Ulota crisp			
Betu pend		Cytis scop		Epip hell		Ranu acris		Care flac		Dryo aem		Hylo brevi		Ulota norv			
Carp betu		Eric cine		Eupa		Ranu auri		Care nigr		Dryo affi		Hylo splen		Ulot phyl			
Cast sati		Eric tetr		Euph		Ranu fica		Care pani		Dryo dila		Hyoc armo		Zygo viri			
Cory avel		Hede heli		Fili ulma		Ranu flam		Care pend		Dryo f-m		Hypn cupr					
Crat mono		Ligu vulg		Frag vesc		Ranu repe		Care puli		Hyme		Hypn jutl		**Liverworts**			
Euon euro		Myri gale		Gali apar		Rume ace		Care rem		Hyme		Hypn lind		Bazz tril			
Fagu sylv		Rhod pont		Gali odor		Rume		Care ripi		Osmu		Isop eleg		Caly argu			
Fran alnu		Ribe rubr		Gali palu		Rume san		Care strig		Phly		Isot myos		Caly fissa			
Frax exce		Ribe u-c		Gali saxa		Sani euro		Care sylv		Poly aust		Isot myur		Caly muel			
Ilex aqui		Rosa arv		Gera robe		Scro nod		Care vesi		Poly inte		Leuc glau		Ceph bicu			
Lari deci		Rosa can		Geum		Scut gale				Poly vulg		Mniu horn		Chil poly			
Malu sylv		Rubu idea		Glec		Sene aqua		**Horsetails**		Pols acul		Neck		Cono coni			
Pice abie		Rubu frut		Herac		Sene jaco		Equi fluv		Pols seti		Neck crisp		Dipl albi			
Picea sitc		Rubu saxa		Hyac non		Sile dioi		Equi hyem		Pter aqui		Orth affi		Frul dila			
Pinu cont		Symp albu		Hype		Sola dulc		Equi palu				Orth rivu		Frul tama			
Pinu sylv		Ulex euro		Hype perf		Soli virg		Equi sylv		**Mosses**		Phys pyri		Leje cavi			
Popu nigr		Ulex gali		Hype pulc		Stac palu		Equi telm		Ambl fluv		Pleu acum		Leje ulic			
Popu trem		Vacc myrt		Impa glan		Stac sylv				Ambl ripa		Pleu schr		Lepi rept			
Prun aviu				Iris pseu		Stel holo		**Grasses**		Ambl		Plth dent		Loph bid			
Prun laur		**Herbs**		Lami gale		Succ prat		Agro cani		Ambl vari		Plth undu		Loph cusp			
Prun padu		Ajug rept		Laps		Tara offi		Agro capi		Brac		Pmni undu		Lunu cruc			
Prun spin		Alli pete		Lath mont		Teuc scor		Agro stol		Brac riv		Pogo aloi		Marc mach			
Pseu menz		Alli urs		Lathr		Urtic dioi		Anth odor		Brac rut		Pogo urni		Marc poly			
Q.pet x rob		Anem nem		List ovat		Vale offi		Brach sylv		Call cord		Pohl carn		Metz frut			
Quer petr		Ange syl		Loni peri		Vero cham		Brom		Call cusp		Poly		Metz furc			
Quer robu		Anth sylv		Lych fl-c		Vero mont		Dact glom		Cinc font		Poly form		Pell endi			
Rham cath		Aqui vulg		Lyco euro		Vero offi		Dant decu		Cirr pili		Poly long		Pell epip			
Sali alba		Arum macu		Lysi		Vero serp		Desc cesp		Clim den		Pseu puru		Pell nees			
Sali auri		Calth palu		Lysi		Vicia sep		Desc flex		Crat fili		Raco acic		Radu			
Sali cine		Caly sepi		Lyth sali		Viola pal		Fest alti		Cryp hete		Rhiz punc		Ricc cham			
Sali capr		Card flex		Mela prat		Viola reic		Fest gigi		Cten moll		Rhyn ripa		Ricc mult			
Sali frag		Card hirs		Ment		Viola rivi		Holc lana		Dich pell		Rhyt lore		Sacc viti			
Sali purp		Card prat		Mono				Holc moll		Dicr maju		Rhyt squa		Scap grac			
Samb nigr		Cent nigr		Myce		**Rushes**		Meli unif		Dicr scop		Rhyt triq		Scap nemo			
Sorb aria ss		Ceph long		Myos		Junc acut		Mili effu		Eurh		Sphag auri		Scap undu			
Sorb auc		Chry opp		Neot n-av		Junc bufo		Moli caer		Eurh		Sphag		Schi apoc			
Sorb hib		Circ lute		Oena		Junc bulb		Phal arun		Eurh		Sphag fim		Trich tome			
Tili cord		Cirs arve		Orch		Junc cong		Phra aust		Fiss adia							
Taxu bacc		Cirs pal		Oxal acet		Junc effu		Poa annu		Fiss bryo							
Ulmu glab		Cirs vulg		Peta frag		Junc infl		Poa nemo		Fiss taxi							

Site ID: Releve: Grid Ref:

Date: Team: Soil ID:

Veg. Comm. Altitude: Aspect: Slope:

Bare Soil	
Rocks etc.	
Litter	
Ground layer	
Field layer	
Shrub layer	
Canopy	
Soil pH 1	
Soil pH 2	
Dead Wood	

C2

Site Name: **Releve:** **Date:** **Team:**

Lichen Check List. For each of the spp. listed, deem O – Observed/ NO – Not observed.

Species	Host Spp.	Substrate	Associated spp.	Freq/Abun	Sample
Arthonia cinnabarina					
Chrysothrix candelaris					
Cladonia coniocraea					
Cladonia chlorophaea					
Dimerella lutea					
Enterographa crassa					
Evernia prunastri					
Graphis scripta					
Lecanactis abietina					
Lecanora chlarotera					
Lecidella elaeochroma					
Lepraria incana agg.					
Leptogium spp.					
Normandina pulchella					
Parmelia caperata					
Parmelia perlata					
Parmelia sulcata					
Phaeophysica orbicularis					
Physcia aipolia					
Physcia tenella					
Physconia distorta					
Peltigera praetextdata					
Peltigera horizontalis					
Pyrenula macrospora					
Ramalina farinacea					
Ramalina fastigiata					
Ramalina fraxinea					
Sticta spp.					
Thelotrema lepadinum					
Usnea subfloridana					
Xanthoria parietina					
Other Spp.					

D1

Site: **Date:** **Releve:** **Team:**

Total Plot Size:____________________

Species	dbh	CP	Log L	Ht.	Stem Q	Species	dbh	CP	Log L	Ht.	Stem Q

Species	<25cm	26-100cm	101-200cm	201-400cm	>400cm

(D2)

Vertical Stratigraphy **Date:**

Site Name: **Releve:** **Team:**

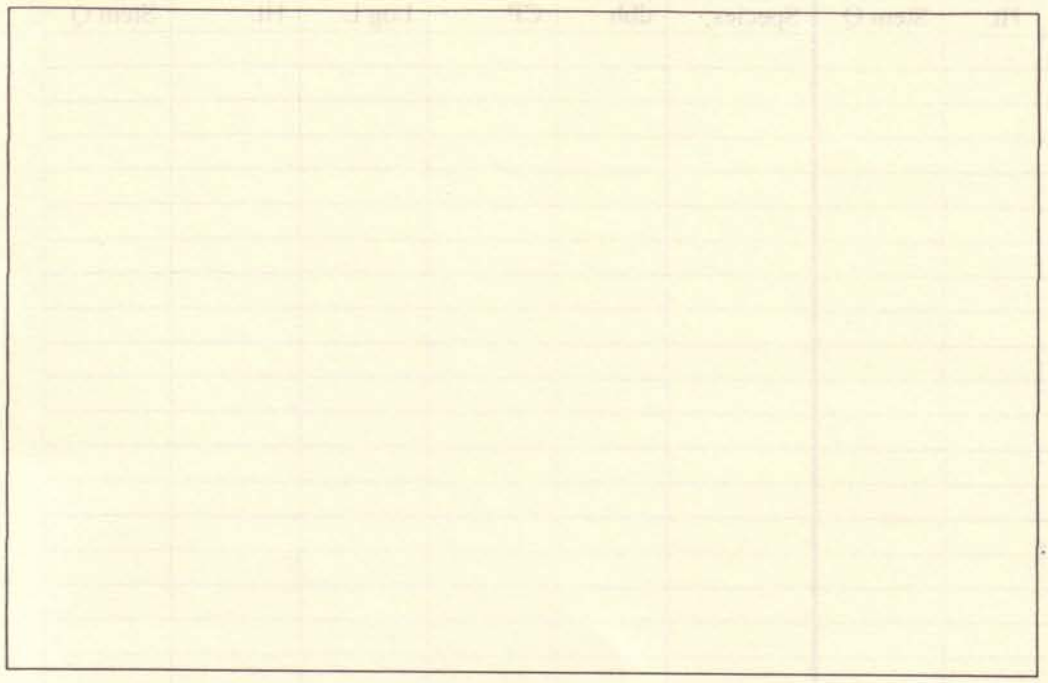


Photo Details

Strata	Ht	Dominants	% Cover

Appendix 3 List of lichen of interest, the presence of which were noted during field survey.

Species
Graphis scripta
Lepraria incana agg.
Parmelia perlata
Thelotrema lepadinum
Enterographa crassa
Lecidella elaeochroma
Cladonia coniocraea
Arthonia cinnabarina
Parmelia caperata
Ramalina farinacea
Dimerella lutea
Pyrenula macrospora
Usnea subfloridana
Cladonia chlorophaea
Evernia prunastri
Lecanora chlarotera
Normandina pulchella
Xanthoria parietina
Chrysothrix candelaris
Lecanactis abietina
Parmelia sulcata
Physcia tenella
Ramalina fastigiata
Peltigera praetextdata
Physcia aipolia
Leptogium spp.
Peltigera horizontalis
Phaeophysica orbicularis
Physconia distorta
Ramalina fraxinea
Sticta sp.

Appendix 4: National Heritage Areas (NHAs) in Ireland that contain native woodland

In Arc View an intersect was carried out between all FIPS polygons that contained native woodland and the NHA polygons for each county to produce a list of NHAs that contain native woodland.

NHA Site Code	County
000781	Carlow
000792	Carlow
000797	Carlow
000806	Carlow
000810	Carlow
002162	Carlow
000001	Cavan
000002	Cavan
000006	Cavan
000007	Cavan
000008	Cavan
000584	Cavan
000974	Cavan
000978	Cavan
000980	Cavan
000983	Cavan
000986	Cavan
000987	Cavan
000992	Cavan
001841	Cavan
000011	Clare
000014	Clare
000016	Clare
000020	Clare
000022	Clare
000027	Clare
000030	Clare
000032	Clare
000035	Clare
000036	Clare
000038	Clare
000051	Clare
000054	Clare
000057	Clare
000062	Clare
000071	Clare
000239	Clare
000268	Clare
000337	Clare
000993	Clare
001000	Clare
001001	Clare
001005	Clare
001006	Clare
001012	Clare
001013	Clare
001017	Clare
001019	Clare

NHA Site Code	County
001020	Clare
001331	Clare
001686	Clare
001714	Clare
001926	Clare
002001	Clare
002048	Clare
002054	Clare
002091	Clare
002157	Clare
002307	Clare
000073	Cork
000074	Cork
000075	Cork
000076	Cork
000079	Cork
000084	Cork
000088	Cork
000090	Cork
000091	Cork
000094	Cork
000097	Cork
000099	Cork
000101	Cork
000103	Cork
000106	Cork
000108	Cork
000365	Cork
001029	Cork
001034	Cork
001035	Cork
001036	Cork
001039	Cork
001040	Cork
001042	Cork
001043	Cork
001046	Cork
001049	Cork
001054	Cork
001055	Cork
001058	Cork
001061	Cork
001062	Cork
001064	Cork
001065	Cork
001066	Cork
001067	Cork
001070	Cork

NHA Site Code	County
001072	Cork
001074	Cork
001075	Cork
001076	Cork
001081	Cork
001082	Cork
001084	Cork
001230	Cork
001248	Cork
001408	Cork
001515	Cork
001547	Cork
001561	Cork
001740	Cork
002050	Cork
002086	Cork
001793	Cork
001794	Cork
001795	Cork
001796	Cork
001797	Cork
001798	Cork
001799	Cork
001854	Cork
001879	Cork
001979	Cork
001987	Cork
001990	Cork
002036	Cork
002049	Cork
000116	Donegal
000131	Donegal
000133	Donegal
000139	Donegal
000140	Donegal
000158	Donegal
000162	Donegal
000163	Donegal
000166	Donegal
000180	Donegal
000190	Donegal
000197	Donegal
000428	Donegal
001089	Donegal
001098	Donegal
001102	Donegal
001114	Donegal
001117	Donegal

A4 contd.

NHA Site Code	County
001118	Donegal
001125	Donegal
001129	Donegal
001141	Donegal
001155	Donegal
001162	Donegal
001190	Donegal
002011	Donegal
002012	Donegal
002047	Donegal
002057	Donegal
002068	Donegal
002164	Donegal
002176	Donegal
000128	Dublin
000178	Dublin
000202	Dublin
000206	Dublin
000211	Dublin
000713	Dublin
000725	Dublin
001206	Dublin
001209	Dublin
001211	Dublin
001212	Dublin
002122	Dublin
000011	Galway
000216	Galway
000310	Galway
000319	Galway
000331	Galway
000606	Galway
000735	Galway
001227	Galway
001240	Galway
001242	Galway
001253	Galway
001254	Galway
001260	Galway
001267	Galway
001271	Galway
001280	Galway
001288	Galway
001303	Galway
001312	Galway
001313	Galway
001709	Galway
001774	Galway
001779	Galway
001926	Galway
002008	Galway
002031	Galway
002034	Galway
002062	Galway
002080	Galway
002082	Galway
002117	Galway

NHA Site Code	County
000222	Galway
000229	Galway
000234	Galway
000242	Galway
000248	Galway
000252	Galway
000254	Galway
000261	Galway
000268	Galway
000284	Galway
000297	Galway
000299	Galway
000304	Galway
001642	Leitrim
001807	Leitrim
001808	Leitrim
001919	Leitrim
001976	Leitrim
000174	Limerick
000429	Limerick
000433	Limerick
000435	Limerick
000437	Limerick
000439	Limerick
000930	Limerick
000961	Limerick
001030	Limerick
001386	Limerick
001425	Limerick
001427	Limerick
001430	Limerick
001431	Limerick
001432	Limerick
001434	Limerick
001849	Limerick
001850	Limerick
001851	Limerick
001996	Limerick
002001	Limerick
002035	Limerick
002036	Limerick
002086	Limerick
002087	Limerick
002088	Limerick
002090	Limerick
000442	Longford
000447	Longford
000448	Longford
000449	Longford
000691	Longford
000985	Longford
000992	Longford
001443	Longford
001444	Longford
001448	Longford
001450	Longford
001818	Longford

NHA Site Code	County
001819	Longford
001822	Longford
002069	Longford
002310	Longford
000452	Louth
000453	Louth
000455	Louth
000456	Louth
001293	Louth
001461	Louth
001462	Louth
001464	Louth
001465	Louth
001468	Louth
001616	Louth
001801	Louth
001803	Louth
001804	Louth
000093	Kerry
000343	Kerry
000350	Kerry
000353	Kerry
000363	Kerry
000364	Kerry
000365	Kerry
000375	Kerry
000383	Kerry
001342	Kerry
001346	Kerry
001349	Kerry
001353	Kerry
001354	Kerry
001364	Kerry
001371	Kerry
001375	Kerry
001383	Kerry
001386	Kerry
001787	Kerry
001881	Kerry
001960	Kerry
002040	Kerry
002070	Kerry
002092	Kerry
002098	Kerry
002112	Kerry
000390	Kildare
000392	Kildare
000393	Kildare
000395	Kildare
000396	Kildare
000731	Kildare
000810	Kildare
000858	Kildare
001388	Kildare
001389	Kildare
001390	Kildare
001391	Kildare

NHA Site Code	County
001394	Kildare
001398	Kildare
002103	Kildare
002104	Kildare
000400	Kilkenny
000402	Kilkenny
000403	Kilkenny
000405	Kilkenny
000409	Kilkenny
000410	Kilkenny
000698	Kilkenny
000827	Kilkenny
000833	Kilkenny
000842	Kilkenny
000843	Kilkenny
000844	Kilkenny
000845	Kilkenny
001859	Kilkenny
002051	Kilkenny
002076	Kilkenny
002094	Kilkenny
000412	Laois
000413	Laois
000415	Laois
000416	Laois
000417	Laois
000419	Laois
000421	Laois
000652	Laois
000859	Laois
000860	Laois
000862	Laois
000864	Laois
000865	Laois
000867	Laois
000876	Laois
001494	Laois
001800	Laois
002076	Laois
002357	Laois
000422	Leitrim
000424	Leitrim
000428	Leitrim
000623	Leitrim
000691	Leitrim
000983	Leitrim
001403	Leitrim
001404	Leitrim
001407	Leitrim
001412	Leitrim
001413	Leitrim
001415	Leitrim
001417	Leitrim
001418	Leitrim
001419	Leitrim
001421	Leitrim
001805	Louth
001828	Louth
001856	Louth
001862	Louth
001957	Louth
000297	Mayo
000458	Mayo
000471	Mayo
000476	Mayo
000519	Mayo
000527	Mayo
000532	Mayo
000550	Mayo
000735	Mayo
001470	Mayo
001482	Mayo
001485	Mayo
001518	Mayo
001520	Mayo
001774	Mayo
001910	Mayo
001922	Mayo
001932	Mayo
001955	Mayo
002078	Mayo
000006	Meath
000552	Meath
000554	Meath
000557	Meath
000987	Meath
001324	Meath
001398	Meath
001558	Meath
001579	Meath
001580	Meath
001582	Meath
001587	Meath
001592	Meath
001593	Meath
001594	Meath
001814	Meath
001861	Meath
001862	Meath
001957	Meath
002103	Meath
000001	Monaghan
000558	Monaghan
000559	Monaghan
000560	Monaghan
000561	Monaghan
000563	Monaghan
001594	Monaghan
001595	Monaghan
001596	Monaghan
001602	Monaghan
001605	Monaghan
001607	Monaghan
001611	Monaghan
001612	Monaghan
001785	Monaghan
001836	Monaghan
002077	Monaghan
000010	Offaly
000216	Offaly
000412	Offaly
000413	Offaly
000564	Offaly
000565	Offaly
000570	Offaly
000571	Offaly
000572	Offaly
000574	Offaly
000575	Offaly
000580	Offaly
000582	Offaly
000583	Offaly
000585	Offaly
000586	Offaly
000882	Offaly
000885	Offaly
000889	Offaly
000890	Offaly
000894	Offaly
000900	Offaly
000903	Offaly
000906	Offaly
000909	Offaly
000913	Offaly
000920	Offaly
000921	Offaly
000925	Offaly
000927	Offaly
001775	Offaly
001777	Offaly
001830	Offaly
002104	Offaly
002355	Offaly
000222	Roscommon
000587	Roscommon
000591	Roscommon
000596	Roscommon
000602	Roscommon
000605	Roscommon
000607	Roscommon
000608	Roscommon
001623	Roscommon
001633	Roscommon
001636	Roscommon
001638	Roscommon
001642	Roscommon
001643	Roscommon
001644	Roscommon
001651	Roscommon
001652	Roscommon
001673	Roscommon

NHA Site Code	County
002072	Roscommon
002310	Roscommon
000458	Sligo
000587	Sligo
000622	Sligo
000623	Sligo
000625	Sligo
000627	Sligo
000628	Sligo
000636	Sligo
000638	Sligo
001656	Sligo
001664	Sligo
001665	Sligo
001670	Sligo
001673	Sligo
001898	Sligo
001909	Sligo
001976	Sligo
002006	Sligo
000011	Tipperary
000216	Tipperary
000564	Tipperary
000639	Tipperary
000640	Tipperary
000647	Tipperary
000650	Tipperary
000652	Tipperary
000653	Tipperary
000654	Tipperary
000655	Tipperary
000890	Tipperary
000929	Tipperary
000930	Tipperary
000933	Tipperary
000934	Tipperary
000936	Tipperary
000937	Tipperary
000939	Tipperary
000942	Tipperary
000943	Tipperary
000947	Tipperary
000948	Tipperary
000950	Tipperary
000952	Tipperary
000954	Tipperary
000956	Tipperary
000958	Tipperary
000959	Tipperary
000961	Tipperary
000964	Tipperary
000969	Tipperary
000970	Tipperary
000971	Tipperary
000972	Tipperary
001133	Tipperary
001683	Tipperary
001848	Tipperary
001853	Tipperary
001980	Tipperary
001981	Tipperary
001984	Tipperary
001995	Tipperary
002043	Tipperary
000072	Waterford
000073	Waterford
000399	Waterford
000402	Waterford
000659	Waterford
000667	Waterford
000668	Waterford
000669	Waterford
000671	Waterford
000787	Waterford
001691	Waterford
001692	Waterford
001693	Waterford
001707	Waterford
001708	Waterford
001933	Waterford
001952	Waterford
000565	Westmeath
000673	Westmeath
000676	Westmeath
000677	Westmeath
000678	Westmeath
000681	Westmeath
000684	Westmeath
000685	Westmeath
000686	Westmeath
000687	Westmeath
000688	Westmeath
000690	Westmeath
000692	Westmeath
000694	Westmeath
000918	Westmeath
000987	Westmeath
001711	Westmeath
001725	Westmeath
001732	Westmeath
001775	Westmeath
001810	Westmeath
001812	Westmeath
001814	Westmeath
001831	Westmeath
002103	Westmeath
002310	Westmeath
002323	Westmeath
000697	Wexford
000698	Wexford
000708	Wexford
000712	Wexford
000746	Wexford
000755	Wexford
000757	Wexford
000765	Wexford
000770	Wexford
000774	Wexford
000781	Wexford
000812	Wexford
001733	Wexford
000713	Wicklow
000714	Wicklow
000718	Wicklow
000719	Wicklow
000724	Wicklow
000725	Wicklow
000730	Wicklow
000731	Wicklow
000733	Wicklow
001746	Wicklow
001748	Wicklow
001749	Wicklow
001750	Wicklow
001754	Wicklow
001755	Wicklow
001756	Wicklow
001767	Wicklow
001768	Wicklow
001769	Wicklow
001771	Wicklow
001852	Wicklow
001931	Wicklow
002053	Wicklow
002122	Wicklow

Appendix 5 - Testing the accuracy of FIPS

Six Inch Map No.	Total site No.	No. of FIPS Sites > 1 ha	No. of incorrect FIPS sites	No. of non-FIPS sites > 1 ha	Non-FIPS sites Wood type	Non-FIPS sites Size ha	Reason not in Fips
CL1024	6	6	0	0	0	0	none
CL1051	11	11	0	0	0	0	none
CO 122	20	17	3 (Felled)	3	Scrub	1.6	scrub
CO 122					Scrub	1.6	scrub
CO 122					Broadleaf	2.6	none
CO 50	5	4	3 (2 felled/1 tree line)	1	Scrub	1.7	scrub
CW 14	7	3	0	4	Broadleaf	1.5	open
CW 14					Scrub/Broadleaf	1.5	open
CW 14					Scrub/Broadleaf	1.5	none
CW 14					Scrub/Broadleaf	1	none
CW 16	20	12	0	8	Scrub/Broadleaf	1	open
CW 16					Scrub/Broadleaf	1.75	none
CW 16					Broadleaf	1	low/open
CW 16					Broadleaf	1.5	none
CW 16					Scrub/Broadleaf	1	none
CW 16					Broadleaf	3	open
CW 16					Scrub/Broadleaf	5	low/open
CW 16					Scrub/Broadleaf	1	low/open
CW 24	13	9	0	4	Broadleaf	3	none
CW 24					Broadleaf	2	open
CW 24					Scrub/Broadleaf	1.5	none
CW 24					Scrub/Broadleaf	5	low/open
CW 26	17	11	0	6	Scrub/Broadleaf	3	low/open
CW 26					Scrub/Broadleaf	1	none
CW 26					Broadleaf	1	open
CW 26					Broadleaf	1	open
CW 26					Broadleaf	1.5	open
CW 26					Broadleaf	1	open
GA 68	83	72	1 (Felled)	11	Scrub	1.9	open/scrub
GA 68					Scrub	7.5	open/scrub
GA 68					Scrub	3.8	open/scrub
GA 68					Scrub	3.6	open/scrub
GA 68					Scrub	10	open/scrub
GA 68					Scrub	4.2	open/scrub
GA 68					Scrub	3.2	open/scrub
GA 68					Scrub	1.4	open/scrub
GA 68					Scrub	2.1	open/scrub
GA 68					Scrub	1.1	open/scrub
GA 68					Scrub	1.6	open/scrub
GA29	5	5	0	0	0	0	none
KE 03	9	8	0	1	Broadleaf	1	none
KE 16	10	5	0	5	Scrub	1.9	scrub
KE 16					Scrub	2.4	scrub
KE 16					Scrub	1	scrub
KE 16					Scrub	1	scrub
KE 16					Scrub	1.1	scrub
KK 12	4	4	0	0	0		none
KK 14	20	19	0	1	Broadleaf	3.5	narrow
KK 20	16	13	0	3	Broadleaf	3	open
KK 20					Broadleaf	2	narrow
KK 20					Broadleaf	1	narrow
KK 28	26	23	0	3	Broadleaf	4	open

Six Inch Map No.	Total site No.	No. of FIPS Sites > 1 ha	No. of incorrect FIPS sites	No. of non-FIPS sites > 1 ha	Non-FIPS sites Wood type	Non-FIPS sites Size ha	Reason not in Fips
KK 28					Broadleaf	2	open
KK 28					Scrub/Broadleaf	3.5	open
KK 33	21	19	0	2	Broadleaf	2	open
KK 33					Scrub/Broadleaf	1.5	scrub
KK 39	11	9	0	2	Broadleaf	6.5	none
KK 39					Broadleaf	2	none
KK 46	6	5	1 (Mixed not broadleaf)	1	Scrub/Broadleaf	2	none
LI 18	6	3	0	3	Broadleaf	4.4	none
LI 18					Broadleaf	4.6	none
LI 18					Scrub	1.6	scrub
LI23	14	13	0	1	Scrub	1.2	scrub
MA 21	5	5	1 (Felled)	0	0	0	none
MA 57	3	3	0	0	0	0	none
OF 30	23	23	0	0	0		none
OF 38	26	21	1 (Mixed not broadleaf)	5	Mixed	5	open
OF 38					Scrub/Broadleaf	2.5	open
OF 38					Scrub/Broadleaf	4.5	open
OF 38					Broadleaf	1	open
OF 38					Scrub/Broadleaf	1.5	scrub
OF 6	10	10	1 (Mixed not broadleaf)	0	0	0	none
TI 63	7	6	1 (Felled)	1	Scrub	2	scrub
TI 89	12	7	0	5	Scrub/Broadleaf	8.4	none
TI 89					Scrub	3.5	scrub
TI 89					Scrub	2.5	scrub
TI 89					Broadleaf	1.6	open
TI 89					Scrub	1.3	scrub
WX 10	9	7	1 (Felled)	2	Broadleaf	2	none
WX 10					Broadleaf	2	none
WX 20	23	13	0	10	Broadleaf	1	none
WX 20					Broadleaf	2	none
WX 20					Broadleaf	1.5	open
WX 20					Broadleaf	1	none
WX 20					Scrub/Broadleaf	3.5	scrub
WX 20					Mixed	2.5	none
WX 20					Scrub/Broadleaf	2.5	scrub
WX 20					Broadleaf	1.5	none
WX 20					Broadleaf	1.5	none
WX 20					Scrub/Broadleaf	2	scrub
WX 44	3	3	0	0	0	0	none

Appendix 6 References relevant to native Irish woodland

This list includes publications referred to in the report text.
See also FIR CD – produced by Coillte (1997) and soon to be available on their website.

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Appendix 7 Table of vascular plants bryophytes for surveyed sites

Species	1	2	3	4	5	6	7	8	9	10	12	14	15	17	18	19	20	22	26	27	28	30	31	33	34	35	36	37	38	48	49	51	53	55	58	61	65	69	73	74	75	76	78	79	80	81	82	83	84	85
Tree species																																																		
Abie alba															1				1						1	1																									
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Acer camp											1											1																												
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Acer pseu	1	1	1	1	1	1	1		1	1	1		1	1	1	1	1		1	1	1		1	1	1			1		1	1	1	1	1	1	1	1	1	1				1	1	1	1			1	1
Aesc hipp			1		1					1	1		1	1					1	1			1									1												1						
Alnu glut	1		1	1		1	1		1	1	1			1						1			1	1			1	1	1				1		1		1		1										
Alnu inca																																																	
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Betu pub			1	1	1	1	1	1	1	1	1		1				1		1			1			1	1	1		1	1	1		1	1	1			1			1	1			1	1	1	1	1	1
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Carp betu																			1																1															
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Cham laws																										1																								
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Crat mono	1		1	1	1	1		1	1	1	1	1	1	1	1		1		1	1	1	1	1	1	1	1	1	1	1	1	1			1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
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Appendix 7 Table of vascular plants bryophytes for surveyed sites

Species	1	2	3	4	5	6	7	8	9	10	12	14	15	17	18	19	20	22	26	27	28	30	31	33	34	35	36	37	38	48	49	51	53	55	58	61	65	69	73	74	75	76	78	79	80	81	82	83	84	85
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Rham cath																										1											1						1					1
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Species	1	2	3	4	5	6	7	8	9	10	12	14	15	17	18	19	20	22	26	27	28	30	31	33	34	35	36	37	38	48	49	51	53	55	58	61	65	69	73	74	75	76	78	79	80	81	82	83	84	85
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Appendix 7 Table of vascular plants bryophytes for surveyed sites

Species	1	2	3	4	5	6	7	8	9	10	12	14	15	17	18	19	20	22	26	27	28	30	31	33	34	35	36	37	38	48	49	51	53	55	58	61	65	69	73	74	75	76	78	79	80	81	82	83	84	85
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Appendix 7 Table of vascular plants bryophytes for surveyed sites

Species	1	2	3	4	5	6	7	8	9	10	12	14	15	17	18	19	20	22	26	27	28	30	31	33	34	35	36	37	38	48	49	51	53	55	58	61	65	69	73	74	75	76	78	79	80	81	82	83	84	85
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Frag vesc					1				1				1		1	1					1	1		1	1	1				1	1			1	1	1	1							1					
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Gali apar	1		1		1				1	1		1	1		1	1	1	1	1		1		1			1				1	1	1		1	1	1		1	1				1						
Gali odor														1										1																										
Gali palu	1			1			1						1							1			1					1	1				1						1	1						1		
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Glec hede	1		1	1	1		1			1	1	1	1	1	1					1	1	1	1	1		1	1			1						1	1						1	1	1			1		1
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Hier perp																																																	
Hipp vulg																																																	1	
Hyac nons	1	1	1	1	1		1	1	1	1	1	1	1	1	1		1		1		1	1	1	1	1			1		1		1		1	1	1	1	1	1		1	1	1			1		
Hydr vulg																																																	
Hype andr	1											1	1		1				1		1	1		1		1	1			1					1				1										
Hype caly											1																																						
Hype humi																																																	
Hype macu												1																																						
Hype perf											1											1					1													1										
Hype pulc								1					1								1									1			1												1				
Hype tetr																														1																	1				
Hypo radi																																															1	1				
Impa glan												1																							1																
Iris pseu			1						1	1	1	1	1	1	1			1				1	1		1			1		1		1													1				
Laps comm	1						1														1												1											1			1		1
Lath mont																1															1		1						1										
Lath prat															1											1																							
Lemm mino																																																		

Appendix 7 Table of vascular plants bryophytes for surveyed sites

Species	1	2	3	4	5	6	7	8	9	10	12	14	15	17	18	19	20	22	26	27	28	30	31	33	34	35	36	37	38	48	49	51	53	55	58	61	65	69	73	74	75	76	78	79	80	81	82	83	84	85
Leon autu																																																		
Leon hisp																										1																									
Leuc aest																				1																														
Leuc vulg																																															1			
Linu cath																																																		
List ovat															1												1																								
Lith offi																																																		
Loni niti																																																		
Loni peri	1	1	1	1	1	1	1	1	1	1	1		1	1	1	1	1		1		1	1	1	1	1		1			1	1	1		1	1	1		1	1	1		1	1		1		1	1	1	1
Lotu corn															1						1					1		1					1					1		1										
Lotu ulig			1																																															
Lych fl-c																														1																				
Lyco euro												1						1					1	1																												
Lysi nemo	1			1	1		1	1	1			1					1		1			1	1	1					1				1		1									1					
Lysi numu																							1																												
Lysi vulg																							1																												
Lyth sali						1							1										1									1		1													1		1	
Matr disc																																																	1	
Medi lupu																																																		
Mela prat				1	1												1																																	
Ment aqua	1			1							1		1					1		1		1	1					1				1	1				1			1							1		1	
Ment arve			1																																														
Meny trif																																															1			
Merc pere																						1	1																								1			1	
Myos arve																																																	1	
Myos laxa																																																	
Myos scor				1																																												1	
Myos secu																														1																			
Nart ossi																																																	
Odon vern																																																1	
Oena croc	1		1	1	1							1	1	1			1	1										1				1		1		1													
Orch masc													1	1	1											1				1																			
Orig vulg																					1																													
Orob hede																																																	
Oxal acet	1	1		1	1		1	1	1			1	1			1	1		1		1	1		1	1	1				1	1				1	1		1	1	1		1			1			1	
Pedi sylv																																											1				1			
Peta frag															1								1																												
Peta hybr																																																		
Ping vulg																																																		
Plan coro																																																		

Appendix 7 Table of vascular plants bryophytes for surveyed sites

Species	1	2	3	4	5	6	7	8	9	10	12	14	15	17	18	19	20	22	26	27	28	30	31	33	34	35	36	37	38	48	49	51	53	55	58	61	65	69	73	74	75	76	78	79	80	81	82	83	84	85
Plan lanc									1						1											1					1			1					1					1					
Plan majo																																								1				1			1		
Plan med													1						1							1					1																				
Poly amph																																																		
Poly avic																																																		
Poly hydr																																																		
Poly pers																																								1							1			
Pote angl																																																		
Pote anse													1									1	1			1																				1	1		1	
Pote erect												1											1			1	1					1									1	1	1			1	1	1		1	
Pote palu																												1																			1				
Pote rept					1				1						1								1																								1			
Pote ster	1			1						1	1	1			1	1	1	1	1		1	1		1	1	1	1				1	1			1		1	1		1	1		1		1			1		1
Poto poly																																																		
Prim veri																					1					1																										
Prim vulg	1		1	1	1			1	1				1		1						1	1	1	1	1	1	1	1		1		1			1	1	1						1		1			1		1
Prun vulg					1		1							1								1					1					1								1					1		1	1		1
Puli dyse																																																		
Ranu acri									1				1	1							1			1				1		1	1	1													1	1				
Ranu auri																										1																									
Ranu fica			1	1	1			1	1	1		1	1	1	1		1		1	1		1		1	1	1	1				1			1		1			1				1						
Ranu flam				1																				1				1	1	1			1								1					1		1	
Ranu omni																																																		
Ranu repe	1		1	1	1	1	1					1	1	1		1		1	1	1				1		1		1	1	1	1	1		1		1	1	1		1	1			1		1	1	1	1	
Rhin mino																																																		
Rori amph																																																		
Rori nast					1					1																				1											1							
Rori palu																		1																																
Rume acet									1																			1										1			1	1							
Rume cong																														1																				
Rume cris			1																							1																							
Rume obtu	1									1				1	1								1	1															1											
Rume san	1		1		1		1				1	1	1		1	1	1	1		1	1		1					1				1		1		1	1			1				1			1		1
Sagi proc																																																		
Sani euro	1		1	1						1	1		1	1			1		1	1	1	1	1	1	1		1			1		1			1	1								1				1	
Scro auri												1																																						
Scro nod	1		1		1						1	1	1						1			1		1							1			1				1					1						
Scut gale																																								1										
Sene aqua	1			1			1													1											1							1									1		
Sene jaco					1			1				1			1							1		1		1				1	1		1					1				1					1		1	

Appendix 7 Table of vascular plants bryophytes for surveyed sites

Species	1	2	3	4	5	6	7	8	9	10	12	14	15	17	18	19	20	22	26	27	28	30	31	33	34	35	36	37	38	48	49	51	53	55	58	61	65	69	73	74	75	76	78	79	80	81	82	83	84	85
Sene squa																														1																					
Sisy offi																																																		
Smyr olus					1																																													
Sola dulc																																																		
Sola nigr																				1																															
Soli virg				1	1																						1												1											
Sonc arve																																																		
Sonc aspe																																															1			
Sonc oler																														1																		1		
Spar erec																																																		
Stac arve													1																																						
Stac palu																1																																			
Stac sylv	1			1	1		1			1	1	1		1	1				1			1	1	1	1						1		1							1				1		1				
Stel alsi												1	1															1	1																					
Stel gram																																																		
Stel holo	1	1		1	1		1	1	1	1			1				1		1			1								1					1	1		1	1	1		1							
Stel medi						1																																							1			1		
Succ prat				1											1														1												1					1	1	1		1	
Symp offi													1																																						
Tara offi					1			1	1	1			1		1	1			1		1		1	1		1								1			1			1	1			1						
Teuc scor		1		1	1		1	1	1				1		1	1	1							1				1												1				1						
Thal flav																																																		
Tori japo																																1												1						
Trif dubi																																																		
Trif prat									1						1																										1									
Trif repe															1															1																1		1		
Tuss farf												1	1																																	1				
Umbi rupe					1			1	1				1	1			1																						1	1	1									
Urti uren																																																		
Urtic dioi	1		1	1	1	1		1	1	1	1	1	1	1	1	1		1	1		1	1	1	1	1	1		1	1	1	1	1			1	1	1	1	1	1	1		1	1			1	1	1
Vale offi	1		1						1		1		1				1	1																															1	
Vero becc					1															1				1																											
Vero cham									1	1	1	1			1		1				1	1	1	1		1			1	1	1	1			1	1		1	1				1						1
Vero hede										1																																								
Vero mont	1	1	1	1	1		1		1	1		1	1		1	1			1		1			1	1		1				1		1	1			1	1	1	1				1		1			1	1
Vero offi																				1																															
Vero pers																																																		
Vero serp																			1				1	1															1					1							
Vici crac																																															1	1		1	
Vicia sep					1			1		1	1		1		1	1			1		1			1		1	1			1	1	1	1	1	1	1		1				1		1		1			1

Appendix 7 Table of vascular plants bryophytes for surveyed sites

Species	1	2	3	4	5	6	7	8	9	10	12	14	15	17	18	19	20	22	26	27	28	30	31	33	34	35	36	37	38	48	49	51	53	55	58	61	65	69	73	74	75	76	78	79	80	81	82	83	84	85
Vinc mino																																																		
Viol sp			1									1			1												1										1	1											
Viola pal																											1	1				1				1	1				1							
Viola reic				1				1		1					1									1																										
Viola rivi	1		1	1	1		1		1		1	1	1	1	1	1	1		1		1	1	1	1	1	1	1			1	1			1	1	1		1					1	1		1	1		1
Grass species																																																		
Agro cani												1													1					1								1							1	1		1	
Agro capi												1	1																									1			1			1	1	1		1	
Agro stol	1	1	1	1	1	1	1			1			1			1	1	1		1	1		1	1			1	1	1			1				1	1			1							1		1
Aira cary																																	1																
Alop geni																										1			1																					
Alop prat																																1																	
Anth odor							1					1			1	1								1		1			1	1	1			1	1			1			1	1				1	1		1	
Arrh elat		1																									1						1													1	1
Aven pube																																																	
Brac pinn																																																	
Brac sylv	1		1	1	1	1	1		1		1		1				1			1	1	1	1				1			1		1		1	1	1	1					1	1			1	1
Briz medi																																																	
Brom ramo	1										1										1			1		1																								
Cyno cris																																								1							1	
Dact glom	1	1	1	1		1	1			1			1		1	1	1						1			1		1	1			1	1	1					1				1		1	1		1	
Desc flex				1																																												
Desch cesp	1			1							1						1			1			1	1				1		1		1	1		1	1				1				1	1	1			
Elym cani																																																	
Elyt junc																																																	
Elyt repe																																																	
Fest alti																																																	
Fest gigi																																												1					1
Fest ovin																																																	
Fest rubr																							1																							1		1	
Glyc flui				1																								1		1							1			1						1		
Holc lana		1					1	1				1	1		1	1								1				1	1	1	1	1	1					1		1	1	1	1			1	1			1
Holc moll																										1													1											
Loli pere																																															1		1	
Meli unif	1				1									1								1				1																				1			
Moli caer																											1						1									1				1	1	1		1	
Phal arun	1										1			1				1					1			1					1	1																	
Phle prat																																														1		1	
Phra aust			1								1			1				1								1																				1		1	
Poa annu															1			1												1																		1		1	

Appendix 7 Table of vascular plants bryophytes for surveyed sites

Species	1	2	3	4	5	6	7	8	9	10	12	14	15	17	18	19	20	22	26	27	28	30	31	33	34	35	36	37	38	48	49	51	53	55	58	61	65	69	73	74	75	76	78	79	80	81	82	83	84	85
Poa triv			1										1					1	1			1	1						1		1												1							
Rush & sedge species																																																		
Junc acut																																									1					1		1	
Junc arti																																														1				
Junc bufo																														1																	1		
Junc bulb																														1																			
Junc cong				1									1																																					
Junc effu	1	1	1	1	1	1	1				1	1	1		1	1			1	1		1		1	1	1		1	1	1	1	1	1	1	1	1				1	1	1				1	1		1	
Junc infl											1																					1		1													1		1	
Junc tenu					1		1									1																			1															
Luzu camp				1																									1	1																			
Luzu mult												1												1																											
Luzu pilo							1					1	1				1																					1													
Luzu sylv	1		1	1	1		1		1			1	1	1			1		1					1						1			1		1	1	1		1	1										
Typh lati											1																																							
Care acut																				1																															
Care aqua																																																		
Care bine																																																		
Care demi																																																		
Care divu																																																		
Care echi				1																																														
Care elat																																																		
Care flac				1																	1	1	1	1		1	1						1	1								1						1	
Care flav																																																		
Care hirt																																																	
Care laev				1																																														
Care nigr																						1																													
Care otru																																																		
Care palle																																																		
Care pani																						1						1																					1			
Care pend			1		1	1						1	1							1														1		1														
Care pilu																																							1											
Care puli																																																		
Care rem	1		1	1	1	1	1		1		1	1	1			1	1	1	1	1		1		1				1		1		1	1			1	1			1	1				1				
Care ripi																		1		1																															
Care rost																											1																							
Care sero													1																																						
Care strig			1	1																1																															
Care sylv	1		1	1	1		1		1	1	1	1	1		1	1	1		1	1	1	1	1	1		1	1		1	1		1		1	1	1								1	1			1		1
Care vesi																																																		

Appendix 7 Table of vascular plants bryophytes for surveyed sites

Species	1	2	3	4	5	6	7	8	9	10	12	14	15	17	18	19	20	22	26	27	28	30	31	33	34	35	36	37	38	48	49	51	53	55	58	61	65	69	73	74	75	76	78	79	80	81	82	83	84	85
Care viri				1																																														
Clad mari																																																		
Rhyn alba																																																		
Scho lacu																																														1				
Scho nigr																											1																							
Trig palu																																																		
Horsetail species																																																		
Equi arve			1			1							1															1						1								1							
Equi fluv														1				1		1			1				1																	1					
Equi palu															1																																			
Equi sylv				1													1																														1		
Equi telm																								1									1																
Fern species																																																	
Aspl adia														1	1																																		
Aspl tric																																																	
Athy f-f	1		1	1			1									1	1					1	1					1		1			1	1		1					1							1
Blec spic				1	1		1	1	1			1	1		1		1		1					1	1			1	1		1		1	1	1	1		1	1	1	1	1		1		1	
Dryo aem									1																																							
Dryo affi	1	1	1		1	1	1	1			1	1	1		1	1	1		1		1	1		1	1					1	1		1	1	1				1					1	1			
Dryo cart																								1																									
Dryo dila	1	1	1	1		1	1	1	1		1	1	1		1	1	1		1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1
Dryo f-m									1		1	1	1	1		1			1		1	1	1	1		1	1		1	1					1	1	1		1				1	1				1	1
Ophi vulg																																																	
Osmu rega																																									1					1	1		1	
Phly scolo	1		1	1	1		1		1	1	1		1	1	1	1		1			1		1	1	1					1	1		1		1	1						1	1				1
Pols seti	1		1	1	1		1		1	1	1		1	1	1			1						1						1	1	1	1	1	1	1	1		1	1			1	1				1
Poly vulg	1		1	1	1		1	1			1	1	1	1	1		1	1				1		1		1					1		1	1	1	1			1				1			1		
Pter aqui		1	1	1	1	1	1	1	1			1	1		1	1	1	1	1		1	1	1	1	1	1			1	1		1	1	1	1		1	1	1		1			1	1	1	1	1	1
Moss & liverwort species																																																	
Ambl serp																																																	
Atri undu											1																																				1		
Brac riv																																																	
Brac rut				1						1	1							1																	1									1			1		
Bryu sp.																																																	
Call cusp				1																1			1																			1							
Camp intr																																																	
Camp pyri																																															1		
Cirr pili																																																	
Clim den										1				1	1																																			

Appendix 7 Table of vascular plants bryophytes for surveyed sites

Species	1	2	3	4	5	6	7	8	9	10	12	14	15	17	18	19	20	22	26	27	28	30	31	33	34	35	36	37	38	48	49	51	53	55	58	61	65	69	73	74	75	76	78	79	80	81	82	83	84	85
Cryp hete																																																		
Cten moll																																			1																
Dicr arra																																																		
Dicr cirr																																																		
Dicr hete																																																		
Dicr maju								1																																		1								
Dicr scop								1																																				1		1		1		
Eurh prae	1	1	1	1					1	1	1			1	1			1		1	1	1			1					1				1	1		1	1				1	1	1	1	1	1	1	1
Eurh scop																																																		
Eurh stri			1	1		1								1		1			1			1	1			1	1			1	1		1				1	1	1				1		1		1	1		1
Fiss adia																																																		
Fiss bryo				1																																														
Fiss taxi																											1																			1						
Font anti																																																		
Homa seri																					1																									1				1		
Hook luce			1	1	1				1																			1																						
Hylo brevi							1				1						1																																			
Hylo splen													1																																							
Hypn ando	1																1							1										1																		
Hypn cupr	1			1			1				1			1		1				1	1				1									1								1		1		1	1	1	1	1
Hypn jutl																					1																								1	1	1			1		
Hypn resu																																																	1		
Isop eleg					1														1																		1													
Isot myos													1																	1	1				1		1							1			1		1
Isot myur																					1																								1						
Leuc glau													1																																					1		
Mniu horn	1		1	1	1		1	1				1	1	1			1		1					1	1				1	1	1		1		1				1			1			1		1			
Neck comp														1	1		1				1	1				1																		1	1						
Neck crisp											1													1																												
Orth affi																																															1		1			
Orth pulc																																																		
Pleu schr																																																		
Plth dent														1																																					
Plth undu																																																		
Pmni undu	1		1	1							1			1		1						1																												
Poly aloi																																																		
Poly comm			1	1	1		1					1			1	1								1	1				1		1				1				1				1				1			
Poly form	1		1	1									1			1	1							1							1							1								1		1		
Pseu puru																									1																								1		
Rhiz punc	1			1	1															1							1																						

Appendix 7 Table of vascular plants bryophytes for surveyed sites

Species	1	2	3	4	5	6	7	8	9	10	12	14	15	17	18	19	20	22	26	27	28	30	31	33	34	35	36	37	38	48	49	51	53	55	58	61	65	69	73	74	75	76	78	79	80	81	82	83	84	85
Rhyt lore																	1																																	
Rhyt squa																																			1																
Rhyt triq				1				1			1			1	1	1	1							1											1	1								1	1			1		
Spha capi																																													1						
Spha cusp																									1																										
Spha palu																									1																		1				1					
Spha recu																																																		
Spha squa																																																		
Tham alop	1		1	1	1				1	1	1			1				1			1	1	1	1		1	1	1		1				1		1	1							1	1			1		1
Thui tama	1	1		1	1	1	1	1	1		1			1	1	1	1		1		1	1		1			1	1		1	1		1	1	1	1	1	1	1		1	1	1	1	1	1	1		1	1
Tort sp.														1																																					
Ulot crisp																					1																														1
Ulot norv															1																																				
Ulot phyl																																																		
Zygo viri															1																																				
Caly muel																																																1			
Cono coni																																																		
Dipl albi																																																		
Frul dila				1			1							1									1				1									1									1	1	1			
Frul tama															1	1											1																								
Lepi rept																																																		
Loph bid															1		1			1														1													1				
Loph cusp																																						1												
Loph hete																																																		
Marc poly	1																																																		
Metz frut																																																		
Metz furc																								1											1															
Pell endi																																																		
Pell epip					1			1																				1	1								1													
Plag aspl														1																																					
Plag pore														1																																					
Pore plat														1																																					
Radu comp				1										1							1			1																							1	1	1			1
Scap irri																																																		
	80	28	95	104	91	33	74	46	69	65	74	79	119	75	98	64	66	47	71	57	72	81	81	91	51	78	53	51	36	87	70	72	54	75	73	68	46	59	55	61	38	36	43	62	70	58	88	55	78	63

Appendix 7 Table of vascular plants bryophytes for surveyed sites

Species	86	88	89	91	95	96	99	100	102	103	106	108	109	110	112	113	114	116	117	122	123	124	125	126	127	128	130	131	135	136	137	138	139	141	145	147	148	149	151	153
Tree species																																								
Abie alba						1												1	1								1				1						1			
Abie gran																																								
Abie proc																																								
Acer camp																																								
Acer plat																																								
Acer pseu	1	1	1			1	1	1	1	1		1		1	1	1	1	1	1	1	1		1		1	1	1			1	1	1	1		1	1	1		1	
Aesc hipp		1				1							1						1		1					1														
Alnu glut	1						1	1	1	1							1				1	1		1			1	1		1			1		1		1		1	
Alnu inca																																					1			
Arau arau																																								
Betu pend							1																																	
Betu pub	1	1	1		1				1	1	1							1		1	1	1	1	1				1	1		1				1	1	1	1	
Budd davi																																					1			
Carp betu																															1									
Cast sati		1									1								1																					
Cedr deod																																								
Cham laws																															1									
Cory avel	1	1	1	1		1	1	1	1		1	1	1	1				1	1		1	1	1	1	1	1		1	1	1			1				1		1	
Crat mono	1	1	1	1		1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1		1	1			1	1
Cupr leyl											1																														
Euca sp																																								
Euon euro	1		1			1		1					1					1							1	1				1	1	1								1
Fagu sylv	1	1	1	1		1	1	1	1	1	1	1	1	1	1			1	1	1	1	1	1		1	1	1			1	1	1	1		1	1	1		1	
Fall japo																																								
Frax exce	1	1	1	1		1	1	1		1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		1	1
Fuch mage																																								
Ilex aqui	1	1	1	1	1	1	1	1	1	1		1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			1		1	1	1	1
Jugl regi																																								
Lari deci	1							1																		1					1	1								
Lari kaem																																								
Leyc form																																					1			
Malu sylv		1	1			1	1										1													1					1				1
Pice abie						1	1		1										1			1				1	1			1		1							
Pice sitc	1																							1								1		1						1
Pinu cont																																								
Pinu sylv		1	1					1		1													1				1			1	1		1			1			1	
Popu alba																	1																							
Popu nigr																																								
Popu trem						1																																		

Appendix 7 Table of vascular plants bryophytes for surveyed sites

Species	86	88	89	91	95	96	99	100	102	103	106	108	109	110	112	113	114	116	117	122	123	124	125	126	127	128	130	131	135	136	137	138	139	141	145	147	148	149	151	153
Popu xcan																																								
Prun aviu						1		1										1							1					1									1	
Prun dome																																								
Prun laur	1	1				1			1	1					1				1								1	1					1	1		1	1		1	
Prun padu	1																																						1	
Prun spin	1		1			1		1	1			1	1	1	1	1	1				1	1			1	1				1	1					1			1	
Pseu menz								1						1							1												1		1	1		1	1	
Qpet x rob											1																							1					1	
Quer cerr																																								
Quer ilex																																								
Quer petr			1		1		1					1											1														1	1	1	
Quer robu	1	1				1			1	1			1	1	1	1	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1		1	1		1		1
Rham cath																																								
Sali alba															1		1																		1					
Sali auri										1												1																1	1
Sali capr						1							1		1	1	1										1				1						1			
Sali cine	1		1		1	1	1	1	1	1		1		1		1	1	1	1	1	1	1		1			1	1		1				1	1	1	1	1	1	
Sali frag															1		1																							
Sali pent						1																																		
Sali tria																																								
Sali vimi																																								
Samb nigr		1	1	1			1	1	1			1	1	1	1		1		1			1	1	1	1	1				1	1	1		1		1	1		1	1
Sequ semp																																								
Sorb auc	1		1	1	1				1	1	1								1			1	1			1										1	1	1	
Sorb hib																										1														
Taxu bacc	1																1																							
Thuj plic																																								
Tili cord		1																																						
Tili plat																																								
Tsug hete																																								
Ulmu glab			1			1						1		1	1	1	1		1							1		1		1		1	1		1	1			1	
Ulmu pro																																								
Vibu opul	1		1	1		1		1					1			1		1									1	1											
Woody speci																																								
Bamb sp.																																								
Buxu semp																																								
Callu vulg	1																						1																	
Clem vita																																								
Corn sang	1																1								1															
Corn seri																																								

Appendix 7 Table of vascular plants bryophytes for surveyed sites

Species	86	88	89	91	95	96	99	100	102	103	106	108	109	110	112	113	114	116	117	122	123	124	125	126	127	128	130	131	135	136	137	138	139	141	145	147	148	149	151	153
Coto sp																1	1		1																					
Cytis scop																												1												
Eric cine																																								
Eric tetr	1				1																																			
Hede heli	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Ligu oval																																								
Ligu vulg																1															1		1			1				
Myri gale	1																																							
Rhod pont									1										1														1						1	
Ribe nigr																																								
Ribe rubr			1																																				1
Ribe u-c																									1															
Rosa arv		1										1														1	1			1		1				1				
Rosa can	1					1						1	1	1	1	1	1	1	1			1			1			1	1	1	1	1								1
Rubu caes																																								
Rubu frut	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Rubu idea	1		1																													1								
Symp albu	1													1		1	1										1	1								1					
Ulex euro	1		1		1	1		1	1	1					1						1	1	1								1					1	1	1	
Ulex gali																																	1							
Vacc myrt			1		1				1	1	1											1	1																1	
Herb species																																								
Achi mill																																								
Aego poda																																								
Aeth cyna																																			1					
Agri eupa																																								
Ajug rept	1			1		1		1				1	1	1	1			1	1	1	1	1		1	1	1		1			1							1	1
Alch fili																															1									
Alch xant																																								
Alis plan																																								
Alli pete													1						1						1															
Alli urs																																								1
Anag arve																																			1					
Anem nem																																								
Ange syl						1		1		1						1	1			1	1			1									1	1	1		1		1	1
Anth sylv												1		1	1		1								1	1					1	1				1				
Apiu nodi																	1				1				1										1					
Aqui vulg																															1									
Arct minu	1												1												1						1							1	
Arum macu	1	1	1	1		1		1					1	1	1	1			1			1			1	1	1	1			1	1			1					1

Appendix 7 Table of vascular plants bryophytes for surveyed sites

Species	86	88	89	91	95	96	99	100	102	103	106	108	109	110	112	113	114	116	117	122	123	124	125	126	127	128	130	131	135	136	137	138	139	141	145	147	148	149	151	153
Bell pere						1							1												1						1				1					
Beru erec																																			1					
Blac perf																														1										
Bras rapa																																								
Call stag												1																											1	
Calth palu																	1																							
Caly sepi								1											1												1				1				1	
Camp rotu																																								
Camp trac																									1															
Caps burp																																			1					
Card flex						1						1				1	1		1		1	1				1	1	1		1				1	1	1				1
Card hirs														1																		1								
Card prat																	1											1												
Carl vulg																																								
Cent eryt																																								
Cent nigr																																								
Cera font																																			1				1	
Cham angu	1																		1		1	1										1	1		1		1			
Chen albu																																			1					
Chen bo-h																																								
Chry opp				1		1		1				1				1	1	1			1			1	1	1						1	1	1					1	1
Circ lute	1	1	1	1		1	1	1					1	1	1		1	1	1		1	1			1	1				1	1	1	1	1	1		1		1	1
Cirs arve																															1									
Cirs diss																																			1					
Cirs pal					1		1													1	1										1		1		1	1			1	
Cirs vulg												1	1		1		1		1						1			1		1	1								
Coni macu																																								
Cono maju						1						1			1			1	1					1	1															
Coro squa																																			1					
Crep palu																																								
Croc xcro																																								
Dact fuch																1																								
Dact maja																																								1
Dauc caro																																								
Digi purp					1						1	1							1		1	1	1			1						1					1	1	1	
Epil hirs													1			1	1													1	1				1					
Epil mont							1			1	1	1	1	1	1	1				1	1								1	1	1							1	
Epil palu										1																														
Epil parv																																								
Epip hell																																								

Appendix 7 Table of vascular plants bryophytes for surveyed sites

Species	86	88	89	91	95	96	99	100	102	103	106	108	109	110	112	113	114	116	117	122	123	124	125	126	127	128	130	131	135	136	137	138	139	141	145	147	148	149	151	153
Eupa cann																																								
Eupr offi																																								
Fila vulg																																								
Fili ulma	1		1			1	1	1				1	1		1	1	1	1	1		1	1		1	1		1	1	1	1	1			1	1	1			1	1
Frag vesc	1			1		1							1			1		1	1								1				1									
Gale tetr																																				1				
Gali apar						1	1	1			1	1	1	1	1	1							1		1	1	1	1		1	1	1	1	1	1	1			1	1
Gali odor				1															1																				
Gali palu	1				1			1		1		1				1	1			1	1			1				1	1	1				1				1	
Gali saxa																												1											
Gali ulig																															1								
Gali veru																																							
Gera colu																																							
Gera diss													1																										
Gera robe	1	1		1		1	1	1				1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		1		1	1	1		1	1
Geum riva																																								
Geum urba	1			1		1	1	1				1	1	1	1	1	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1		1	1
Glec hede	1		1									1	1	1		1	1	1	1						1						1	1	1							1
Gnap ulig																																		1						
Gunn tinc																	1																							
Hera mant																																								
Hera spho	1					1		1				1	1	1	1		1		1	1					1	1					1	1	1	1	1	1	1		1	1
Hier perp																																								
Hipp vulg																																								
Hyac nons						1	1	1			1	1	1	1	1			1	1		1	1			1	1	1	1			1	1	1	1			1	1	1	1
Hydr vulg																																								
Hype andr						1		1				1	1	1				1	1												1		1			1			1	
Hype caly																																								
Hype humi																																								
Hype macu						1									1															1										
Hype perf																														1										
Hype pulc											1																				1								1	
Hype tetr												1	1																											
Hypo radi																																							1	
Impa glan																																	1	1						
Iris pseu								1									1							1	1					1				1	1				1	
Laps comm							1	1							1				1											1					1					
Lath mont													1																											
Lath prat						1						1	1		1															1										
Lemm mino																																								

Appendix 7 Table of vascular plants bryophytes for surveyed sites

Species	86	88	89	91	95	96	99	100	102	103	106	108	109	110	112	113	114	116	117	122	123	124	125	126	127	128	130	131	135	136	137	138	139	141	145	147	148	149	151	153
Leon autu																																						1		
Leon hisp																																								
Leuc aest																																								
Leuc vulg																																								
Linu cath																																								
List ovat						1										1																									
Lith offi																																								
Loni niti																																			1					
Loni peri	1		1	1	1	1	1	1		1	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		1	1	1	1		1
Lotu corn						1							1							1										1									1		
Lotu ulig																																								
Lych fl-c												1																	1											
Lyco euro																																								
Lysi nemo	1							1		1		1		1								1		1				1								1	1	1	1	
Lysi numu																																								
Lysi vulg																																								
Lyth sali							1																																1	
Matr disc																																			1					
Medi lupu																																			1					
Mela prat																																								
Ment aqua	1											1					1				1									1					1					
Ment arve																																								
Meny trif																																								
Merc pere																															1									
Myos arve																									1															
Myos laxa																																								
Myos scor																																								
Myos secu																																								
Nart ossi																																								
Odon vern																																								
Oena croc								1																1										1			1		1	1
Orch masc																			1							1					1						1			
Orig vulg																																								
Orob hede															1																									
Oxal acet	1			1		1		1		1	1	1						1	1	1	1	1	1	1	1	1		1	1			1	1	1			1		1	1
Pedi sylv																																								
Peta frag																			1												1					1				
Peta hybr																																			1					
Ping vulg																																								
Plan coro																																							1	

Appendix 7 Table of vascular plants bryophytes for surveyed sites

Species	86	88	89	91	95	96	99	100	102	103	106	108	109	110	112	113	114	116	117	122	123	124	125	126	127	128	130	131	135	136	137	138	139	141	145	147	148	149	151	153
Plan lanc						1							1		1				1		1										1									
Plan majo													1	1			1				1				1						1				1					
Plan med						1													1																					
Poly amph																																								
Poly avic																																			1					
Poly hydr																																								
Poly pers																																			1				1	
Pote angl																																								
Pote anse						1									1															1	1									
Pote erect	1									1																	1													
Pote palu																																								
Pote rept						1						1	1													1				1										
Pote ster	1							1				1	1	1	1	1		1	1		1	1			1	1				1	1	1				1			1	
Poto poly																																								
Prim veri						1																																		
Prim vulg	1			1	1	1	1	1				1	1	1	1		1								1		1						1	1	1	1			1	1
Prun vulg	1						1	1				1									1						1		1											
Puli dyse																																								
Ranu acri						1									1										1				1						1					
Ranu auri														1														1												
Ranu fica						1								1					1							1		1			1									
Ranu flam										1		1								1																			1	
Ranu omni																																							1	
Ranu repe	1					1		1		1		1	1	1	1	1	1	1	1	1	1	1			1	1		1	1	1	1	1	1	1	1	1		1	1
Rhin mino																																								
Rori amph																																								
Rori nast																	1																						1	
Rori palu																																								
Rume acet													1																											
Rume cong													1			1	1								1							1								
Rume cris																	1																		1					
Rume obtu																																								
Rume san	1						1	1				1	1	1	1	1	1	1	1		1					1		1	1	1		1	1		1	1			1	1
Sagi proc																																								
Sani euro	1					1		1						1	1			1	1	1	1				1		1	1	1		1		1							
Scro auri																					1			1																
Scro nod								1						1		1															1						1			
Scut gale																																							1	
Sene aqua								1				1									1									1									1	1
Sene jaco												1	1		1										1			1		1	1									

Appendix 7 Table of vascular plants bryophytes for surveyed sites

Species	86	88	89	91	95	96	99	100	102	103	106	108	109	110	112	113	114	116	117	122	123	124	125	126	127	128	130	131	135	136	137	138	139	141	145	147	148	149	151	153
Sene squa																																								
Sisy offi																																			1					
Smyr olus																																								
Sola dulc							1																	1															1	
Sola nigr																																								
Soli virg										1																														
Sonc arve																																								
Sonc aspe																																			1					
Sonc oler	1											1	1												1										1					
Spar erec																																								
Stac arve																																								
Stac palu								1																																
Stac sylv	1		1					1				1		1			1		1		1				1						1	1							
Stel alsi												1								1																			
Stel gram																																							1	
Stel holo								1		1		1							1				1		1	1						1								
Stel medi	1																																							
Succ prat					1					1																														
Symp offi																																								
Tara offi	1					1		1				1	1	1	1	1		1	1		1				1			1			1	1			1					
Teuc scor							1				1	1							1		1																1	1	1	
Thal flav																																								
Tori japo																																								
Trif dubi													1																	1										
Trif prat						1									1				1											1					1					
Trif repe													1																	1										
Tuss farf																									1															
Umbi rupe																						1	1																	
Urti uren																																								
Urtic dioi	1	1	1	1		1		1				1	1	1	1		1		1		1	1	1	1				1		1	1	1	1	1	1			1	1
Vale offi																	1							1												1		1	1
Vero becc																																								
Vero cham						1		1				1	1	1	1	1	1	1	1		1	1			1	1		1			1					1			1	
Vero hede																			1																				
Vero mont	1			1		1	1							1	1	1	1		1					1	1	1	1	1		1	1	1	1			1			1	1
Vero offi												1									1								1										
Vero pers																																			1					
Vero serp						1										1											1	1			1								
Vici crac																														1										
Vicia sep						1	1	1				1	1	1	1			1	1					1	1		1	1		1	1	1	1		1	1				

Appendix 7 Table of vascular plants bryophytes for surveyed sites

Species	86	88	89	91	95	96	99	100	102	103	106	108	109	110	112	113	114	116	117	122	123	124	125	126	127	128	130	131	135	136	137	138	139	141	145	147	148	149	151	153
Vinc mino																																								
Viol sp						1					1	1	1		1	1		1		1	1	1		1	1	1	1			1	1		1	1		1			1	1
Viola pal										1																														
Viola reic																									1															
Viola rivi	1	1		1		1		1						1					1							1	1				1					1	1		
Grass specie																																								
Agro cani	1					1								1		1									1			1												
Agro capi	1								1					1			1									1			1			1								
Agro stol	1				1	1	1	1		1			1	1	1	1	1	1	1		1	1								1	1	1	1			1		1	1	1
Aira cary																																								
Alop geni																																		1						
Alop prat																																								
Anth odor						1			1			1	1				1													1	1						1	1	
Arrh elat												1												1						1			1		1				1	
Aven pube																																								
Brac pinn												1																												
Brac sylv	1	1	1	1			1	1		1		1	1	1			1	1							1		1	1	1	1	1	1	1		1	1			1	1
Briz medi																																								
Brom ramo						1									1				1																					
Cyno cris													1		1															1										
Dact glom	1		1			1		1				1			1	1									1						1				1					
Desc flex																																								
Desch cesp	1		1			1	1			1	1	1	1			1		1		1		1		1			1	1		1	1	1			1			1	
Elym cani																																								
Elyt junc																																		1						
Elyt repe																																								
Fest alti																																		1						
Fest gigi	1																																							
Fest ovin																									1															
Fest rubr						1							1										1																	
Glyc flui					1					1														1													1		1	
Holc lana					1	1	1	1	1	1		1	1		1	1	1		1	1		1		1				1	1	1	1		1		1	1		1	1	1
Holc moll												1																												
Loli pere																														1					1				1	
Meli unif														1											1															
Moli caer	1		1		1					1																														
Phal arun						1		1							1		1							1													1				
Phle prat																														1										
Phra aust	1		1																																					
Poa annu																																			1					

Appendix 7 Table of vascular plants bryophytes for surveyed sites

Species	86	88	89	91	95	96	99	100	102	103	106	108	109	110	112	113	114	116	117	122	123	124	125	126	127	128	130	131	135	136	137	138	139	141	145	147	148	149	151	153
Poa triv						1									1				1							1	1	1												
Rush & sedg																																								
Junc acut																																								
Junc arti																																							1	
Junc bufo																																			1					
Junc bulb										1																														
Junc cong																						1																		
Junc effu	1				1	1	1	1	1	1		1	1			1	1	1	1	1	1	1		1			1	1	1	1	1	1	1	1		1	1	1	1	1
Junc infl																																								
Junc tenu																																								
Luzu camp																											1													
Luzu mult																											1													
Luzu pilo												1																												
Luzu sylv						1			1	1	1	1		1									1			1						1		1			1	1		
Typh lati																																								
Care acut																	1																							
Care aqua																																								
Care bine																																								
Care demi																																								
Care divu														1																			1							
Care echi										1																														
Care elat																																								
Care flac						1							1														1			1	1									
Care flav																																								
Care hirt						1																																		
Care laev												1																												
Care nigr																																								
Care otru						1																																		
Care palle																																								
Care pani								1																																
Care pend						1	1		1								1		1																					
Care pilu																																								
Care puli																																								
Care rem	1					1		1				1	1	1	1		1	1	1	1	1	1		1		1	1		1	1	1	1	1	1	1	1			1	1
Care ripi																																								
Care rost																																								
Care sero																																								
Care strig																																								
Care sylv	1			1		1	1	1				1	1	1	1	1		1	1			1				1	1	1			1	1	1			1				1
Care vesi																																								

Appendix 7 Table of vascular plants bryophytes for surveyed sites

Species	86	88	89	91	95	96	99	100	102	103	106	108	109	110	112	113	114	116	117	122	123	124	125	126	127	128	130	131	135	136	137	138	139	141	145	147	148	149	151	153
Care viri																																								
Clad mari																																								
Rhyn alba																																								
Scho lacu																																								
Scho nigr																																								
Trig palu																																								
Horsetail spe																																								
Equi arve												1			1		1							1											1					
Equi fluv																	1																							
Equi palu																																								
Equi sylv																														1										
Equi telm						1												1																1	1					1
Fern species																																								
Aspl adia																																								
Aspl tric															1										1						1									
Athy f-f								1		1								1			1			1								1		1		1			1	1
Blec spic	1				1			1	1	1		1						1	1	1	1	1		1		1	1					1	1				1		1	
Dryo aem																																								
Dryo affi					1	1	1	1	1	1	1	1	1	1		1		1	1	1	1		1	1		1		1				1	1	1			1		1	1
Dryo cart																																								
Dryo dila	1		1		1	1	1	1	1	1	1		1	1		1		1	1	1	1	1	1	1		1	1	1		1	1	1	1	1	1	1	1	1	1
Dryo f-m					1	1							1	1	1	1			1							1		1		1	1					1				
Ophi vulg						1																																		
Osmu rega					1																																			
Phly scolo	1	1		1			1	1	1			1	1	1	1	1		1	1					1	1		1				1	1		1	1	1				1
Pols seti				1	1	1	1	1				1	1	1	1	1		1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1			1	1
Poly vulg				1				1				1		1							1	1	1		1					1	1				1				1	
Pter aqui	1		1				1	1	1	1	1	1	1	1				1	1		1		1								1		1		1	1	1	1	1	
Moss & liver																																								
Ambl serp																																								
Atri undu															1																									
Brac riv																																								
Brac rut				1		1									1														1											
Bryu sp.																																								
Call cusp								1																																
Camp intr																																								
Camp pyri																																								
Cirr pili																										1														
Clim den								1																																

Appendix 7 Table of vascular plants bryophytes for surveyed sites

Species	86	88	89	91	95	96	99	100	102	103	106	108	109	110	112	113	114	116	117	122	123	124	125	126	127	128	130	131	135	136	137	138	139	141	145	147	148	149	151	153
Cryp hete																																								
Cten moll	1																																							
Dicr arra																																							1
Dicr cirr																						1																		
Dicr hete																					1																		1	
Dicr maju					1																																		
Dicr scop																																							
Eurh prae	1				1	1						1	1		1		1			1	1		1	1	1		1			1	1	1	1	1		1			1	
Eurh scop																																							
Eurh stri	1			1		1			1				1		1			1	1	1	1		1	1	1	1	1	1	1		1	1		1	1				1	1
Fiss adia								1																															
Fiss bryo																	1														1								
Fiss taxi																															1								
Font anti																																							
Homa seri																									1														
Hook luce								1													1					1													1	
Hylo brevi	1																																						
Hylo splen				1																																			
Hypn ando	1																					1	1			1						1						1	
Hypn cupr	1	1	1	1	1			1													1		1									1					1	1	1	
Hypn jutl	1											1										1			1														
Hypn resu															1						1																		
Isop eleg					1						1																											1	
Isot myos				1					1		1				1						1	1	1			1		1			1						1	1	
Isot myur	1																																						
Leuc glau																																							
Mniu horn	1		1					1	1						1	1					1	1				1						1				1			
Neck comp	1			1		1		1								1												1			1	1	1					1	
Neck crisp																																							
Orth affi	1																																						
Orth pulc																					1																		
Pleu schr																																							
Plth dent																							1																
Plth undu																																							
Pmni undu				1				1					1	1		1						1			1			1				1	1	1					1	
Poly aloi																																							
Poly comm									1																		1													
Poly form	1				1			1	1	1								1				1										1								
Pseu puru					1				1																															
Rhiz punc				1						1														1															1	

Appendix 7 Table of vascular plants bryophytes for surveyed sites

Species	86	88	89	91	95	96	99	100	102	103	106	108	109	110	112	113	114	116	117	122	123	124	125	126	127	128	130	131	135	136	137	138	139	141	145	147	148	149	151	153
Rhyt lore	1																																							
Rhyt squa																																	1							
Rhyt triq	1			1		1										1		1								1	1		1		1									
Spha capi																																								
Spha cusp																																								
Spha palu	1				1					1																														
Spha recu																																								
Spha squa																																								
Tham alop	1			1		1		1							1	1	1		1		1	1			1	1	1				1	1								
Thui tama	1		1	1	1	1		1	1	1	1	1			1	1		1	1		1	1	1		1	1	1	1	1	1	1	1	1	1		1			1	1
Tort sp.																																								
Ulot crisp																					1																		1	
Ulot norv																																								
Ulot phyl																																								
Zygo viri																																								
Caly muel																																								
Cono coni																	1																							
Dipl albi																																				1				
Frul dila	1		1																												1									
Frul tama																																								
Lepi rept																					1																			
Loph bid																	1											1												
Loph cusp																	1																							
Loph hete																								1																
Marc poly																																								
Metz frut																																								
Metz furc	1											1										1	1								1		1		1					
Pell endi								1																																
Pell epip																	1	1			1			1																
Plag aspl																																								
Plag pore																															1									
Pore plat																																								
Radu comp	1																										1													
Scap irri																																								
	95	26	41	40	35	97	44	84	37	50	27	85	77	63	74	60	72	56	81	36	75	59	39	49	72	63	54	63	32	74	98	65	58	38	80	59	46	26	102	55

Appendix 7 Table of vascular plants bryophytes for surveyed sites

Species	154	155	156	157	158	159	160	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	183	184	185	186	187	189	190	191	192	197	198	199
Tree species																																						
Abie alba	1																		1													1						
Abie gran																																						
Abie proc																			1																			
Acer camp																																						
Acer plat																																						
Acer pseu	1	1	1	1	1	1	1	1		1	1	1	1	1		1	1		1	1	1	1	1		1	1		1	1	1	1	1	1	1	1	1	1	1
Aesc hipp	1																				1		1					1	1		1			1	1			
Alnu glut	1			1		1								1							1	1								1	1		1	1	1	1		1
Alnu inca																																						
Arau arau																																1						
Betu pend				1						1											1											1						
Betu pub	1		1		1	1	1						1	1	1	1	1							1	1	1	1				1				1		
Budd davi																																						
Carp betu	1																																					
Cast sati	1																1																					
Cedr deod																																						
Cham laws																																						
Cory avel	1	1	1	1	1	1	1	1				1	1		1		1		1	1		1	1	1	1	1	1	1		1	1	1		1		1	1	
Crat mono	1	1	1	1	1		1	1		1				1	1	1		1	1	1	1	1	1		1	1			1	1	1	1		1	1	1	1	1
Cupr leyl																																						
Euca sp																		1																				
Euon euro			1	1	1															1	1	1	1					1	1								
Fagu sylv	1	1			1		1	1	1	1		1	1	1	1	1		1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	
Fall japo																													1	1					1			
Frax exce	1	1	1	1	1	1	1	1		1		1	1	1		1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Fuch mage																																	1					
Ilex aqui	1	1	1	1	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			1	1	1	1	1	1	1	
Jugl regi																					1																	
Lari deci																1											1										
Lari kaem																																						
Leyc form																	1																1				1	
Malu sylv																							1													1		
Pice abie			1															1						1			1						1					
Pice sitc			1										1																									
Pinu cont																																						
Pinu sylv										1						1			1	1	1			1		1		1									1	
Popu alba																																						
Popu nigr																																						
Popu trem																					1								1									

Appendix 7 Table of vascular plants bryophytes for surveyed sites

Species	154	155	156	157	158	159	160	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	183	184	185	186	187	189	190	191	192	197	198	199
Popu xcan																																						
Prun aviu				1		1																									1							
Prun dome											1																											
Prun laur	1	1	1		1												1										1	1	1	1	1	1		1	1	1	1	
Prun padu																																						
Prun spin		1	1	1	1	1	1	1				1								1	1	1	1			1					1				1	1		1
Pseu menz	1										1																	1										
Qpet x rob									1									1							1	1											1	1	
Quer cerr																																						
Quer ilex																																						
Quer petr			1		1					1					1	1				1				1														
Quer robu	1			1			1	1			1	1	1				1		1	1	1	1					1	1	1	1	1	1	1	1	1	1	1	1
Rham cath																					1	1																
Sali alba	1																																		1			
Sali auri					1		1			1			1	1			1										1											
Sali capr						1			1	1							1		1							1	1											
Sali cine	1			1		1	1	1	1	1			1	1			1		1		1	1	1	1			1		1		1	1	1	1	1	1		1
Sali frag																					1																	1
Sali pent																																						
Sali tria																																						
Sali vimi																					1																	
Samb nigr		1	1	1	1	1	1	1		1	1	1				1	1		1	1			1				1	1	1				1	1	1	1		1
Sequ semp																																		1				
Sorb auc			1	1	1		1		1	1				1	1	1		1							1	1	1	1					1	1			1		
Sorb hib																																						
Taxu bacc	1						1										1				1	1	1							1	1		1	1			1	
Thuj plic																														1			1	1				
Tili cord	1																												1									
Tili plat																					1																	
Tsug hete																					1																	
Ulmu glab	1	1	1								1									1								1	1	1					1	1		1
Ulmu pro																																						
Vibu opul	1						1						1								1	1	1				1									1		
Woody speci																																						
Bamb sp.																																	1					
Buxu semp																													1									
Callu vulg							1		1	1																												
Clem vita																																						
Corn sang																																						
Corn seri																																						

Appendix 7 Table of vascular plants bryophytes for surveyed sites

Species	154	155	156	157	158	159	160	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	183	184	185	186	187	189	190	191	192	197	198	199
Coto sp																				1					1														
Cytis scop														1																								
Eric cine																																						
Eric tetr																																						
Hede heli	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		1	1	1	1	1	1		1	1
Ligu oval																																						
Ligu vulg																																						
Myri gale																																						
Rhod pont		1															1	1											1				1	1			1	
Ribe nigr																					1																	
Ribe rubr												1																										
Ribe u-c																																						
Rosa arv	1		1																												1							1
Rosa can		1	1						1				1									1																
Rubu caes																																						
Rubu frut	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1		1	1	1	1	1	1	1		1	
Rubu idea					1		1																						1									
Symp albu	1																1	1			1								1	1							1	
Ulex euro	1		1	1		1	1		1	1			1	1		1								1											1			
Ulex gali																										1												
Vacc myrt									1							1		1							1	1												
Herb species																																						
Achi mill									1																													
Aego poda																	1											1										
Aeth cyna																																						
Agri eupa																																						
Ajug rept	1		1				1		1				1				1		1	1		1				1	1					1			1		1	
Alch fili																						1																
Alch xant																																						
Alis plan																																						
Alli pete																																						
Alli urs																																						
Anag arve								1																			1											
Anem nem	1															1																						
Ange syl	1		1	1	1									1			1				1	1				1	1				1		1		1			1
Anth sylv									1																					1								1
Apiu nodi	1																				1	1													1			1
Aqui vulg																						1																
Arct minu			1					1									1																					
Arum macu	1	1	1	1	1	1	1	1											1	1		1	1							1		1		1		1	1	1

Appendix 7 Table of vascular plants bryophytes for surveyed sites

Species	154	155	156	157	158	159	160	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	183	184	185	186	187	189	190	191	192	197	198	199
Bell pere			1						1						1												1											
Beru erec																																						
Blac perf																																						
Bras rapa																																						
Call stag																																						
Calth palu																																						
Caly sepi	1				1	1	1	1						1					1																1	1		1
Camp rotu																																						
Camp trac																																						
Caps burp																																						
Card flex	1		1		1									1					1	1	1				1	1	1			1	1			1	1			
Card hirs																					1																	
Card prat																																						
Carl vulg																																						
Cent eryt																																						
Cent nigr							1	1														1																
Cera font								1							1																							
Cham angu					1					1	1		1			1			1							1	1		1					1			1	
Chen albu																																						
Chen bo-h																																						
Chry opp	1		1	1	1														1					1	1	1	1			1	1	1	1	1	1			1
Circ lute	1		1	1	1			1						1		1	1		1	1		1		1		1	1	1	1	1	1	1	1			1	1	1
Cirs arve			1					1								1					1	1	1	1					1								
Cirs diss															1									1														
Cirs pal	1						1						1		1								1	1		1							1			1		
Cirs vulg															1	1			1					1			1		1									
Coni macu																																						
Cono maju								1														1	1		1											1		
Coro squa																																						
Crep palu	1																																					
Croc xcro	1																																					
Dact fuch	1																		1	1		1																
Dact maja																																						
Dauc caro																																						
Digi purp	1				1				1						1									1		1	1						1					
Epil hirs	1				1		1		1					1		1			1		1	1					1								1	1		1
Epil mont	1	1	1		1				1					1		1			1	1						1			1							1	
Epil palu														1													1										
Epil parv																						1																
Epip hell			1																																			

Appendix 7 Table of vascular plants bryophytes for surveyed sites

Species	154	155	156	157	158	159	160	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	183	184	185	186	187	189	190	191	192	197	198	199
Eupa cann																																						
Eupr offi																																						
Fila vulg																																						
Fili ulma	1	1	1		1	1	1	1				1	1	1					1	1	1	1	1			1				1	1		1	1	1	1		1
Frag vesc			1			1	1		1										1	1		1													1		
Gale tetr																																						
Gali apar	1	1	1		1			1			1	1					1		1		1	1				1				1			1	1				1
Gali odor								1																														
Gali palu	1		1											1					1		1	1												1	1			1
Gali saxa															1																						
Gali ulig																																						1
Gali veru																																						
Gera colu																																						
Gera diss																																						
Gera robe	1		1	1	1		1	1	1			1	1	1		1	1		1	1		1	1	1	1	1	1			1		1	1	1	1	1	1	1
Geum riva																						1																
Geum urba	1	1	1		1	1	1	1	1			1		1			1		1	1		1	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1
Glec hede	1		1			1		1											1				1	1										1	1		
Gnap ulig																																						
Gunn tinc																																						
Hera mant																																						
Hera spho	1	1	1					1	1			1				1				1		1	1			1			1	1		1	1	1		1		
Hier perp																																						
Hipp vulg																																						
Hyac nons	1	1	1	1	1			1				1	1			1			1	1				1		1	1	1		1	1					1	1	
Hydr vulg																																						
Hype andr								1		1		1							1					1			1						1					
Hype caly																																						
Hype humi							1									1																						
Hype macu			1																																			
Hype perf									1											1																		
Hype pulc			1						1			1	1			1				1					1	1	1											
Hype tetr	1						1	1	1													1		1														
Hypo radi			1						1				1		1											1												
Impa glan						1						1																										
Iris pseu	1												1								1	1			1			1						1	1			1
Laps comm			1					1								1								1		1	1										
Lath mont																									1													
Lath prat			1					1											1			1					1			1							
Lemm mino																						1																

Appendix 7 Table of vascular plants bryophytes for surveyed sites

Species	154	155	156	157	158	159	160	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	183	184	185	186	187	189	190	191	192	197	198	199
Leon autu																																						
Leon hisp																																						
Leuc aest																																						
Leuc vulg													1																									
Linu cath																																						
List ovat																				1																		
Lith offi																																						
Loni niti																																						
Loni peri	1	1	1		1	1	1	1	1	1		1		1	1	1		1	1	1				1	1	1	1				1	1		1	1	1	1	
Lotu corn	1		1						1				1											1			1							1				1
Lotu ulig																																						
Lych fl-c													1														1											
Lyco euro																					1	1												1				
Lysi nemo	1		1										1						1	1					1	1	1				1				1		1	
Lysi numu																																						
Lysi vulg																																						
Lyth sali																					1	1														1		1
Matr disc	1							1																														
Medi lupu								1																														
Mela prat																																						
Ment aqua	1						1														1	1	1			1								1	1			1
Ment arve																																						
Meny trif																																						
Merc pere																							1															
Myos arve																																						
Myos laxa																																						1
Myos scor																					1																	
Myos secu																																						
Nart ossi																																						
Odon vern																																						
Oena croc																								1														
Orch masc																				1																		
Orig vulg																																						
Orob hede																																						
Oxal acet	1	1	1	1	1							1		1	1	1		1	1			1	1	1	1	1	1					1	1		1	1		
Pedi sylv																																						
Peta frag																1																						
Peta hybr																																						
Ping vulg																																						
Plan coro																																						

Appendix 7 Table of vascular plants bryophytes for surveyed sites

Species	154	155	156	157	158	159	160	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	183	184	185	186	187	189	190	191	192	197	198	199
Plan lanc			1					1	1				1		1				1			1					1											
Plan majo	1		1					1	1							1			1	1					1	1												
Plan med																																						
Poly amph																																						1
Poly avic	1																																					
Poly hydr																										1								1				
Poly pers												1																						1				
Pote angl													1																									
Pote anse								1														1				1												
Pote erect							1			1												1			1													
Pote palu																																						
Pote rept			1						1							1			1			1		1			1											
Pote ster	1	1	1	1	1		1		1				1		1					1		1	1	1	1	1	1									1		
Poto poly																																						
Prim veri																																						
Prim vulg		1	1					1				1		1			1		1	1		1	1			1					1		1	1	1	1		
Prun vulg	1		1		1			1								1				1		1	1	1	1		1											
Puli dyse																						1																1
Ranu acri								1														1												1	1			
Ranu auri																																						
Ranu fica																																						
Ranu flam													1	1								1												1				
Ranu omni																																						
Ranu repe	1		1		1			1	1		1		1	1	1	1			1	1	1	1		1		1	1			1		1	1	1	1		1	1
Rhin mino																						1																
Rori amph																					1																	
Rori nast														1								1																1
Rori palu																																						
Rume acet													1		1											1												
Rume cong		1																									1											
Rume cris																																						
Rume obtu											1															1								1				
Rume san	1		1		1			1				1		1		1			1	1	1	1	1	1		1	1		1	1	1	1	1	1	1	1	1	1
Sagi proc																																						
Sani euro		1						1				1					1					1		1	1							1				1		
Scro auri	1																																					1
Scro nod	1	1	1		1						1		1						1	1																		
Scut gale																																						
Sene aqua							1														1			1		1												
Sene jaco	1		1					1	1							1			1	1	1	1			1		1											1

Appendix 7 Table of vascular plants bryophytes for surveyed sites

Species	154	155	156	157	158	159	160	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	183	184	185	186	187	189	190	191	192	197	198	199
Sene squa																																						
Sisy offi																																						
Smyr olus																																						
Sola dulc							1														1													1				1
Sola nigr																																						
Soli virg										1																												
Sonc arve																																						
Sonc aspe	1																																	1				1
Sonc oler												1							1							1												
Spar erec																																						
Stac arve																								1														
Stac palu																	1																					
Stac sylv	1		1	1		1						1		1					1	1						1	1			1				1		1		
Stel alsi																										1												
Stel gram																																						
Stel holo	1		1	1	1							1	1			1																			1			
Stel medi	1																																					
Succ prat							1		1				1									1																
Symp offi	1																				1																	
Tara offi	1		1						1				1		1	1			1	1		1			1		1									1	1	
Teuc scor		1				1			1	1			1			1		1						1	1	1												
Thal flav																																						
Tori japo								1								1																						
Trif dubi																																						
Trif prat	1		1					1	1				1						1				1			1												
Trif repe									1				1		1																								
Tuss farf																						1		1														
Umbi rupe												1												1														
Urti uren																																						
Urtic dioi	1		1	1	1	1	1	1			1	1	1	1		1			1		1	1	1	1		1		1	1	1	1	1	1		1	1		1
Vale offi												1													1													1
Vero becc														1																								
Vero cham		1							1				1		1				1	1											1						1	
Vero hede																																						
Vero mont	1	1	1					1				1				1				1		1	1	1			1			1						1		1
Vero offi													1												1													
Vero pers																																						
Vero serp								1																														
Vici crac			1																			1														1		
Vicia sep	1		1				1		1				1						1	1		1	1			1	1			1			1		1	1		

Appendix 7 Table of vascular plants bryophytes for surveyed sites

Species	154	155	156	157	158	159	160	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	183	184	185	186	187	189	190	191	192	197	198	199
Vinc mino	1																																					
Viol sp		1			1							1		1	1	1			1	1				1	1	1	1					1	1		1	1	1	
Viola pal														1																								
Viola reic																																						
Viola rivi			1				1	1	1	1							1				1	1	1						1		1							
Grass specie																																						
Agro cani		1					1		1																													
Agro capi							1											1	1						1													
Agro stol	1				1			1	1	1	1	1	1		1	1				1	1	1		1	1	1	1		1	1	1		1	1	1		1	1
Aira cary																																						
Alop geni																																						
Alop prat																																						
Anth odor							1		1				1		1							1																	
Arrh elat	1		1		1			1				1							1							1	1								1			
Aven pube																																						
Brac pinn																																						
Brac sylv	1	1	1	1			1	1	1			1	1						1	1	1	1	1	1		1	1			1	1	1	1		1	1		
Briz medi																						1																
Brom ramo																						1																
Cyno cris			1						1						1				1			1					1											
Dact glom	1	1	1				1	1								1			1	1		1		1		1	1			1	1				1		
Desc flex																																						
Desch cesp	1	1	1							1					1						1	1				1	1				1			1	1	1		
Elym cani																																						
Elyt junc																																						
Elyt repe																																						
Fest alti	1																																					
Fest gigi	1															1																				1		
Fest ovin																																						
Fest rubr															1																							
Glyc flui							1							1								1				1									1			
Holc lana	1		1		1				1	1	1		1	1		1			1	1		1	1	1	1	1	1			1			1	1			1
Holc moll																																						
Loli pere	1							1																		1											
Meli unif												1																										
Moli caer							1															1															
Phal arun					1								1								1	1															1
Phle prat								1														1															
Phra aust																					1																
Poa annu	1							1																														

Appendix 7 Table of vascular plants bryophytes for surveyed sites

Species	154	155	156	157	158	159	160	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	183	184	185	186	187	189	190	191	192	197	198	199
Poa triv												1																											
Rush & sedg																																						
Junc acut																						1																
Junc arti																1											1											
Junc bufo																1																						
Junc bulb													1																									
Junc cong	1																																					
Junc effu	1		1		1		1						1	1	1	1			1			1				1	1						1	1	1	1	1	
Junc infl																						1																
Junc tenu													1												1													
Luzu camp															1																							
Luzu mult							1						1																									
Luzu pilo									1							1										1												
Luzu sylv	1	1			1				1	1		1	1		1	1		1	1						1	1	1			1							
Typh lati																																						
Care acut																																						
Care aqua																																						
Care bine																																						
Care demi																											1											
Care divu																																						
Care echi																																						
Care elat																																						
Care flac		1	1				1		1										1	1							1											
Care flav																																						
Care hirt							1															1																
Care laev																																						
Care nigr																																						
Care otru																																						
Care palle																																						
Care pani																																			1			
Care pend	1				1							1		1					1		1										1		1			1	1	
Care pilu																																						
Care puli																																						
Care rem	1				1							1	1	1		1		1		1	1						1			1	1	1	1	1	1	1	1	
Care ripi																																						
Care rost																																						
Care sero																																						
Care strig																																						
Care sylv	1	1	1			1		1	1			1	1						1	1		1			1	1	1				1		1			1	1	
Care vesi																					1																	

Appendix 7 Table of vascular plants bryophytes for surveyed sites

Species	154	155	156	157	158	159	160	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	183	184	185	186	187	189	190	191	192	197	198	199
Care viri																																						
Clad mari																																						
Rhyn alba																																						
Scho lacu																																						
Scho nigr																																						
Trig palu																																						
Horsetail spe																																						
Equi arve	1													1								1									1				1		1
Equi fluv																						1																
Equi palu																					1																	
Equi sylv			1				1																															
Equi telm																											1						1		1			
Fern species																																						
Aspl adia																																						
Aspl tric																																						
Athy f-f					1							1		1		1	1			1	1									1				1	1	1	1
Blec spic	1	1	1	1			1		1	1			1	1	1	1	1	1	1						1	1				1	1		1		1			
Dryo aem																																						
Dryo affi	1	1	1						1	1			1	1		1	1	1	1	1	1	1		1	1	1	1	1				1	1		1		1	1
Dryo cart																																						
Dryo dila	1	1	1	1	1	1	1		1			1	1	1	1	1	1	1	1	1				1	1	1	1	1			1	1	1	1	1	1	1	1
Dryo f-m			1		1		1	1	1											1		1					1	1	1	1					1	1		
Ophi vulg																																						
Osmu rega																																						
Phly scolo	1		1	1	1	1		1									1		1			1						1		1	1		1	1	1	1	1	1
Pols seti	1	1	1		1			1				1					1					1		1		1	1				1	1	1	1	1	1	1	1
Poly vulg	1	1		1													1				1		1	1									1					
Pter aqui	1	1	1	1	1		1	1	1	1		1	1		1	1		1	1	1			1	1	1	1	1		1			1	1				1	
Moss & liver																																						
Ambl serp																																						
Atri undu	1																																					
Brac riv																																						
Brac rut		1			1			1													1										1							1
Bryu sp.																																						
Call cusp			1																																			
Camp intr																																						
Camp pyri																																						
Cirr pili																									1													
Clim den																								1														

Appendix 7 Table of vascular plants bryophytes for surveyed sites

Species	154	155	156	157	158	159	160	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	183	184	185	186	187	189	190	191	192	197	198	199
Cryp hete																																						
Cten moll																																						
Dicr arra																																						
Dicr cirr																																						
Dicr hete													1													1												
Dicr maju																																						
Dicr scop							1																															
Eurh prae	1	1	1				1	1										1			1	1	1	1			1				1	1		1	1			
Eurh scop																																						
Eurh stri	1	1			1		1		1							1			1	1		1		1		1	1				1			1		1	1	1
Fiss adia																	1																					
Fiss bryo	1																																					
Fiss taxi																						1													1			
Font anti																																						
Homa seri																					1																	
Hook luce	1			1										1		1									1							1	1			1	1	
Hylo brevi															1																							
Hylo splen																								1														
Hypn ando		1							1									1	1			1		1		1										1		
Hypn cupr	1		1	1			1	1										1			1	1	1	1	1												
Hypn jutl	1		1				1		1	1			1									1				1												
Hypn resu																			1																			
Isop eleg																										1												
Isot myos		1	1				1		1				1		1			1	1				1	1	1	1				1								
Isot myur								1																														
Leuc glau																																						
Mniu horn	1	1		1	1											1	1	1							1	1	1									1	
Neck comp	1	1	1						1												1			1								1						
Neck crisp																																						
Orth affi																																						
Orth pulc																																						
Pleu schr																																						
Plth dent			1																																			
Plth undu																																				1		
Pmni undu	1																1		1			1			1	1					1		1		1			
Poly aloi																										1												
Poly comm																																						
Poly form			1		1		1		1						1	1		1						1	1	1												
Pseu puru							1																															
Rhiz punc																									1											1		1

Appendix 7 Table of vascular plants bryophytes for surveyed sites

Species	154	155	156	157	158	159	160	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	183	184	185	186	187	189	190	191	192	197	198	199
Rhyt lore							1																															
Rhyt squa																																						
Rhyt triq		1	1				1		1										1	1			1				1									1		
Spha capi																																						
Spha cusp																																						
Spha palu																																						
Spha recu																																						
Spha squa																																						
Tham alop			1	1	1		1	1												1	1	1	1					1		1		1				1	1
Thui tama	1		1	1	1		1		1					1	1	1		1		1		1		1	1	1	1			1	1		1			1	1	1
Tort sp.																																						
Ulot crisp																																						
Ulot norv	1																																					
Ulot phyl																																						
Zygo viri																																						
Caly muel																																						
Cono coni																					1																	
Dipl albi																									1											1		
Frul dila				1																																		
Frul tama																																						
Lepi rept																																						
Loph bid	1						1		1													1														1		
Loph cusp	1																										1											
Loph hete																																						
Marc poly																																						
Metz frut																																1						
Metz furc		1	1					1											1													1						
Pell endi																																						
Pell epip																																						
Plag aspl																																						
Plag pore																																						
Pore plat																																						
Radu comp																				1							1											
Scap irri																																						
	116	54	97	40	62	28	71	70	67	32	16	47	64	49	42	64	39	29	78	66	68	104	45	64	55	82	83	24	31	46	49	39	56	54	60	69	46	60

Appendix 7 Table of vascular plants bryophytes for surveyed sites

Species	200	201	203	204	205	206	208	209	210	211	213	217	219	221	223	225	226	227	228	229	230	234	236	237	238	240	241	242	245	246	249	250	251	252	253	254	255	256
Tree species																																						
Abie alba																				1													1					
Abie gran																																						
Abie proc																																						
Acer camp										1																												
Acer plat																												1										
Acer pseu	1			1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		1	1	1		1		1	1	1	1	1	1	1	1		1	1
Aesc hipp				1						1				1								1						1										
Alnu glut		1	1	1		1	1	1		1	1	1	1	1							1	1		1		1		1				1				1	1	
Alnu inca																												1										
Arau arau																																						
Betu pend																				1																		
Betu pub		1	1	1	1	1	1	1	1	1	1		1				1		1		1			1	1	1	1	1					1		1	1	1
Budd davi																																						
Carp betu							1																															
Cast sati										1																			1									
Cedr deod																																						
Cham laws																															1							
Cory avel	1	1	1	1	1		1	1		1	1	1		1	1	1	1	1	1	1	1	1	1				1	1	1	1	1	1	1	1	1	1	1	1
Crat mono	1	1	1	1	1	1		1	1	1	1		1	1	1	1		1	1	1	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1
Cupr leyl																																						
Euca sp																																						
Euon euro	1											1									1							1	1	1	1	1	1					
Fagu sylv				1			1	1		1		1	1			1	1	1		1	1	1	1	1			1	1	1	1			1		1	1	1	
Fall japo																				1																		
Frax exce	1	1	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1				1	1	1	1	1	1	1	1	1	1	
Fuch mage										1										1																		
Ilex aqui	1	1	1	1	1	1		1	1	1	1		1			1		1	1	1	1	1		1	1	1	1		1	1	1	1	1	1	1	1	1	
Jugl regi																																						
Lari deci																		1	1					1													1	
Lari kaem										1																												
Leyc form																																	1					
Malu sylv																							1		1													
Pice abie							1																					1										
Pice sitc		1		1	1										1																				1	1	1	
Pinu cont																																				1		
Pinu sylv		1		1			1						1							1			1	1	1	1		1						1	1			
Popu alba																																						
Popu nigr										1																												
Popu trem																1																						

Appendix 7 Table of vascular plants bryophytes for surveyed sites

Species	200	201	203	204	205	206	208	209	210	211	213	217	219	221	223	225	226	227	228	229	230	234	236	237	238	240	241	242	245	246	249	250	251	252	253	254	255	256
Popu xcan																																						
Prun aviu										1					1			1															1					
Prun dome																																						
Prun laur		1								1		1								1																1	1
Prun padu																																						
Prun spin	1	1	1	1			1	1		1	1			1	1	1		1			1	1	1				1	1	1	1	1	1	1	1	1	1	1	1
Pseu menz										1																												
Qpet x rob																																						1
Quer cerr																																						
Quer ilex																																						
Quer petr					1	1	1						1											1														1
Quer robu	1	1	1	1			1	1	1	1	1			1	1	1	1	1	1	1	1	1	1		1		1	1	1				1				1	
Rham cath																																						
Sali alba												1				1																						
Sali auri											1		1				1								1								1			1	1	1
Sali capr	1		1	1		1											1			1	1			1			1						1		1		
Sali cine	1	1	1	1	1	1	1	1		1	1	1	1	1	1	1				1	1	1	1	1	1	1		1		1	1	1	1	1	1	1	1	1
Sali frag										1						1																						
Sali pent																																						
Sali tria																																						
Sali vimi																																						
Samb nigr				1			1	1		1			1	1	1	1		1		1				1				1	1	1	1		1		1		1	
Sequ semp																																						
Sorb auc			1	1	1	1				1	1		1						1					1	1	1	1	1		1			1	1	1	1	1	1
Sorb hib																																				1		
Taxu bacc		1																															1					
Thuj plic																																						
Tili cord																		1																				
Tili plat																																						
Tsug hete																																	1					
Ulmu glab	1									1	1	1		1		1	1	1			1	1						1	1			1						
Ulmu pro																																						
Vibu opul			1	1								1									1							1				1					1
Woody speci																																						
Bamb sp.										1																												
Buxu semp																				1								1										
Callu vulg													1											1	1	1										1		
Clem vita																												1										
Corn sang		1								1																		1										
Corn seri																												1										

Appendix 7 Table of vascular plants bryophytes for surveyed sites

Species	200	201	203	204	205	206	208	209	210	211	213	217	219	221	223	225	226	227	228	229	230	234	236	237	238	240	241	242	245	246	249	250	251	252	253	254	255	256
Coto sp		1								1																													
Cytis scop																																						
Eric cine																																						
Eric tetr																								1	1	1													
Hede heli	1	1	1	1	1	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1
Ligu oval																																						
Ligu vulg		1								1					1	1												1											
Myri gale																																						
Rhod pont							1			1		1								1								1											
Ribe nigr																																						
Ribe rubr																												1					1					
Ribe u-c																																						
Rosa arv	1																											1										
Rosa can	1	1	1	1						1	1		1		1						1	1	1						1	1	1	1	1		1	1		1
Rubu caes		1																				1																
Rubu frut	1	1	1	1	1	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Rubu idea														1										1	1			1			1						1	
Symp albu		1								1						1																						
Ulex euro				1	1	1		1	1				1				1					1	1		1			1					1	1	1	1	1	1
Ulex gali																																						
Vacc myrt					1				1															1			1								1	1	1
Herb species																																						
Achi mill																																						
Aego poda																																						
Aeth cyna																																						
Agri eupa																																						
Ajug rept	1		1	1	1		1			1	1		1	1		1					1		1									1		1	1	1	1
Alch fili																																						
Alch xant																																						
Alis plan																																						
Alli pete																																1						
Alli urs																																						
Anag arve										1																												
Anem nem											1																											
Ange syl	1			1			1	1		1	1		1		1	1	1					1									1	1			1	1	
Anth sylv		1		1		1		1							1		1																				
Apiu nodi								1														1										1						
Aqui vulg																																						
Arct minu																							1															
Arum macu	1		1	1				1		1				1	1	1	1	1			1							1	1		1	1	1	1	1			1

Appendix 7 Table of vascular plants bryophytes for surveyed sites

Species	200	201	203	204	205	206	208	209	210	211	213	217	219	221	223	225	226	227	228	229	230	234	236	237	238	240	241	242	245	246	249	250	251	252	253	254	255	256
Bell pere																																						
Beru erec																																						
Blac perf																																						
Bras rapa																																						
Call stag													1																									
Calth palu																												1										
Caly sepi		1					1	1		1						1																							
Camp rotu																																						
Camp trac																																						
Caps burp																																						
Card flex	1		1	1	1	1		1		1	1		1			1	1		1	1	1		1											1	1		
Card hirs																													1			1						1
Card prat							1						1																									
Carl vulg																																						
Cent eryt																																						
Cent nigr		1		1		1																1		1													
Cera font																							1									1						
Cham angu	1			1				1														1			1	1		1			1				1			
Chen albu										1																												
Chen bo-h																																						
Chry opp	1		1	1		1	1	1		1	1			1	1		1	1		1								1			1	1	1		1	1	1	1
Circ lute	1	1		1			1	1		1	1			1	1	1		1	1	1	1	1	1	1				1	1	1	1	1	1	1	1	1		
Cirs arve	1															1				1	1	1																
Cirs diss					1																																	
Cirs pal				1	1	1				1	1		1									1	1					1				1			1	1		
Cirs vulg	1			1	1								1									1						1										
Coni macu																																						
Cono maju																													1	1								
Coro squa																																						
Crep palu																																						
Croc xcro										1																												
Dact fuch	1															1																						
Dact maja																																						
Dauc caro										1																												
Digi purp									1		1		1				1		1								1									1		
Epil hirs	1	1						1		1			1		1	1				1		1						1				1						
Epil mont	1		1	1		1				1			1				1		1	1	1	1	1	1	1	1					1	1				1	1	
Epil palu				1							1																											
Epil parv																																						
Epip hell	1																																	1				

Appendix 7 Table of vascular plants bryophytes for surveyed sites

Species	200	201	203	204	205	206	208	209	210	211	213	217	219	221	223	225	226	227	228	229	230	234	236	237	238	240	241	242	245	246	249	250	251	252	253	254	255	256
Eupa cann							1			1						1																						
Eupr offi																																						
Fila vulg																																						
Fili ulma	1	1	1	1			1	1		1	1		1	1	1	1	1				1	1						1		1		1				1	1	1
Frag vesc		1		1									1				1			1	1		1					1	1	1		1			1	1	1	1
Gale tetr																																						
Gali apar		1				1	1	1		1				1		1	1			1								1	1		1	1						
Gali odor																		1											1	1	1				1		1	1
Gali palu	1			1	1	1		1	1		1		1			1	1					1	1					1				1				1	1	
Gali saxa																			1																			
Gali ulig																																						
Gali veru																															1							
Gera colu																																						
Gera diss																																						
Gera robe		1	1	1	1		1	1		1	1		1		1	1	1	1	1	1	1	1	1					1	1	1	1	1		1	1	1	1	1
Geum riva																																						
Geum urba		1	1	1	1		1	1		1	1		1	1	1	1	1	1		1	1	1	1	1				1	1	1	1	1	1	1	1	1	1	1
Glec hede			1	1						1								1		1								1	1	1	1	1	1		1		1	
Gnap ulig																																						
Gunn tinc																																						
Hera mant																																						
Hera spho	1	1	1					1		1				1		1	1	1		1		1	1					1	1		1	1	1			1	1	
Hier perp																																						
Hipp vulg																																						
Hyac nons	1		1	1			1	1	1	1	1		1	1	1		1	1	1	1	1						1	1	1	1	1	1	1	1	1	1	1	1
Hydr vulg																																						
Hype andr			1	1									1							1			1										1		1		1
Hype caly																																						
Hype humi																																						
Hype macu				1																		1																
Hype perf																			1	1																		
Hype pulc		1							1	1			1										1		1		1									1	1
Hype tetr	1					1																						1				1						
Hypo radi								1																														
Impa glan																																						
Iris pseu		1					1	1		1	1	1			1	1												1										
Laps comm	1			1						1							1	1					1					1			1	1			1			
Lath mont	1																																					
Lath prat		1																		1												1						
Lemm mino																																						

Appendix 7 Table of vascular plants bryophytes for surveyed sites

Species	200	201	203	204	205	206	208	209	210	211	213	217	219	221	223	225	226	227	228	229	230	234	236	237	238	240	241	242	245	246	249	250	251	252	253	254	255	256
Leon autu																						1																	
Leon hisp																																						
Leuc aest																																						
Leuc vulg																																						
Linu cath																																						
List ovat																																						
Lith offi																																						
Loni niti																																						
Loni peri	1		1	1	1	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1
Lotu corn		1		1				1		1			1			1							1															
Lotu ulig																																						
Lych fl-c						1				1						1																						
Lyco euro								1		1																		1										
Lysi nemo			1	1	1		1		1	1	1		1		1		1		1	1			1										1		1	1	1	1
Lysi numu																																						
Lysi vulg												1																								1		1
Lyth sali		1										1			1													1								1	
Matr disc																																						
Medi lupu																																						
Mela prat																																					1	
Ment aqua	1			1	1			1		1		1	1		1	1						1						1								1		1
Ment arve					1																																	
Meny trif																																						
Merc pere																																						
Myos arve										1																												
Myos laxa										1																												
Myos scor																																						
Myos secu													1																									
Nart ossi																																						
Odon vern																																						
Oena croc					1		1	1					1	1																									
Orch masc																																						
Orig vulg																																						
Orob hede																																						
Oxal acet			1	1	1	1	1	1	1		1		1					1	1	1	1		1				1		1	1				1	1	1	1	1
Pedi sylv																																						
Peta frag																																						
Peta hybr																							1									1						
Ping vulg																																						
Plan coro																																						

Appendix 7 Table of vascular plants bryophytes for surveyed sites

Species	200	201	203	204	205	206	208	209	210	211	213	217	219	221	223	225	226	227	228	229	230	234	236	237	238	240	241	242	245	246	249	250	251	252	253	254	255	256
Plan lanc	1	1						1														1				1						1						
Plan majo	1			1				1		1																												
Plan med																																1						
Poly amph																																						
Poly avic																																						
Poly hydr																																						
Poly pers	1			1						1																												
Pote angl																																						
Pote anse	1																					1																
Pote erect		1											1							1				1	1	1										1		1
Pote palu																																						
Pote rept	1																					1	1					1										
Pote ster			1	1	1					1	1						1	1	1	1			1					1	1	1			1	1	1	1		1
Poto poly																																						
Prim veri																																						
Prim vulg	1		1				1	1		1			1			1					1							1	1	1		1	1		1	1		1
Prun vulg	1	1		1						1										1		1	1									1				1		1
Puli dyse																1						1																
Ranu acri				1				1		1						1						1				1						1				1	1	
Ranu auri																																						
Ranu fica							1																															
Ranu flam				1	1	1	1	1			1		1										1									1				1		1
Ranu omni																																						
Ranu repe	1	1	1	1	1	1	1	1		1	1		1	1	1	1	1			1	1	1	1			1	1	1				1			1	1	1	
Rhin mino																																						
Rori amph																																						
Rori nast																							1									1						
Rori palu																1																						
Rume acet																			1	1						1										1		
Rume cong				1																																		
Rume cris																																			1			
Rume obtu																																1						
Rume san	1						1	1		1			1	1		1		1		1		1	1			1	1	1		1	1	1			1	1	1	
Sagi proc																																						
Sani euro			1				1				1			1								1	1						1	1	1	1	1	1	1	1		1
Scro auri																1																						
Scro nod	1		1							1				1						1															1			
Scut gale																																						
Sene aqua				1		1	1	1			1									1												1				1	1	
Sene jaco	1	1		1						1	1		1							1		1	1		1	1	1	1								1		

Appendix 7 Table of vascular plants bryophytes for surveyed sites

Species	200	201	203	204	205	206	208	209	210	211	213	217	219	221	223	225	226	227	228	229	230	234	236	237	238	240	241	242	245	246	249	250	251	252	253	254	255	256
Sene squa																																						
Sisy offi																																						
Smyr olus																																						
Sola dulc		1								1																		1										
Sola nigr																																						
Soli virg																								1														
Sonc arve		1																				1																
Sonc aspe																																				1		1
Sonc oler	1																																					
Spar erec																																						
Stac arve																																						
Stac palu	1																																					
Stac sylv	1	1		1			1	1		1			1	1						1	1	1						1	1		1	1					1	1
Stel alsi																							1															
Stel gram																																1						
Stel holo	1						1		1		1			1			1	1	1								1		1	1						1	
Stel medi								1																								1						
Succ prat		1																					1	1												1		1
Symp offi																																						
Tara offi		1		1	1					1				1			1								1	1		1							1		
Teuc scor				1	1				1				1										1														
Thal flav		1																										1										
Tori japo		1																													1							
Trif dubi																																						
Trif prat	1	1		1																		1																
Trif repe		1																														1						
Tuss farf																				1												1		1				
Umbi rupe															1															1								
Urti uren																																1						
Urtic dioi	1	1		1	1	1	1	1		1	1		1	1	1	1	1			1	1	1	1			1		1	1	1	1	1	1		1			
Vale offi							1						1																								1	1
Vero becc				1																								1				1						
Vero cham	1		1	1				1								1			1	1	1												1		1	1	
Vero hede																																						
Vero mont	1	1		1			1			1	1					1	1	1		1		1	1				1	1	1	1	1	1	1		1		1	1
Vero offi	1																		1																		
Vero pers																																						
Vero serp																				1																	
Vici crac		1																																				
Vicia sep	1	1	1	1		1	1	1						1	1	1	1	1		1		1		1				1	1	1	1		1		1	1	1	1

Appendix 7 Table of vascular plants bryophytes for surveyed sites

Species	200	201	203	204	205	206	208	209	210	211	213	217	219	221	223	225	226	227	228	229	230	234	236	237	238	240	241	242	245	246	249	250	251	252	253	254	255	256
Vinc mino																																						
Viol sp	1	1	1	1	1	1		1	1	1	1			1		1	1	1	1	1	1	1	1	1	1	1		1										
Viola pal					1	1					1		1															1										
Viola reic																																						
Viola rivi																													1	1	1	1	1	1	1	1	1	1
Grass specie																																						
Agro cani			1																																1	1	1
Agro capi																			1				1			1			1		1	1			1	1		1
Agro stol	1	1	1	1	1			1	1	1	1		1	1		1	1			1	1	1	1		1	1	1	1				1				1	1	1
Aira cary																																						
Alop geni																																						
Alop prat																																						
Anth odor		1											1						1	1					1						1	1			1	1		
Arrh elat	1						1	1		1				1		1										1		1			1	1						
Aven pube																																						
Brac pinn																																						
Brac sylv	1	1	1	1			1	1		1				1	1	1	1	1		1	1	1		1				1	1	1	1	1	1	1	1	1	1	
Briz medi																																						
Brom ramo															1															1								
Cyno cris													1																							1		
Dact glom	1	1							1					1		1	1		1	1		1	1			1		1	1		1	1			1			1
Desc flex																								1														
Desch cesp	1	1		1			1	1		1	1		1		1	1	1		1	1	1	1		1				1								1	1	1
Elym cani																																						
Elyt junc																																						
Elyt repe																																						
Fest alti								1																														
Fest gigi										1												1										1						
Fest ovin																																						
Fest rubr																				1															1	1		
Glyc flui				1	1		1	1		1	1				1	1	1					1	1								1				1		
Holc lana	1	1		1	1			1		1			1	1			1		1	1		1	1			1		1			1	1					1
Holc moll																																						
Loli pere																																						
Meli unif																													1									
Moli caer		1				1							1											1	1										1		1
Phal arun	1							1				1																1									
Phle prat	1	1																																				
Phra aust		1								1		1																1									
Poa annu	1									1																												

Appendix 7 Table of vascular plants bryophytes for surveyed sites

Species	200	201	203	204	205	206	208	209	210	211	213	217	219	221	223	225	226	227	228	229	230	234	236	237	238	240	241	242	245	246	249	250	251	252	253	254	255	256
Poa triv																																						
Rush & sedg																																						
Junc acut																																				1		
Junc arti																																						
Junc bufo				1																																		
Junc bulb																																						
Junc cong	1																			1		1														1		
Junc effu			1	1	1	1				1	1		1		1	1	1			1	1	1	1		1	1	1					1				1	1	1
Junc infl	1	1																				1																
Junc tenu																																						
Luzu camp																																						
Luzu mult																																						
Luzu pilo																										1												
Luzu sylv	1								1	1							1		1								1									1	1	1
Typh lati																																						
Care acut																																						
Care aqua																																						
Care bine													1																							1		
Care demi																																						
Care divu																																						
Care echi						1					1		1																									
Care elat																																						
Care flac		1				1														1		1		1				1								1		
Care flav																																						
Care hirt																																						
Care laev						1																																
Care nigr																																						
Care otru										1																												
Care palle																																						
Care pani						1	1																	1				1										
Care pend	1									1																												
Care pilu																																						
Care puli																																						
Care rem	1	1	1	1	1	1	1			1	1		1			1	1			1	1	1	1		1		1					1	1				1	1
Care ripi										1																												
Care rost																																						
Care sero																																						
Care strig																																						
Care sylv	1	1		1			1			1							1	1	1	1	1	1		1			1	1	1	1	1	1	1		1	1	1	1
Care vesi																																						

Appendix 7 Table of vascular plants bryophytes for surveyed sites

Species	200	201	203	204	205	206	208	209	210	211	213	217	219	221	223	225	226	227	228	229	230	234	236	237	238	240	241	242	245	246	249	250	251	252	253	254	255	256
Care viri																																						
Clad mari																												1										
Rhyn alba																																						
Scho lacu																																						
Scho nigr																																						
Trig palu																																						
Horsetail spe																																						
Equi arve		1								1			1		1	1									1			1										
Equi fluv												1																								1		1
Equi palu																																				1		
Equi sylv											1																									1		
Equi telm																																				1		
Fern species																																						
Aspl adia																													1									
Aspl tric																				1								1										
Athy f-f	1		1	1	1		1				1		1				1		1	1								1							1		1	
Blec spic	1		1	1	1	1	1	1	1	1	1		1						1		1		1	1	1		1									1	1	1
Dryo aem																								1														
Dryo affi	1		1	1	1	1		1		1	1		1		1			1	1	1	1						1				1	1			1	1	1	1
Dryo cart																							1															
Dryo dila	1	1	1	1	1	1	1	1	1	1	1		1	1	1	1	1	1	1		1		1	1	1	1	1	1	1	1	1		1	1	1	1	1	1
Dryo f-m	1			1										1		1		1	1	1	1	1	1					1	1	1	1		1	1	1	1	1	
Ophi vulg																																						
Osmu rega													1																									
Phly scolo			1	1			1	1		1	1			1	1	1	1	1		1		1						1	1	1	1	1	1		1	1		1
Pols seti	1		1	1	1		1	1		1				1	1	1	1	1		1	1	1					1	1	1	1	1	1	1		1	1		
Poly vulg				1	1			1		1				1	1				1		1	1	1				1	1	1		1					1	1	1
Pter aqui	1		1		1		1	1	1	1			1	1			1		1	1			1	1	1	1	1	1	1			1		1	1	1	1	
Moss & liver																																						
Ambl serp																																						
Atri undu									1																													
Brac riv																																						
Brac rut																																1	1	1				
Bryu sp.																																						
Call cusp																												1										
Camp intr																																				1		
Camp pyri																																						
Cirr pili																																						
Clim den																																						

Appendix 7 Table of vascular plants bryophytes for surveyed sites

Species	200	201	203	204	205	206	208	209	210	211	213	217	219	221	223	225	226	227	228	229	230	234	236	237	238	240	241	242	245	246	249	250	251	252	253	254	255	256
Cryp hete																																1						
Cten moll																																						
Dicr arra																																						
Dicr cirr																																						
Dicr hete																																						
Dicr maju																				1																		
Dicr scop																																				1		
Eurh prae	1		1			1	1	1		1					1		1							1				1	1			1	1	1	1	1	1	1
Eurh scop							1																															
Eurh stri	1	1	1	1		1	1	1					1	1	1	1	1			1	1			1	1			1	1	1	1	1	1	1	1	1	1	1
Fiss adia																																						
Fiss bryo																																		1				
Fiss taxi													1																							1		
Font anti																																						
Homa seri																				1												1						
Hook luce			1				1				1																											1
Hylo brevi																																						
Hylo splen																																						
Hypn ando			1			1							1													1	1		1	1		1	1			1	1	1
Hypn cupr																	1						1					1	1	1	1	1	1	1	1	1	1	1
Hypn jutl																							1								1		1					1
Hypn resu																																						
Isop eleg																																						
Isot myos	1		1						1	1				1						1	1		1				1	1				1				1	1	1
Isot myur																													1	1			1					
Leuc glau																																						
Mniu horn	1		1				1	1					1				1			1			1				1	1								1	1
Neck comp				1						1					1		1			1							1	1					1			1	1
Neck crisp																																		1				
Orth affi																																1						
Orth pulc																																						
Pleu schr																																						
Plth dent								1																														
Plth undu																																						
Pmni undu			1			1								1		1	1			1								1						1				
Poly aloi																																						
Poly comm																																				1		
Poly form			1						1		1							1	1	1				1	1	1	1										1	1
Pseu puru						1																				1										1		1
Rhiz punc					1						1		1																									

Appendix 7 Table of vascular plants bryophytes for surveyed sites

Species	200	201	203	204	205	206	208	209	210	211	213	217	219	221	223	225	226	227	228	229	230	234	236	237	238	240	241	242	245	246	249	250	251	252	253	254	255	256
Rhyt lore																																				1	1	1
Rhyt squa																										1												1
Rhyt triq	1		1		1												1			1	1			1	1			1	1	1	1		1	1	1	1	1	1
Spha capi																									1													
Spha cusp																																						
Spha palu						1							1											1	1													
Spha recu																																						
Spha squa																										1												
Tham alop			1				1			1				1		1	1	1		1								1	1	1	1	1	1	1				1
Thui tama	1	1	1		1	1	1	1	1	1	1		1	1	1	1	1	1		1	1			1	1	1	1	1		1	1		1		1	1	1	1
Tort sp.																																						
Ulot crisp										1																										1		1
Ulot norv																																						
Ulot phyl																																						
Zygo viri																																						
Caly muel																																						
Cono coni																1																						
Dipl albi																				1																		
Frul dila																				1				1								1				1		
Frul tama																														1						1		
Lepi rept																																						
Loph bid																								1												1		
Loph cusp										1																												
Loph hete																																						
Marc poly																																						
Metz frut																																						
Metz furc			1							1					1		1											1		1		1	1					
Pell endi																																						
Pell epip					1		1				1		1															1								1		
Plag aspl																																				1		1
Plag pore																																						
Pore plat																																						
Radu comp										1					1								1										1					1
Scap irri																																1						
	87	73	62	89	51	49	68	74	29	115	62	19	79	51	50	69	63	43	43	88	52	70	66	49	38	38	37	107	57	51	56	90	61	41	61	104	82	83

Appendix 7 Table of vascular plants bryophytes for surveyed sites

Species	257	258	259	260	262	263	265	266	268	269	270	273	274	275	276	277	278	280	281	282	283	284	286	287	289	290	294	296	297	300	302	303	304	305	307	308	309	310
Tree species																																						
Abie alba				1																						1							1			1		1
Abie gran																																						
Abie proc																																						
Acer camp																																						
Acer plat																																						
Acer pseu	1		1	1	1	1				1		1	1		1	1		1	1		1	1	1	1		1	1		1	1	1	1	1	1	1			1
Aesc hipp																		1	1		1			1			1						1					1
Alnu glut	1			1	1		1		1	1	1	1			1			1	1		1	1		1						1		1	1		1		1	1
Alnu inca																																						
Arau arau																																						
Betu pend																																						
Betu pub	1	1	1	1	1		1	1	1		1	1	1	1			1		1	1		1	1		1		1		1	1	1			1	1	1	1	1
Budd davi																																						
Carp betu																																						
Cast sati				1								1														1												
Cedr deod																																						
Cham laws																																						1
Cory avel	1	1	1	1	1	1	1			1					1	1		1	1	1	1	1	1			1	1	1		1	1	1	1		1			1
Crat mono	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1		1	
Cupr leyl				1																																		
Euca sp																																						
Euon euro									1	1					1				1	1	1	1	1	1									1					
Fagu sylv	1	1	1	1		1				1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1		1	1	1	1	1	1	1		1
Fall japo																																						
Frax exce	1	1		1	1	1	1	1	1	1	1	1			1	1	1	1	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1			1
Fuch mage																																						
Ilex aqui	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1		1		1
Jugl regi																																						
Lari deci																					1															1		
Lari kaem																										1					1							1
Leyc form							1																															
Malu sylv	1		1						1				1														1				1							
Pice abie			1														1			1	1	1											1					
Pice sitc			1	1				1					1	1		1	1				1		1						1		1				1		1
Pinu cont																																						
Pinu sylv	1	1	1					1				1		1			1	1			1	1	1		1	1			1		1			1			1	
Popu alba																																						
Popu nigr																																						
Popu trem																																						

Appendix 7 Table of vascular plants bryophytes for surveyed sites

Species	257	258	259	260	262	263	265	266	268	269	270	273	274	275	276	277	278	280	281	282	283	284	286	287	289	290	294	296	297	300	302	303	304	305	307	308	309	310
Popu xcan										1																												
Prun aviu			1	1											1	1													1									
Prun dome																																						
Prun laur				1						1		1									1										1							1
Prun padu																																						
Prun spin			1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1			1	1	1		1	1	1		1	1			1	1			1
Pseu menz																					1		1										1	1		1		1
Qpet x rob											1																					1						1
Quer cerr																																						
Quer ilex																																						
Quer petr	1	1										1	1																	1					1			
Quer robu			1	1				1	1	1		1			1	1	1		1	1	1	1	1	1	1	1	1	1	1		1		1	1	1			
Rham cath																				1		1	1												1			
Sali alba										1																												
Sali auri						1	1		1		1		1	1			1													1						1	
Sali capr				1															1	1		1			1	1			1	1	1						1
Sali cine	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		1		1		1				1		1	1	1	1		1		1	1
Sali frag					1	1																		1													
Sali pent																																						
Sali tria																																						
Sali vimi																																						
Samb nigr					1					1					1	1	1	1	1	1						1	1	1	1		1		1					1
Sequ semp																																						
Sorb auc	1	1					1	1			1	1	1	1	1		1						1		1			1	1	1	1					1		1
Sorb hib																																						
Taxu bacc						1															1				1													1
Thuj plic																																						
Tili cord																					1																	
Tili plat																																						
Tsug hete																																						
Ulmu glab															1	1			1		1		1	1							1			1	1			1
Ulmu pro																																						
Vibu opul			1		1		1		1					1					1	1				1												1	
Woody speci																																						
Bamb sp.																																						1
Buxu semp																					1			1														
Callu vulg							1	1						1			1								1				1								1	1
Clem vita					1					1																												
Corn sang																																			1			
Corn seri																																						

Appendix 7 Table of vascular plants bryophytes for surveyed sites

Species	257	258	259	260	262	263	265	266	268	269	270	273	274	275	276	277	278	280	281	282	283	284	286	287	289	290	294	296	297	300	302	303	304	305	307	308	309	310
Coto sp																																						
Cytis scop																																						
Eric cine																																						
Eric tetr													1												1				1								1	
Hede heli	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
Ligu oval																																						
Ligu vulg								1	1	1											1													1					
Myri gale																									1												1	
Rhod pont							1																															1
Ribe nigr																																						
Ribe rubr																			1				1															
Ribe u-c										1																												
Rosa arv				1				1				1							1				1			1						1						
Rosa can				1	1	1	1	1	1	1		1		1	1	1	1	1	1			1		1				1					1	1	1			1
Rubu caes																																						
Rubu frut	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		1	1	1
Rubu idea								1				1	1	1			1			1			1						1		1			1			
Symp albu				1	1																			1		1											
Ulex euro					1		1	1	1		1		1	1	1		1										1	1			1						1	
Ulex gali																																						
Vacc myrt		1					1	1					1												1											1		1
Herb species																																						
Achi mill			1																																			
Aego poda										1																												
Aeth cyna																																						
Agri eupa																																						
Ajug rept	1				1		1				1				1			1	1	1				1			1			1	1		1	1	1			
Alch fili																																						
Alch xant			1																																			
Alis plan																																						
Alli pete					1											1										1												
Alli urs					1																		1															
Anag arve					1				1																													
Anem nem					1																																	
Ange syl			1	1	1		1	1		1	1	1	1			1	1	1		1		1		1									1	1		1	
Anth sylv																		1																				
Apiu nodi					1													1						1									1					
Aqui vulg																																						
Arct minu				1	1	1																		1		1	1								1			
Arum macu	1		1	1	1	1			1	1					1	1			1				1			1	1	1					1	1	1			1

Appendix 7 Table of vascular plants bryophytes for surveyed sites

Species	257	258	259	260	262	263	265	266	268	269	270	273	274	275	276	277	278	280	281	282	283	284	286	287	289	290	294	296	297	300	302	303	304	305	307	308	309	310
Bell pere								1	1												1					1													
Beru erec																																						
Blac perf																																						
Bras rapa																																						
Call stag																																						
Calth palu																								1														
Caly sepi	1					1		1		1	1						1																	1					
Camp rotu																																						
Camp trac																						1																
Caps burp																																						
Card flex	1	1		1		1						1			1	1		1						1				1		1			1	1	1			
Card hirs		1			1				1																													
Card prat																																						
Carl vulg																																						
Cent eryt					1															1	1																	
Cent nigr			1		1	1	1																															1
Cera font				1	1			1	1																													
Cham angu		1	1			1		1					1		1		1	1	1	1	1	1				1			1		1							1
Chen albu																																						
Chen bo-h																																		1				
Chry opp	1			1	1		1				1				1	1		1						1				1					1	1				
Circ lute	1	1	1	1	1					1					1	1		1		1	1	1	1	1		1		1	1	1	1	1			1			1
Cirs arve			1		1							1				1	1			1							1	1										
Cirs diss							1																				1											
Cirs pal		1	1	1	1		1		1	1		1	1	1				1	1	1						1	1	1		1	1				1			1
Cirs vulg			1		1				1			1	1		1				1							1				1				1				
Coni macu																											1											
Cono maju	1															1										1												
Coro squa																																						
Crep palu																																						
Croc xcro								1																										1				
Dact fuch				1			1			1										1																		
Dact maja																																						
Dauc caro					1																																	
Digi purp	1	1		1	1			1							1													1		1					1		
Epil hirs			1	1	1	1				1		1		1	1		1	1	1	1	1		1															1
Epil mont		1		1			1		1			1			1		1	1	1		1	1	1			1		1	1		1				1			
Epil palu																														1	1							1
Epil parv					1							1																										
Epip hell																															1							

Appendix 7 Table of vascular plants bryophytes for surveyed sites

Species	257	258	259	260	262	263	265	266	268	269	270	273	274	275	276	277	278	280	281	282	283	284	286	287	289	290	294	296	297	300	302	303	304	305	307	308	309	310
Eupa cann						1		1												1						1							1					1
Eupr offi																																						
Fila vulg					1																																	
Fili ulma	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		1		1			1		1	1	1		1	1
Frag vesc									1			1	1						1	1		1				1			1		1			1				
Gale tetr																																						
Gali apar	1		1		1	1		1	1	1	1	1				1		1		1		1	1			1	1	1			1		1	1				
Gali odor			1																1																			
Gali palu				1	1		1		1	1	1	1		1			1		1				1	1						1			1		1		1	
Gali saxa																																						
Gali ulig																																						
Gali veru																																						
Gera colu																			1																			
Gera diss																																						
Gera robe	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1			1
Geum riva																																						
Geum urba	1	1	1	1	1	1	1		1	1	1	1			1	1	1	1	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1			1
Glec hede	1	1			1					1					1	1	1	1	1	1			1	1		1	1	1					1		1			
Gnap ulig																																						
Gunn tinc																																						
Hera mant																																						
Hera spho	1		1		1	1		1	1	1	1	1			1	1	1	1		1		1	1			1	1	1			1		1	1				1
Hier perp																																						1
Hipp vulg																																						
Hyac nons		1	1	1	1		1				1				1	1		1	1	1	1	1	1			1		1		1	1	1	1					1
Hydr vulg																																					1	
Hype andr	1				1							1							1							1					1	1						1
Hype caly																																						
Hype humi												1					1																					
Hype macu								1													1	1									1							
Hype perf																							1								1							1
Hype pulc			1		1		1		1					1			1		1		1	1					1						1			1	
Hype tetr			1		1							1							1																		
Hypo radi		1	1		1	1		1	1																						1	1						
Impa glan																								1				1										1
Iris pseu										1	1					1				1			1	1									1				1	
Laps comm			1		1	1			1						1	1	1	1	1		1	1	1			1	1	1			1				1			1
Lath mont																						1																1
Lath prat					1	1																																
Lemm mino																																						

Appendix 7 Table of vascular plants bryophytes for surveyed sites

Species	257	258	259	260	262	263	265	266	268	269	270	273	274	275	276	277	278	280	281	282	283	284	286	287	289	290	294	296	297	300	302	303	304	305	307	308	309	310
Leon autu																																						
Leon hisp																																						
Leuc aest																																						
Leuc vulg					1															1																		
Linu cath			1					1																														
List ovat							1																														1	
Lith offi				1																																		
Loni niti																																						
Loni peri	1	1	1	1	1	1	1		1	1	1	1	1	1	1	1		1	1	1	1	1	1		1	1	1	1	1	1	1	1	1		1		1
Lotu corn			1																																			
Lotu ulig																																						
Lych fl-c																																						
Lyco euro																								1													1	
Lysi nemo	1	1		1							1	1			1			1					1				1			1	1	1			1			
Lysi numu																			1		1																	
Lysi vulg																																						
Lyth sali			1			1	1	1	1	1		1					1			1			1	1									1	1			1	
Matr disc									1																													
Medi lupu			1										1						1																			
Mela prat																																						
Ment aqua					1	1	1			1	1			1		1			1	1		1		1									1		1		1	
Ment arve																																						
Meny trif																																						
Merc pere																							1															
Myos arve																																						
Myos laxa																																						
Myos scor																								1														
Myos secu																																						
Nart ossi							1																		1													
Odon vern		1	1		1																																	
Oena croc											1													1										1					
Orch masc																																						
Orig vulg																																						
Orob hede																																						
Oxal acet	1	1		1			1				1				1			1			1							1		1	1	1	1			1		1
Pedi sylv																																						
Peta frag										1		1														1												1
Peta hybr																																						
Ping vulg							1																															
Plan coro																																						

Appendix 7 Table of vascular plants bryophytes for surveyed sites

Species	257	258	259	260	262	263	265	266	268	269	270	273	274	275	276	277	278	280	281	282	283	284	286	287	289	290	294	296	297	300	302	303	304	305	307	308	309	310
Plan lanc		1	1		1	1		1				1	1									1				1					1							1
Plan majo		1						1	1													1									1							1
Plan med					1																																	
Poly amph																																						
Poly avic																																						
Poly hydr																																						
Poly pers																																						
Pote angl																															1							
Pote anse					1	1							1									1				1												
Pote erect						1	1	1					1	1			1																				1	
Pote palu																	1																				1	
Pote rept		1	1		1			1													1	1	1								1							
Pote ster	1	1	1			1	1		1	1	1				1	1	1	1	1		1	1	1			1					1		1					1
Poto poly																																						
Prim veri												1																										
Prim vulg	1				1	1	1			1		1			1	1			1		1		1			1	1						1	1				
Prun vulg		1	1	1	1	1	1	1	1			1			1					1	1	1	1			1	1	1			1							1
Puli dyse																																						
Ranu acri				1			1																	1											1			
Ranu auri																																						
Ranu fica	1																																1					
Ranu flam				1	1		1		1	1		1					1													1								
Ranu omni																																						
Ranu repe	1		1	1	1	1	1		1	1	1	1	1		1	1	1	1	1	1	1	1	1	1		1	1	1		1	1		1	1	1			1
Rhin mino			1																	1																	
Rori amph																																						
Rori nast										1	1																			1						1	
Rori palu																																						
Rume acet							1	1					1																									
Rume cong																																1						
Rume cris																																						
Rume obtu					1							1														1									1			
Rume san	1		1	1	1	1			1	1	1	1	1		1	1	1	1	1		1	1	1	1		1	1	1			1	1	1	1				1
Sagi proc					1																																	
Sani euro					1	1				1					1		1	1	1							1												1
Scro auri																																						
Scro nod		1	1		1				1				1						1		1	1				1	1				1							1
Scut gale																																						
Sene aqua		1			1		1				1													1										1				
Sene jaco	1	1	1		1			1	1			1	1		1		1				1	1				1	1	1			1							1

Appendix 7 Table of vascular plants bryophytes for surveyed sites

Species	257	258	259	260	262	263	265	266	268	269	270	273	274	275	276	277	278	280	281	282	283	284	286	287	289	290	294	296	297	300	302	303	304	305	307	308	309	310
Sene squa																																						
Sisy offi																																						
Smyr olus																																						
Sola dulc						1			1			1	1											1			1	1									1	
Sola nigr																																						
Soli virg																																						
Sonc arve																		1																				
Sonc aspe					1																					1												
Sonc oler	1								1																	1												
Spar erec					1																																	
Stac arve																																						
Stac palu																																					1	
Stac sylv			1	1	1			1					1		1	1	1	1		1		1	1			1	1	1							1			1
Stel alsi																		1												1								1
Stel gram			1			1	1																															
Stel holo													1		1		1											1			1	1						
Stel medi				1	1				1			1																						1				
Succ prat						1	1															1														1	
Symp offi																																						
Tara offi			1		1	1		1	1	1		1	1		1			1		1	1	1	1			1	1				1				1			1
Teuc scor											1																											1
Thal flav																							1															
Tori japo					1								1																		1							
Trif dubi																																						1
Trif prat			1			1							1							1						1				1							
Trif repe		1	1		1			1					1													1				1							
Tuss farf		1			1													1																			
Umbi rupe																																						
Urti uren																																						
Urtic dioi	1		1	1	1	1	1	1	1	1	1	1	1		1	1	1	1	1	1		1	1	1		1	1	1	1	1	1	1	1	1	1			1
Vale offi			1				1	1			1									1																	
Vero becc		1			1							1					1	1						1												1	
Vero cham	1	1		1			1			1		1							1	1	1	1	1			1	1			1	1							1
Vero hede																																						
Vero mont			1	1	1	1	1		1	1	1				1	1	1	1			1		1	1		1		1			1			1	1			1
Vero offi							1																				1											1
Vero pers																																						
Vero serp									1										1								1											
Vici crac			1		1	1		1								1																				1		
Vicia sep	1	1	1	1	1	1		1	1	1	1		1	1				1	1	1	1	1	1			1		1	1	1	1		1	1				1

Appendix 7 Table of vascular plants bryophytes for surveyed sites

Species	257	258	259	260	262	263	265	266	268	269	270	273	274	275	276	277	278	280	281	282	283	284	286	287	289	290	294	296	297	300	302	303	304	305	307	308	309	310
Vinc mino																																						
Viol sp											1							1		1		1	1			1	1		1	1	1	1	1	1	1		1	1
Viola pal																																						
Viola reic																																						
Viola rivi	1	1	1	1	1	1	1		1	1		1			1	1	1											1										
Grass specie																																						
Agro cani			1			1							1	1																							1	
Agro capi		1				1		1	1				1		1	1	1											1										
Agro stol	1	1	1	1	1	1	1	1	1	1		1		1	1	1	1		1	1	1	1	1				1	1		1	1	1		1	1			1
Aira cary																																						
Alop geni																																						
Alop prat						1																																
Anth odor	1	1	1		1	1	1	1				1	1	1													1					1					
Arrh elat		1	1		1	1		1	1	1			1							1		1								1		1	1				
Aven pube													1																									
Brac pinn											1																											
Brac sylv			1		1	1	1		1	1	1	1				1		1	1	1	1	1	1	1		1	1	1	1		1	1	1	1				1
Briz medi							1																															
Brom ramo					1	1	1											1																				
Cyno cris		1	1			1																																
Dact glom	1	1	1	1	1	1		1	1				1			1	1		1	1	1	1				1	1				1	1		1				1
Desc flex																																						
Desch cesp	1		1	1	1		1			1		1	1						1	1	1	1						1			1	1	1	1				
Elym cani													1																									
Elyt junc																																						
Elyt repe			1		1			1																														
Fest alti																																						
Fest gigi				1						1						1																1	1					1
Fest ovin																																						
Fest rubr			1					1																														1
Glyc flui				1			1	1				1		1			1													1			1					
Holc lana	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		1		1		1	1			1	1	1	1					1
Holc moll																																						
Loli pere			1		1							1																										
Meli unif			1																																			
Moli caer							1	1	1				1	1			1								1				1								1	
Phal arun			1			1			1				1						1				1	1										1				
Phle prat		1	1		1	1							1																		1	1					
Phra aust													1																									
Poa annu									1																													

Appendix 7 Table of vascular plants bryophytes for surveyed sites

Species	257	258	259	260	262	263	265	266	268	269	270	273	274	275	276	277	278	280	281	282	283	284	286	287	289	290	294	296	297	300	302	303	304	305	307	308	309	310
Poa triv																																						
Rush & sedg																																						
Junc acut		1			1	1	1																															
Junc arti																																						
Junc bufo									1					1																								1
Junc bulb																	1													1								
Junc cong			1				1																														1
Junc effu	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1		1							1		1		1	1		1	1	1		1	1
Junc infl			1		1	1																									1							
Junc tenu																																						
Luzu camp									1																													
Luzu mult									1					1																								
Luzu pilo																					1																	
Luzu sylv	1	1	1	1										1							1									1	1					1		1
Typh lati					1																																	
Care acut																																						
Care aqua																																						
Care bine																																						
Care demi																																						
Care divu																																						
Care echi							1																															
Care elat																				1																		
Care flac	1		1		1		1					1							1		1	1																
Care flav																																						
Care hirt																																						
Care laev											1																											
Care nigr																																						
Care otru																																						
Care palle																																						
Care pani																																	1					
Care pend																		1						1														1
Care pilu																																						
Care puli																	1																					
Care rem	1			1	1		1			1	1	1			1			1			1		1	1				1		1	1	1	1	1				1
Care ripi																																						
Care rost																																						
Care sero																																						
Care strig																																						
Care sylv	1	1	1	1		1				1					1	1		1	1	1	1	1	1			1		1			1	1						1
Care vesi							1																1															

Appendix 7 Table of vascular plants bryophytes for surveyed sites

Species	257	258	259	260	262	263	265	266	268	269	270	273	274	275	276	277	278	280	281	282	283	284	286	287	289	290	294	296	297	300	302	303	304	305	307	308	309	310
Care viri							1																															
Clad mari																																						
Rhyn alba																									1													
Scho lacu																																						
Scho nigr																																						
Trig palu																																		1				
Horsetail spe																																						
Equi arve			1				1		1	1				1				1						1														
Equi fluv										1						1												1									1	
Equi palu							1					1																										
Equi sylv					1		1																															
Equi telm																																	1					
Fern species																																						
Aspl adia																																						
Aspl tric																																						
Athy f-f				1			1				1									1			1							1							1
Blec spic	1	1	1				1				1	1	1				1	1					1		1					1	1	1	1	1		1		1
Dryo aem																																						1
Dryo affi		1		1	1	1	1		1	1		1			1	1			1		1	1	1			1		1			1		1	1				1
Dryo cart																	1																				1	
Dryo dila	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		1	1	1		1	1	1			1		1	1	1	1	1	1	1		1		1
Dryo f-m	1	1	1	1		1	1					1							1	1	1	1	1			1	1		1		1							
Ophi vulg																																						
Osmu rega																																					1	
Phly scolo			1		1	1						1			1	1		1	1		1	1	1	1		1	1	1	1				1	1			1	1
Pols seti	1		1	1	1	1			1			1		1	1	1		1		1		1	1	1		1		1	1		1		1	1				1
Poly vulg	1			1	1		1								1	1		1	1				1	1		1		1		1		1	1	1				
Pter aqui			1		1		1	1	1	1	1			1	1	1	1	1		1	1	1	1		1	1	1	1	1	1	1	1			1			1	1
Moss & liver																																						
Ambl serp						1																																
Atri undu		1		1																																		
Brac riv										1																												
Brac rut	1					1				1					1	1																						
Bryu sp.																																						
Call cusp																																						
Camp intr									1																													
Camp pyri																																						
Cirr pili																																						
Clim den																																						

Appendix 7 Table of vascular plants bryophytes for surveyed sites

Species	257	258	259	260	262	263	265	266	268	269	270	273	274	275	276	277	278	280	281	282	283	284	286	287	289	290	294	296	297	300	302	303	304	305	307	308	309	310
Cryp hete						1										1								1				1										
Cten moll																												1										
Dicr arra																																						
Dicr cirr																																						
Dicr hete																																						
Dicr maju																														1								
Dicr scop	1	1		1																									1									
Eurh prae	1	1	1	1	1	1	1		1	1	1	1	1	1	1	1			1	1		1	1		1			1		1			1	1				
Eurh scop																																						
Eurh stri	1				1		1	1	1	1	1	1		1		1		1	1	1	1	1											1				1	1
Fiss adia																																						
Fiss bryo																																						
Fiss taxi				1		1				1						1			1																			
Font anti																																						
Homa seri						1																																
Hook luce											1																			1				1				
Hylo brevi																																						
Hylo splen													1																									
Hypn ando	1	1	1	1			1			1					1													1	1					1				1
Hypn cupr	1	1	1	1	1	1	1	1				1		1	1	1	1	1										1	1			1						
Hypn jutl							1	1					1	1																								1
Hypn resu																						1																
Isop eleg																																						
Isot myos	1	1		1	1		1								1													1	1	1		1			1			1
Isot myur																																						
Leuc glau																																						
Mniu horn	1	1	1	1	1		1				1	1									1	1	1									1						
Neck comp				1		1				1								1					1				1	1					1					
Neck crisp																																						
Orth affi																																						
Orth pulc																																						
Pleu schr																													1									
Plth dent																																						
Plth undu		1																												1								
Pmni undu					1						1										1	1	1										1					
Poly aloi																																						
Poly comm									1		1			1											1													
Poly form	1	1	1	1				1				1	1								1		1						1	1		1				1		1
Pseu puru								1	1				1	1			1								1				1									
Rhiz punc																							1															

Appendix 7 Table of vascular plants bryophytes for surveyed sites

Species	257	258	259	260	262	263	265	266	268	269	270	273	274	275	276	277	278	280	281	282	283	284	286	287	289	290	294	296	297	300	302	303	304	305	307	308	309	310
Rhyt lore	1	1											1																							1		
Rhyt squa																																						
Rhyt triq	1		1	1	1		1					1	1				1		1		1	1	1			1			1				1			1		
Spha capi																																						
Spha cusp														1																								
Spha palu																													1									
Spha recu																													1									
Spha squa																																						
Tham alop			1		1	1	1			1					1	1		1				1						1							1			
Thui tama	1	1	1	1	1		1		1	1	1	1	1	1	1	1	1	1		1	1	1	1		1				1	1			1	1		1	1	1
Tort sp.																																						
Ulot crisp										1						1																						
Ulot norv																															1							
Ulot phyl										1																												
Zygo viri																																						
Caly muel																																						
Cono coni				1																																		
Dipl albi																							1															
Frul dila	1	1	1			1																																
Frul tama				1																																		
Lepi rept																																						
Loph bid	1														1	1																						
Loph cusp							1		1		1	1		1																								
Loph hete											1																								1				
Marc poly																		1																				1
Metz frut																																						
Metz furc	1			1		1									1	1							1					1				1						1
Pell endi																																						
Pell epip	1										1																						1					1
Plag aspl						1																																
Plag pore																																						
Pore plat																																						
Radu comp	1				1	1	1																	1				1										
Scap irri																																						
	76	69	100	87	122	85	96	66	80	79	62	83	68	49	73	69	66	70	73	66	71	76	80	57	24	72	56	68	45	56	85	44	68	63	45	22	42	100

Appendix 7 Table of vascular plants bryophytes for surveyed sites

Species	311	313	316	320	321	322	324	326	327	328	329	sum
Tree species												
Abie alba							1					21
Abie gran												1
Abie proc												2
Acer camp												3
Acer plat												1
Acer pseu					1	1	1		1	1		162
Aesc hipp									1			38
Alnu glut			1			1						90
Alnu inca												2
Arau arau												1
Betu pend												12
Betu pub	1	1	1		1		1	1		1	1	125
Budd davi												1
Carp betu												5
Cast sati												15
Cedr deod												1
Cham laws	1											5
Cory avel	1	1			1	1	1				1	152
Crat mono	1	1	1		1	1	1	1	1	1	1	184
Cupr leyl												2
Euca sp				1								2
Euon euro	1	1			1							58
Fagu sylv				1		1	1		1			155
Fall japo												7
Frax exce	1	1	1		1	1	1		1	1		184
Fuch mage												3
Ilex aqui	1	1		1	1	1	1	1	1	1	1	187
Jugl regi												1
Lari deci												21
Lari kaem												4
Leyc form												13
Malu sylv					1							29
Pice abie	1											31
Pice sitc						1	1		1			38
Pinu cont												1
Pinu sylv					1					1		72
Popu alba												3
Popu nigr												4
Popu trem					1							9

Appendix 7 Table of vascular plants bryophytes for surveyed sites

Species	311	313	316	320	321	322	324	326	327	328	329	sum
Popu xcan												1
Prun aviu			1									28
Prun dome												1
Prun laur									1			53
Prun padu					1			1				4
Prun spin	1		1		1	1	1			1		126
Pseu menz				1					1			34
Qpet x rob				1								18
Quer cerr												1
Quer ilex												1
Quer petr					1			1		1		43
Quer robu	1	1	1			1	1		1			138
Rham cath										1		11
Sali alba												13
Sali auri			1				1	1		1	1	39
Sali capr		1			1		1					52
Sali cine	1		1		1	1	1	1		1	1	158
Sali frag												12
Sali pent												2
Sali tria												1
Sali vimi												4
Samb nigr					1		1	1	1			114
Sequ semp												1
Sorb auc				1	1	1	1	1				95
Sorb hib												2
Taxu bacc					1							31
Thuj plic												2
Tili cord												14
Tili plat												1
Tsug hete												4
Ulmu glab												70
Ulmu pro					1							3
Vibu opul	1										1	46
Woody speci												0
Bamb sp.												3
Buxu semp												8
Callu vulg					1			1				27
Clem vita												4
Corn sang												8
Corn seri												1

Appendix 7 Table of vascular plants bryophytes for surveyed sites

Species	311	313	316	320	321	322	324	326	327	328	329	sum
Coto sp												10
Cytis scop												4
Eric cine												1
Eric tetr								1				13
Hede heli	1	1	1	1	1	1	1	1	1	1	1	205
Ligu oval									1			1
Ligu vulg					1							18
Myri gale												6
Rhod pont							1		1			28
Ribe nigr												2
Ribe rubr												12
Ribe u-c												6
Rosa arv												27
Rosa can	1						1					80
Rubu caes												2
Rubu frut	1	1	1	1	1	1	1	1	1	1	1	208
Rubu idea					1	1						29
Symp albu								1				29
Ulex euro			1				1	1			1	87
Ulex gali					1							7
Vacc myrt				1	1	1						45
Herb species												0
Achi mill												3
Aego poda												5
Aeth cyna												1
Agri eupa												1
Ajug rept	1		1			1	1					92
Alch fili												3
Alch xant												1
Alis plan												1
Alli pete												11
Alli urs												14
Anag arve												8
Anem nem					1							15
Ange syl			1		1		1	1				84
Anth sylv												38
Apiu nodi												18
Aqui vulg												4
Arct minu					1							22
Arum macu	1				1	1			1			107

Appendix 7 Table of vascular plants bryophytes for surveyed sites

Species	311	313	316	320	321	322	324	326	327	328	329	sum
Bell pere												19
Beru erec												1
Blac perf												1
Bras rapa												1
Call stag												3
Calth palu												14
Caly sepi												32
Camp rotu												1
Camp trac												2
Caps burp												1
Card flex	1		1		1		1					78
Card hirs												10
Card prat												14
Carl vulg												1
Cent eryt					1							4
Cent nigr					1							16
Cera font												15
Cham angu			1		1							58
Chen albu												2
Chen bo-h												1
Chry opp						1	1					87
Circ lute		1	1		1	1			1	1		131
Cirs arve					1							31
Cirs diss												7
Cirs pal			1		1	1	1	1			1	72
Cirs vulg					1							43
Coni macu												1
Cono maju												33
Coro squa												1
Crep palu												2
Croc xcro												5
Dact fuch												14
Dact maja												1
Dauc caro												4
Digi purp												53
Epil hirs					1		1					57
Epil mont			1				1					79
Epil palu					1							13
Epil parv												3
Epip hell												4

Appendix 7 Table of vascular plants bryophytes for surveyed sites

Species	311	313	316	320	321	322	324	326	327	328	329	sum
Eupa cann											1	12
Eupr offi												1
Fila vulg												1
Fili ulma	1		1		1	1	1	1		1	1	135
Frag vesc										1		60
Gale tetr												2
Gali apar	1											97
Gali odor												14
Gali palu	1		1		1	1	1	1		1	1	76
Gali saxa												5
Gali ulig												4
Gali veru												3
Gera colu												1
Gera diss												1
Gera robe	1		1		1	1	1		1	1		170
Geum riva												2
Geum urba			1		1	1	1		1	1		164
Glec hede												79
Gnap ulig												2
Gunn tinc												1
Hera mant												3
Hera spho			1		1	1	1					106
Hier perp												1
Hipp vulg											1	2
Hyac nons					1	1	1		1			130
Hydr vulg											1	2
Hype andr					1							48
Hype caly												1
Hype humi												4
Hype macu			1									12
Hype perf												12
Hype pulc								1				40
Hype tetr					1	1						20
Hypo radi					1							18
Impa glan												9
Iris pseu							1					51
Laps comm			1		1							49
Lath mont												9
Lath prat												18
Lemm mino												1

Appendix 7 Table of vascular plants bryophytes for surveyed sites

Species	311	313	316	320	321	322	324	326	327	328	329	sum
Leon autu			1									3
Leon hisp												1
Leuc aest												1
Leuc vulg												4
Linu cath												2
List ovat											1	8
Lith offi												1
Loni niti												1
Loni peri	1	1	1	1	1	1	1	1		1	1	178
Lotu corn							1					29
Lotu ulig												1
Lych fl-c			1								1	10
Lyco euro												12
Lysi nemo					1	1					1	73
Lysi numu												3
Lysi vulg												4
Lyth sali	1											33
Matr disc					1							6
Medi lupu												5
Mela prat											1	5
Ment aqua			1		1	1		1			1	62
Ment arve			1									3
Meny trif											1	2
Merc pere												7
Myos arve					1							4
Myos laxa												2
Myos scor												4
Myos secu												2
Nart ossi												2
Odon vern												4
Oena croc			1									29
Orch masc												9
Orig vulg												1
Orob hede												1
Oxal acet				1	1	1	1		1			115
Pedi sylv												2
Peta frag												10
Peta hybr												3
Ping vulg												1
Plan coro												1

Appendix 7 Table of vascular plants bryophytes for surveyed sites

Species	311	313	316	320	321	322	324	326	327	328	329	sum
Plan lanc												38
Plan majo					1							30
Plan med												8
Poly amph												1
Poly avic												2
Poly hydr												2
Poly pers					1							10
Pote angl												2
Pote anse												21
Pote erect						1		1			1	37
Pote palu												4
Pote rept							1					30
Pote ster							1					101
Poto poly											1	1
Prim veri												4
Prim vulg	1				1	1						94
Prun vulg					1		1		1		1	62
Puli dyse												4
Ranu acri												33
Ranu auri												3
Ranu fica												32
Ranu flam	1		1								1	39
Ranu omni												1
Ranu repe	1		1		1	1	1		1		1	147
Rhin mino												3
Rori amph												1
Rori nast			1									16
Rori palu												2
Rume acet												16
Rume cong												10
Rume cris												5
Rume obtu												15
Rume san					1		1		1			120
Sagi proc												1
Sani euro					1							71
Scro auri												6
Scro nod					1							45
Scut gale												2
Sene aqua			1									33
Sene jaco			1		1							67

Appendix 7 Table of vascular plants bryophytes for surveyed sites

Species	311	313	316	320	321	322	324	326	327	328	329	sum
Sene squa												1
Sisy offi												1
Smyr olus												1
Sola dulc					1							19
Sola nigr												1
Soli virg												7
Sonc arve												3
Sonc aspe												9
Sonc oler					1							15
Spar erec												1
Stac arve												2
Stac palu												5
Stac sylv					1				1	1		80
Stel alsi			1									12
Stel gram												5
Stel holo			1									54
Stel medi												12
Succ prat						1		1			1	26
Symp offi												3
Tara offi												75
Teuc scor			1									40
Thal flav												3
Tori japo												9
Trif dubi												3
Trif prat												26
Trif repe					1							18
Tuss farf												12
Umbi rupe												15
Urti uren												1
Urtic dioi			1		1		1	1				153
Vale offi							1					28
Vero becc					1							14
Vero cham					1	1	1				1	78
Vero hede												2
Vero mont	1				1	1			1			110
Vero offi												11
Vero pers												1
Vero serp												15
Vici crac												14
Vicia sep	1		1		1	1	1					113

Appendix 7 Table of vascular plants bryophytes for surveyed sites

Species	311	313	316	320	321	322	324	326	327	328	329	sum
Vinc mino												1
Viol sp	1		1			1	1	1	1			89
Viola pal			1									14
Viola reic												6
Viola rivi										1	1	81
Grass specie												0
Agro cani								1				26
Agro capi												37
Agro stol			1		1	1			1	1	1	132
Aira cary												1
Alop geni												3
Alop prat												2
Anth odor											1	53
Arrh elat			1								1	45
Aven pube												1
Brac pinn												2
Brac sylv	1									1		125
Briz medi												2
Brom ramo												15
Cyno cris												16
Dact glom					1	1	1					89
Desc flex												2
Desch cesp	1					1	1					90
Elym cani												1
Elyt junc												1
Elyt repe												3
Fest alti												3
Fest gigi												15
Fest ovin												1
Fest rubr										1		14
Glyc flui			1			1	1				1	41
Holc lana	1		1		1			1			1	120
Holc moll												3
Loli pere												11
Meli unif												11
Moli caer			1		1			1			1	33
Phal arun												31
Phle prat												14
Phra aust												15
Poa annu						1						12

Appendix 7 Table of vascular plants bryophytes for surveyed sites

Species	311	313	316	320	321	322	324	326	327	328	329	sum
Poa triv												16
Rush & sedg												0
Junc acut			1									10
Junc arti												4
Junc bufo					1							9
Junc bulb					1							6
Junc cong												11
Junc effu	1		1		1	1	1	1		1	1	135
Junc infl												13
Junc tenu												6
Luzu camp												6
Luzu mult												7
Luzu pilo					1							12
Luzu sylv				1								66
Typh lati											1	3
Care acut												2
Care aqua											1	1
Care bine												2
Care demi			1									2
Care divu												2
Care echi												6
Care elat												1
Care flac										1		39
Care flav					1							1
Care hirt										1		4
Care laev												4
Care nigr												1
Care otru												2
Care palle											1	1
Care pani			1				1					12
Care pend							1					29
Care pilu												1
Care puli												1
Care rem	1		1			1	1				1	117
Care ripi											1	4
Care rost												1
Care sero												1
Care strig												3
Care sylv	1		1		1				1			116
Care vesi												3

Appendix 7 Table of vascular plants bryophytes for surveyed sites

Species	311	313	316	320	321	322	324	326	327	328	329	sum
Care viri												2
Clad mari												1
Rhyn alba												1
Scho lacu												1
Scho nigr												1
Trig palu												1
Horsetail spe												0
Equi arve			1					1				33
Equi fluv										1		16
Equi palu												5
Equi sylv	1									1		12
Equi telm						1						13
Fern species												0
Aspl adia												3
Aspl tric												5
Athy f-f						1	1		1			60
Blec spic		1	1	1		1	1	1	1		1	111
Dryo aem							1					4
Dryo affi	1		1		1	1	1		1			122
Dryo cart												4
Dryo dila	1	1	1	1	1	1	1	1	1		1	182
Dryo f-m					1	1		1				86
Ophi vulg												1
Osmu rega											1	8
Phly scolo	1		1		1		1	1	1	1		114
Pols seti	1		1		1		1	1	1	1		128
Poly vulg			1	1		1						80
Pter aqui		1	1	1	1		1	1	1	1	1	142
												0
Moss & liver												0
Ambl serp												1
Atri undu												7
Brac riv												1
Brac rut												25
Bryu sp.				1								1
Call cusp						1				1		9
Camp intr												2
Camp pyri												1
Cirr pili												2
Clim den												5

Appendix 7 Table of vascular plants bryophytes for surveyed sites

Species	311	313	316	320	321	322	324	326	327	328	329	sum
Cryp hete												5
Cten moll												3
Dicr arra												1
Dicr cirr												1
Dicr hete												4
Dicr maju						1						6
Dicr scop						1						11
Eurh prae	1	1	1	1	1					1		110
Eurh scop												1
Eurh stri	1	1	1		1	1			1			112
Fiss adia												2
Fiss bryo												5
Fiss taxi												12
Font anti											1	1
Homa seri												8
Hook luce			1				1					27
Hylo brevi												5
Hylo splen						1						5
Hypn ando						1			1			43
Hypn cupr			1			1					1	73
Hypn jutl								1	1			28
Hypn resu												5
Isop eleg												7
Isot myos	1			1		1			1			63
Isot myur												7
Leuc glau												2
Mniu horn					1	1			1		1	72
Neck comp	1											44
Neck crisp												3
Orth affi												4
Orth pulc												1
Pleu schr										1		2
Plth dent				1								5
Plth undu					1		1					5
Pmni undu			1			1		1			1	46
Poly aloi												1
Poly comm												22
Poly form				1					1			58
Pseu puru								1		1		19
Rhiz punc			1								1	18

Appendix 7 Table of vascular plants bryophytes for surveyed sites

Species	311	313	316	320	321	322	324	326	327	328	329	sum
Rhyt lore										1		11
Rhyt squa												4
Rhyt triq	1				1	1				1	1	70
Spha capi												2
Spha cusp												2
Spha palu								1				12
Spha recu												1
Spha squa												1
Tham alop	1			1	1					1		84
Thui tama	1		1	1	1	1	1	1		1	1	156
Tort sp.												1
Ulot crisp			1			1						11
Ulot norv	1											4
Ulot phyl												1
Zygo viri												1
Caly muel												1
Cono coni			1									5
Dipl albi												5
Frul dila												21
Frul tama										1	1	8
Lepi rept												1
Loph bid						1		1				19
Loph cusp						1						11
Loph hete												3
Marc poly												3
Metz frut												1
Metz furc			1									32
Pell endi												1
Pell epip			1									20
Plag aspl												4
Plag pore												2
Pore plat												1
Radu comp			1	1		1						26
Scap irri												1
	49	17	75	24	97	70	66	43	42	42	55	

Appendix 8: Complete list of all vascular plants recorded during the field study

The 8 letter codes used by the field teams during the 2003 field season and the full name for each of the species are shown. Nomenclature follows Preston *et al.* (2002). Due to the recent nomenclature used in Preston *et al* . (2002) some of the 8 letter codes no longer match the new species name, such cases are highlighted in bold. Species that were only recorded on artificial tracks are signified by an asterix. Note that *Carex demissa* and *C. serotina* are retained but are now included within *C. flava* by Preston *et al* . (2002)

Tree Species

Abie alba	Abies alba
Abie gran	Abies grandis
Abie proc	Abies procera
Acer camp	Acer campestre
Acer plat	Acer platanoides
Acer pseu	Acer pseudoplatanus
Aesc hipp	Aesculus hippocastanum
Alnu glut	Alnus glutinosa
Alnu inca	Alnus incana
Arau arau	Araucaria araucana
Betu pend	Betula pendula
Betu pub	Betula pubescens
Budd davi	Buddleja davidii
Carp betu	Carpinus betulus
Cast sati	Castanea sativa
Cedr deod	Cedrus deodara
Cham laws	Chamaecyparis lawsoniana
Cory avel	Corylus avellana
Crat mono	Crataegus monogyna
Cupr leyl	**Chamaecyparis nootkatensis x Cupressus**
Euca sp	Eucalyptus sp.
Euon euro	Euonymus europaeus
Fagu sylv	Fagus sylvatica
Fall japo	Fallopia japonica
Frax exce	Fraxinus excelsior
Fuch mage	Fuchsia magellanica
Ilex aqui	Ilex aquifolium
Jugl regi	Juglans regia
Lari deci	Larix decidua
Lari kaem	Larix kaempferi
Leyc form	Leycesteria formosa
Malu sylv	Malus sylvestris
Pice abie	Picea abies
Pice sitc	Picea sitchensis
Pinu cont	Pinus contorta
Pinu sylv	Pinus sylvestris
Popu alba	Populus alba
Popu nigr	Populus nigra
Popu trem	Populus tremula
Popu xcan	**Populus deltoides x P. nigra**
Prun aviu	Prunus avium
Prun dome	Prunus domestica
Prun laur	Prunus laurocerasus
Prun padu	Prunus padus
Prun spin	Prunus spinosa
Pseu menz	Pseudotsuga menziesii
Qpet x rob	Quercus petraea x Q. robur
Quer cerr	Quercus cerris

Tree species (cont.)

Quer ilex	Quercus ilex
Quer petr	Quercus petraea
Quer robu	Quercus robur
Rham cath	Rhamnus cathartica
Sali alba	Salix alba
Sali auri	Salix aurita
Sali capr	Salix caprea
Sali cine	Salix cinerea
Sali frag	Salix fragilis
Sali pent	Salix pentandra
Sali tria	Salix triandra
Sali vimi	Salix viminalis
Samb nigr	Sambucus nigra
Sequ semp	Sequoia sempervirens
Sorb auc	Sorbus aucuparia
Sorb hib	Sorbus hibernica
Taxu bacc	Taxus baccata
Thuj plic	Thuja plicata
Tili cord	Tilia cordata
Tili plat	Tilia platyphyllos
Tsug hete	Tsuga heterophylla
Ulmu glab	Ulmus glabra
Ulmu pro	Ulmus procera
Vibu opul	Viburnum opulus

Woody species

Bamb sp	Bambusa sp.
Buxu semp	Buxus sempervirens
Callu vulg	Calluna vulgaris
Clem vita	Clematis vitalba
Corn sang	Cornus sanguinea
Corn seri	Cornus sericea
Coto sp	Cotoneaster sp.
Cytis scop	Cytisus scoparius
Eric cine	Erica cinerea
Eric tetr	Erica tetralix
Hede heli	Hedera helix
Ligu oval	Ligustrum ovalifolium
Ligu vulg	Ligustrum vulagre
Loni peri	Lonicera periclymenum
Myri gale	Myrica gale
Rhod pont	Rhododendron ponticum
Ribe nigr	Ribes nigrum
Ribe rubr	Ribes rubrum
Ribe u-c	Ribes uva-crispa
Rosa arv	Rosa arvensis
Rosa can	Rosa canina
Rubu caes	Rubus caesius

Woody species (cont.)

Rubu frut	Rubus fruticosus agg.
Rubu idea	Rubus idaeus
Symp albu	Symphoricarpos albus
Ulex euro	Ulex europaeus
Ulex gali	Ulex galli
Vacc myrt	Vaccinium myrtillus

Herb species

Achi mill	Achillea millefolium*
Aego poda	Aegopodium podagraria
Aeth cyna	Aethusa cynapium*
Agri eupa	Agrimonia eupatoria*
Ajug rept	Ajuga reptans
Alch fili	Alchemilla filicaulis subsp. vestita*
Alch xant	Alchemilla xanthochlora*
Alis plan	Alisma-plantago-aquatica*
Alli peti	Allium petiolata
Alli urs	Allium ursinum
Anag arve	Anagallis arvensis
Anem nem	Anemone nemorosa
Ange syl	Angelica sylvestris
Anth sylv	Anthriscus sylvestris
Apiu nodi	Apium nodiflorum
Aqui vulg	Aquilegia vulgaris
Arct minu	Arctium minus
Arum macu	Arum maculatum
Bell pere	Bellis perennis
Beru erec	Berula erecta
Blac perf	Blackstonia perfoliata*
Bras rapa	Brassica rapa*
Call stag	Callitriche stagnalis
Calth palu	Caltha palustris
Caly sepi	Calystegia sepium
Camp rotu	Campanula rotundifolia
Camp trac	Campanula trachelium
Caps burp	Capsella bursa-pastoris*
Card flex	Cardamine flexuosa
Card hirs	Cardamine hirsuta
Card prat	Cardamine pratensis
Carl vulg	Carlina vulgaris*
Cent eryt	Centaurium erythraea
Cent nigr	Centaurea nigra
Cera font	Cerastium fontanum
Cham angu	Chamerion angustifolium
Chen albu	Chenopodium album agg.*
Chen bo-h	Chenopodium bonus-henricus
Chry leuc	Chrysanthemum leucanthemum
Chry opp	Chrysoplenium oppositifolium
Circ lute	Circaea lutetiana
Cirs arve	Cirsium arvense
Cirs diss	Cirsium dissectum
Cirs pal	Cirsium palustre
Cirs vulg	Cirsium vulgare
Coni macu	Conium maculatum
Cono maju	Conopodium majus
Coro squa	Coronopus squamatus
Crep palu	Crepis paludosa

Herb species (cont.)

Croc xcro	**Crocosmia aurea x C. pottsii**
Dact fuch	Dactylorhiza fuchsii
Dact maja	Dactylorhiza majalis
Dauc caro	Daucus carota
Digi purp	Digitalis purpurea
Epil hirs	Epilobium hirsutum
Epil mont	Epilobium montanum
Epil palu	Epilobium palustre
Epil parv	Epilobium parviflorum
Epip hell	Epipactis helleborine
Eupa cann	Eupatorium cannabinum
Eupr offi	Euphrasia officinalis agg.*
Fila vulg	Filago vulgaris*
Fili ulma	Filipendula ulmaria
Frag vesc	Fragaria vesca
Gale tetr	Galeopsis tetrahit
Gali apar	Galium aparine
Gali odor	Galium odoratum
Gali palu	Galium palustre
Gali saxa	Galium saxatile
Gali ulig	Galium uliginosum
Gali veru	Galium verum
Gera colu	Geranium columbinum
Gera diss	Geranium dissectum*
Gera robe	Geranium robertianum
Geum riva	Geum rivale
Geum urba	Geum urbanum
Glec hede	Glechoma hederacea
Gnap ulig	Gnaphalium uliginosum
Gunn tinc	Gunnera tinctoria
Hera mant	Heracleum mantegazzianum
Hera spho	Heracleum sphondylium
Hier perp	Hieracium agg.*
Hipp vulg	Hippuris vulgaris
Hyac nons	Hyacinthoides non-scripta
Hydr vulg	Hydrocotyle vulgaris
Hype andr	Hypericum androsaemum
Hype caly	Hypericum calycinum
Hype humi	Hypericum humifusum
Hype macu	Hypericum maculatum
Hype perf	Hypericum perforatum
Hype pulc	Hypericum pulchrum
Hype tetr	Hypericum tetrapterum
Hypo radi	Hypochaeris radicata
Impa glan	Impatiens glandulifera
Iris pseu	Iris pseudacorus
Laps comm	Lapsana communis
Lath mont	Lathyrus montanus
Lath prat	Lathyrus pratensis
Lemn mino	Lemna minor
Leon autu	Leontodon autumnalis
Leon hisp	Leontodon hispidus*
Leuc aest	Leucojum aestivum
Linu cath	Linum catharticum*
List ovat	Listera ovata
Lith offi	Lithospermum officinale
Loni niti	Lonicera nitida

Herb species (cont.)	
Lotu corn	Lotus corniculatus
Lotu ulig	Lotus pendunculatus*
Lych fl-c	Lychnis flos-cuculi
Lyco euro	Lycopus europaeus
Lysi nemo	Lysimachia nemorum
Lysi numu	Lysimachia nummularia
Lysi vulg	Lysimachia vulgaris
Lyth sali	Lythrum salicaria
Matr disc	Matricaria discoidea
Medi lupu	Medicago lupulina
Mela prat	Melampyrum pratense
Ment aqua	Mentha aquatica
Ment arve	Mentha arvensis
Meny trif	Menyanthes trifoliata
Merc pere	Mercurialis perennis
Myos arve	Myosotis arvensis
Myos laxa	Myosotis laxa
Myos scor	Myosotis scorpioides
Myos secu	Myosotis secunda
Nart ossi	Narthecium ossifragum
Odon vern	Odontites verna*
Oena croc	Oenanthe crocata
Orch masc	Orchis mascula
Orig vulg	Origanum vulgare
Orob hede	Orobanche hederae
Oxal acet	Oxalis acetosella
Pedi sylv	Pedicularis sylvatica*
Peta frag	Petasites fragrans
Peta hybr	Petasites hybridus
Ping vulg	Pinguicula vulgaris*
Plan coro	Plantago coronopus*
Plan lanc	Plantago lanceolata
Plan majo	Plantago major
Plan med	Plantago media
Poly amph	**Persicaria amphibia**
Poly avic	Polygonum aviculare*
Poly hydr	**Persicaria hydropiper**
Poly pers	**Persicaria maculosa**
Pota poly	Potamogeton polygonifolius
Pote angl	Potentilla anglica*
Pote anse	Potentilla anserina
Pote erect	Potentilla erecta
Pote palu	Potentilla palustris
Pote rept	Potentilla reptans
Pote ster	Potentilla sterilis
Prim veri	Primula veris
Prim vulg	Primula vulgaris
Prun vulg	Prunella vulgaris
Puli dyse	Pulicaria dysenterica
Ranu acri	Ranunculs acris
Ranu auri	Ranunculus auricomus
Ranu fica	Ranunculus ficaria
Ranu flam	Ranunculus flammula
Ranu omni	Ranunculus omiophyllus*
Ranu repe	Ranunculs repens
Rhin mino	Rhinanthus minor*
Rori amph	Rorippa amphibia

Herb species (cont.)	
Rori nast	Rorippa nasturtium-aquaticum
Rori palu	Rorippa palustris
Rume acet	Rumex acetosa
Rume cong	Rumex conglomeratus
Rume cris	Rumex crispus
Rume obtu	Rumex obtusifolius
Rume san	Rumex sanguineus
Sagi proc	Sagina procumbens*
Sani euro	Sanicula europaea
Scro auri	Scrophularia auriculata
Scro nod	Scrophularia nodosa
Scut gale	Scutellaria galericulata
Sene aqua	Senecio aquaticus
Sene jaco	Senecio jacobaea
Sene squa	Senecio squalidus
Smyr olus	Smyrnium olusatrum
Sola dulc	Solanum dulcamara
Sola nigr	Solanum nigrum
Soli virg	Solidago virgaurea
Sonc arve	Sonchus arvensis
Sonc aspe	Sonchus asper
Sonc oler	Sonchus oleraceus
Stac palu	Stachys palustris
Stac sylv	Stachys sylvatica
Stel alsi	**Stellaria uliginosa**
Stel gram	Stellaria graminea
Stel holo	Stellaria holostea
Stel medi	Stellaria media
Succ prat	Succisa pratensis
Symp offi	Symphytum officinale
Tara offi	**Taraxacum agg.**
Teuc scor	Teucrium scorodonia
Thal flav	Thalictrum flavum
Tori japo	Torilis japonica
Trif dubi	Trifolium dubium*
Trif prat	Trifolium pratense
Trif repe	Trifolium repens
Tuss farf	Tussilago farfara
Umbi rupe	Umbilicus rupestris
Urti dioi	Urtica dioica
Urti uren	Urtica urens
Vale offi	Valeriana officinalis
Vero becc	Veronica beccabunga
Vero cham	Veronica chamaedrys
Vero hede	Veronica hederifolia
Vero mont	Veronica montana
Vero offi	Veronica officinalis
Vero pers	Veronica persica
Vero serp	Veronica serpyllifolia
Vici crac	Vicia cracca
Vicia sep	Vicia sepium
Vinc mino	Vinca minor*
Viol sp	Viola sp.
Viola pal	Viola palustris
Viola reic	Viola reichenbachiana
Viola rivi	Viola riviniana
Sisy offi	Sisymbrium officinale*

Herb species (cont.)

Spar erec	Sparganium erectum*
Stac arve	Stachys arvensis*

Grass species

Agro cani	Agrostis canina
Agro capi	Agrostis capillaris
Agro stol	Agrostis stolonifera
Aira cary	Aira caryophyllea
Alop geni	Alopecurus geniculatus
Alop prat	Alopecurus pratensis
Anth odor	Anthoxanthum odoratum
Arrh elat	Arrhenatherum elatius
Aven pube	Helictotrichon pubescens*
Brac pinn	Brachypodium pinnatum
Brac sylv	Brachypodium sylvaticum
Briz medi	Briza media*
Brom ramo	Bromopsis ramosa
Cyno cris	Cynosurus cristatus
Dact glom	Dactylis glomerata
Desc cesp	Deschampsia cespitosa
Desc flex	Deschampsia flexuosa
Elym cani	Elymus caninus*
Elyt junc	Elytrigia juncea*
Elyt repe	Elytrigia repens*
Fest alti	Festuca altissima
Fest gigi	Festuca gigantea
Fest ovin	Festuca ovina
Fest rubr	Festuca rubra
Glyc flui	Glyceria fluitans
Holc lana	Holcus lanatus
Holc moll	Holcus mollis
Loli pere	Lolium perenne
Meli unif	Melica uniflora
Moli caer	Molinia caerulea
Phal arun	Phalaris arundinacea
Phle prat	Phleum pratense*
Phra aust	Phragmites australis
Poa annu	Poa annua
Poa triv	Poa trivialis

Rush, sedge and horsetail species

Junc acut	Juncus acutiflorus
Junc arti	Juncus articulatus
Junc bufo	Juncus bufonius
Junc bulb	Juncus bulbosus
Junc cong	Juncus conglomeratus
Junc effu	Juncus effusus
Junc infl	Juncus inflexus
Junc tenu	Juncus tenuis
Luzu camp	Luzula campestris
Luzu mult	Luzula multiflora
Luzu pilo	Luzula pilosa
Luzu sylv	Luzula sylvatica
Typh lati	Typha latifolia
Scho lacu	Schoenoplectus lacustris*
Care acut	Carex acuta
Care aqua	Carex aquatilis

Rush, sedge and horsetail species (cont.)

Care bine	Carex binervis
Care demi	Carex demissa
Care divu	Carex divulsa
Care echi	Carex echinata
Care elat	Carex elata
Care flac	Carex flacca
Care flav	Carex flava
Care hirt	Carex hirta
Care laev	Carex laevigata
Care nigr	Carex nigra
Care otru	Carex otrubae
Care palle	Carex pallescens
Care pani	Carex paniculata
Care pend	Carex pendula
Care pilu	Carex pilulifera
Care puli	Carex pulicaris
Care rem	Carex remota
Care ripi	Carex riparia
Care rost	Carex rostrata
Care sero	Carex serotina
Care strig	Carex strigosa
Care sylv	Carex sylvatica
Care vesi	Carex vesicaria
Care viri	Carex viridula
Clad mari	Cladium mariscus
Rhyn alba	Rhynchospora alba*
Scho nigr	Schoenus nigricans
Trig palu	Triglochin palustre
Equi arve	Equisetum arvense
Equi fluv	Equisetum fluviatile
Equi palu	Equisetum palustre
Equi sylv	Equisetum sylvaticum
Equi telm	Equisetum telmateia

Fern species

Aspl adia	Asplenium adiantum-nigrum
Aspl tric	Asplenium trichomanes
Athy f-f	Athyrium filix-femina
Blec spic	Blechnum spicant
Dryo aem	Dryopteris aemula
Dryo affi	Dryopteris affinis
Dryo cart	Dryopteris cathusiana
Dryo dila	Dryopteris dilatata
Dryo f-m	Dryopteris filix-mas
Ophi vulg	Ophioglossum vulgatum
Osmu rega	Osmunda regalis
Phly scolo	Phyllitis scolopendrium
Pols seti	Polystichum setiferum
Poly vulg	Polypodium vulgare
Pter aqui	Pteridium aquilinum

Appendix 9

LICHEN_ID	HOST_SP	SUBSTRATE	ASSOC_SP
Grap scri	Quer petr	Trunk/bark	
Lepr inca	Quer petr	Trunk/bark	
Parm cape	Quer petr	Trunk/bark	
Grap scri	Fagu sylv	Trunk/bark	
Ente cras	Quer petr	Trunk/bark	
Grap scri	Quer petr	Trunk/bark	
Lepr inca	Quer petr	Trunk/bark	
Norm pul	Quer petr	Trunk/bark	
Grap scri	Cory avel	Trunk/bark	
Lepr inca	Prun spin	Trunk/bark	
Clad coni	Betu pub	Trunk/bark	
Lepr inca	Betu pub	Trunk/bark	
Lepr inca	Sali vimi	Trunk/bark	
Grap scri	Quer petr	Trunk/bark	
Lepr inca	Quer petr	Trunk/bark	
Norm pul	Quer petr	Bark, trunk and moss	
Arth cinn	Frax exce	Trunk/bark	
Ente cras	Frax exce	Trunk/bark	
Grap scri	Frax exce	Trunk/bark	
Lepr inca	Sali capr	Trunk/bark	
Pyre macr	Frax exce	Trunk/bark	
Grap scri	Frax exce	Trunk/bark	
Parm perl	Prun spin	Trunk/bark	
Grap scri	Frax exce	Trunk/bark	Frullania
Grap scri	Frax exce	Trunk/bark	Frullania
Leci elae	Frax exce	Trunk/damaged area	
Ente cras	Fagu sylv	Trunk/bark	
Grap scri	Fagu sylv	Trunk/bark	
Leca abie	Fagu sylv	Trunk/bark	
Leci elae	Fagu sylv	Trunk/bark	
Lepr inca	Fagu sylv	Trunk/bark	
Lepr inca	Lari deci	Trunk/bark	
Lepr inca	Quer petr	Trunk/bark	
Grap scri	Salix	Trunk/bark	
Pelt prae	Salix	Twig/bark	
Xant pari	Salix	Twig/bark	
Arth cinn	Frax exce	Trunk/bark	
Grap scri	Frax exce	Trunk/bark	
Lepr inca	Frax exce	Trunk/bark	
Norm pul	Frax exce	Bryo/Trunk/bark	
Parm cape	Frax exce	Trunk/bark	
Pyre macr	Frax exce	Trunk/bark	
Thel lepa	Frax exce	Trunk/bark	
Grap scri	Cory avel	Trunk/bark	
Leci elae	Cory avel	Trunk/bark	
Rama fast	Cory avel	Twig/bark	
Thel lepa	Cory avel	Branch/bark	
Arth cinn	Frax exce	Trunk/bark	Lepr inca, Pyre macr
Grap scri	Cory avel	Trunk/bark	
Grap scri	Frax exce	Trunk/bark	Lepr inca, Pyre macr
Lepr inca	Cory avel	Trunk/bark	
Lepr inca	Frax exce	Trunk/bark	Pyre macr, Arth cinn
Pyre macr	Frax exce	Trunk/bark	Lepr inca, Arth cinn, Graph scri
Arth cinn	Frax exce	Trunk/bark	
Grap scri	Aesc hipp	Trunk/bark	

LICHEN_ID	HOST_SP	SUBSTRATE	ASSOC_SP
Grap scri	Alnu glut	Trunk/bark	
Leci elae	Frax exce	Trunk/bark	
Thel lepa	Aesc hipp	Trunk/bark	
Thel lepa	Frax exce	Trunk/bark	
Chry cand	Ulmu glab	Bark fissure	
Grap scri	Fagu sylv	Trunk/bark	
Leci elae	Fagu sylv	Trunk/bark	
Pyre macr	Fagu sylv	Trunk/bark	
Pyre macr	Ulmu glab	Trunk/bark	
Dime lute	Crat mono	Trunk/bark	
Grap scri	Crat mono	Trunk/bark	
Lepr inca	Alnu glut	Trunk/bark	
Thel lepa	Alnu glut	Trunk/bark	
Grap scri	Cory avel	Trunk/bark	Frullania sp.
Ente cras	Cory avel	Bark	
Grap scri	Cory avel	Trunk/bark	
Grap scri	Alnu glut	Trunk/bark	
Grap scri	Sali auri	Trunk/bark	
Lepr inca	Alnu glut	Trunk/bark	
Grap scri	Frax exce	no record	
Thel lepa	Frax exce	none recorded	
Grap scri	Alnu glut	Trunk/bark	
Ente cras	Sorb aucu	Trunk/bark	
Ever prun	Sorb aucu	Trunk/bark	
Grap scri	Fagu sylv	Trunk/bark	
Grap scri	Sorb aucu	Trunk/bark	
Leci elae	Fagu sylv	Trunk/bark	
Lepr inca	Quer robu	Trunk/bark	
Lepr inca	Fagu sylv	Trunk/bark	Hypnum sp.
Parm perl	Sali cine	Trunk (prostrate)	Frullania
Grap scri	Cory avel	Trunk/bark	
Thel lepa	Quer robu	Trunk/bark	
Grap scri	Fagu sylv	Trunk/bark	
Grap scri	Q.pet x r	Trunk/bark	
Dime lute	Quer robu	dead twigs	
Grap scri	Frax exce	Trunk/bark	
Lepr inca	Quer robu	Trunk/bark	
Parm perl	Quer robu	Dead twigs	
Parm perl	Sali cine	Trunk/bark	
Clad chlo	Betu pub	Roots	
Grap scri	Betu pub	Trunk/bark	
Lepr inca	Betu pub	Trunk/bark	
Xant pari	Sorb auc	Trunk/bark	
Ente cras	Frax exce	Trunk/bark	
Grap scri	Fagu sylv	Trunk/bark	
Leci elae	Frax exce	Trunk/bark	
Parm perl	Cory avel	Twig/bark	
Clad coni	Cory avel	Trunk/bark	
Clad coni	Cory avel	Trunk/bark	
Grap scri	Cory avel	Trunk/bark	
Grap scri	Quer robu	Trunk/bark	
Thel lepa	Cory avel	Trunk/bark	
Parm perl	Betu pub	Twig/bark	
Grap scri	Betu pub	Trunk/bark	
Leca chla	Sali cine	Twig/bark	

LICHEN_ID	HOST_SP	SUBSTRATE	ASSOC_SP
Leci elae	Frax exce	Trunk/bark	
Parm cape	Crat mono	Trunk/bark	
Parm perl	Crat mono	Twig/bark	
Xant poly	Quer robu	Twig/bark	
Clad coni	Pinu sylv	Trunk/Lignin	
Grap scri	Betu pub	Trunk/bark	
Parm perl	Betu pub	Twig/bark	
Clad coni	Prun aviu	Trunk/bark	
Grap scri	Cory avel	Trunk/bark	
Rama fari	not identified	Lignin/Twig	
Clad coni	Sorb auc	Trunk/bark	
Grap scri	Sorb aucu	Trunk/bark	
Leci elae	Sorb auc	Trunk/bark	
Lepr inca	Alnu glut	Trunk/bark	
Parm cape	Alnu glut	Branch/bark	
Arth cinn	Cory avel	Branch/bark	
Grap scri	Cory avel	Trunk/bark	
Leci elae	Cory avel	Branch/bark	
Clad coni	Betu pub	Trunk/bark	
Parm perl	Betu pub	Trunk/bark	
Parm perl	Hede heli	Trunk/bark	
Arth cinn	Cory avel	Bark	
Ente cras	Acer pseu	Trunk/bark	
Grap scri	Betu pub	Trunk/bark	
Grap scri	Cory avel	Trunk/bark	
Lepr inca	Betu pub	Trunk/bark	
Lepr inca	Alnu glut	Trunk/bark	
Norm pul	Alnu glut	Trunk/bark	
Ente cras	Frax exce	Trunk/bark	
Lepr inca	Frax exce	Trunk/bark	
Grap scri	Alnu glut	Trunk/bark	
Grap scri	Sali auri	Branch/bark	
Parm perl	Sali cine	Dead branch	
Grap scri	Frax exce	Trunk/bark	
Parm cape	Crat mono	Twig	Usnea
Usne subf	Crat mono	Twig	Parm
Grap scri	Crat mono	Trunk/bark	
Grap scri	Frax exce	Trunk/bark	
Parm perl	Quer robu	rotting lignin	
Thel lepa	Fagu sylv	Trunk/bark	
Grap scri	Crat mono	Trunk/bark	
Grap scri	Frax exce	Trunk/bark	
Thel lepa	Frax exce	Trunk/bark	
Grap scri	Cory avel	Trunk/bark	
Pyre macr	Cory avel	Trunk/bark	
Ente cras	Fagu sylv	Trunk/bark	
Grap scri	Fagu sylv	Trunk/bark	
Grap scri	Frax exce	Trunk/bark	
Grap scri	Quer robu	Trunk/bark	
Grap scri	Frax exce	Trunk/bark	
Lepr inca	Frax exce	Trunk/bark	
Lepr inca	Quer robu	Trunk/bark	
Grap scri	Frax exce	Trunk/bark	
Lepr inca	Frax exce	Trunk/bark	
Lepr inca	Quer petr	Trunk/bark	

LICHEN_ID	HOST_SP	SUBSTRATE	ASSOC_SP
Grap scri	Alnu glut	Trunk/bark	
Grap scri	Frax exce	Trunk/bark	
Lepr inca	Alnu glut	Trunk/bark	
Grap scri	Cory avel	Trunk/bark	
Thel lepa	Quer robu	Trunk/bark	
Grap scri	Frax exce	Trunk/bark	Hypnum
Thel lepa	Quer robu	Trunk/bark	Frullania sp.
Grap scri	Frax exce	Trunk/bark	
Thel lepa	Sali cine	Trunk/bark	Xanth
Xant pari	Sali cine	Trunk/bark	Thel
Grap scri	Frax exce	Trunk/bark	
Grap scri	Frax exce	Trunk/bark	
Leca chla	Frax exce	Trunk/bark	
Lepr inca	Quer robu	Trunk/bark	
Grap scri	Frax exce	Trunk/bark	
Ente cras	Crat mono	Trunk/bark	
Grap scri	Frax exce	Trunk/bark	
Ente cras	Frax exce	Trunk/bark	
Grap scri	Frax exce	Trunk/bark	
Parm sulc	Lari deci	Dead twig	
Grap scri	Frax exce	Trunk/bark	
Grap scri	Frax exce	Trunk/bark	
Parm perl	Sali cine	Trunk/bark	
Usne subf	Ulmu glab	dead branch	
Arth cinn	Cory avel	Bark	
Chry cand	Quer petr	Trunk/bark	
Grap scri	Cory avel	Trunk/bark	
Lepr inca	Betu pub	Trunk/bark	
Grap scri	Cory avel	Trunk/bark	
Parm perl	Q.pet x r	fallen branch	
Rama fari	Q.pet x r	dead twig	
Grap scri	Quer petr	Trunk/bark	
Parm perl	Quer petr	fallen branch	
Parm perl	Sali cine	twigs bark	
Grap scri	Frax exce	Trunk/bark	
Grap scri	Alnu glut	Trunk/bark	
Parm perl	Alnu glut	Trunk/bark	
Grap scri	Fagu sylv	Trunk/bark	
Lepr inca	Quercus	Trunk/bark	
Grap scri	Cory avel	Trunk/bark	
Grap scri	Quer robu	Trunk/bark	
Lepr inca	Betu pub	Branch/bark	
Parm perl	Betu pub	Twig/bark	
Grap scri	Cory avel	Branch/bark	
Grap scri	Frax exce	Trunk/bark	
Clad coni	Q.pet x r	Trunk/bark	Hypnum spp.
Grap scri	Q.pet x r	Trunk/bark	
Parm perl	Quer robu	fallen decaying twig	
Lepr inca	Alnu glut	Trunk/bark	
Lepr inca	Fagu sylv	Trunk/bark	
Lepr inca	Quer petr	Trunk/bark	
Parm perl	Quer petr	Dead twig	
Ente cras	Fagu sylv	Trunk/bark	
Grap scri	Fagu sylv	Trunk/bark	
Grap scri	Frax exce	Trunk/bark	

LICHEN_ID	HOST_SP	SUBSTRATE	ASSOC_SP
Clad coni	Alnu glut	Trunk/bark	
Ente cras	Frax exce	Twig/bark	
Ever prun	Frax exce	Trunk/bark	
Grap scri	Frax exce	Trunk/bark	
Parm cape	Quer robu	Twig/bark	
Phys ten	Crat mono	Trunk/bark	
Clad coni	Cory avel	Trunk/bark	
Ente cras	Cory avel	Trunk/bark	
Grap scri	Cory avel	Trunk/bark	
Parm perl	Cory avel	Twig/bark	
Thel lepa	Cory avel	Branch/bark	
Grap scri	Euon euro	Trunk/bark	
Leca chla	Crat mono	Twig/bark	
Rama fari	Crat mono	Twig/bark	
Parm cape	Fagu sylv	dead branch	
Parm perl	Fagu sylv	dead twig	
Grap scri	Q.pet x r	Trunk/bark	none
Lepr inca	Quer robu	Trunk/bark	
Arth cinn	Cory avel	Trunk/bark	
Ente cras	Cory avel	Trunk/bark	
Grap scri	Cory avel	Trunk/bark	
Lepr inca	Cory avel	Trunk/bark	
Clad chlo	Frax exce	Trunk/bark	
Grap scri	Frax exce	Trunk/bark	
Parm perl	Frax exce	Trunk/bark	
Grap scri	Frax exce	Trunk/bark	
Grap scri	Alnu glut	Trunk/bark	
Grap scri	Frax exce	Trunk/bark	
Lepr inca	Alnu glut	Trunk/bark	
Grap scri	Frax exce	Trunk/bark	
Grap scri	Alnu glut	Trunk/bark	
Grap scri	Frax exce	Trunk/bark	
Lepr inca	Alnu glut	Trunk, moss	
Parm perl	Sali frag	Trunk/bark	
Chry cand	Quer robu	Trunk/bark	
Grap scri	Cory avel	Trunk/bark	Lepr inca
Lepr inca	Alnu glut	Trunk/bark	
Lepr inca	Cory avel	Trunk/bark	Grap scri
Grap scri	Cory avel	Trunk/bark	
Arth cinn	Frax exce	Bark	
Grap scri	Frax exce	Trunk/bark	
Grap scri	Cory avel	Trunk/bark	
Grap scri	Quer robu	Trunk/bark	
Lepr inca	Cory avel	Trunk/bark	
Grap scri	Frax exce	Trunk/bark	
Lepr inca	Betu pub	Trunk/bark	
Lepr inca	Sali cine	Trunk/bark	
Parm perl	Sali cine	twig, bark	
Grap scri	Alnu glut	Trunk/bark	
Parm perl	Sali cine	fallen trunk	
Grap scri	Alnu glut	Trunk/bark	
Lepr inca	Alnu glut	Trunk/bark	
Norm pul	Alnu glut	Trunk/bark	
Clad chlo	Alnu glut	Trunk/bark	
Grap scri	Alnu glut	Trunk/bark	

LICHEN_ID	HOST_SP	SUBSTRATE	ASSOC_SP
Parm perl	Sali cine	twigs/bark	
Grap scri	Frax exce	Trunk/bark	
Grap scri	Quer robu	Trunk/bark	
Lepr inca	Quer robu	Trunk/bark	
Grap scri	Alnu glut	Trunk/bark	
Parm perl	Alnu glut	Trunk/bark	
Rama fari	Alnu glut	Trunk/bark	
Grap scri	Frax exce	Trunk/bark	
Lepr inca	Crat mono	Trunk/bark	
Parm cape	Betu pub	Trunk/bark	
Parm cape	Sali cine	Trunk/bark	
Usne subf	Betu pub	Trunk/bark	
Usne subf	Sali cine	Trunk/bark	
Grap scri	Alnu glut	Trunk/bark	
Lepr inca	Quer robu	on moss	
Grap scri	Cory avel	Trunk/bark	
Grap scri	Fagu sylv	Trunk/bark	
Leca abie	Frax exce	Trunk/bark	
Lepr inca	Frax exce	Trunk/bark	
Pyre macr	Frax exce	Trunk/bark	
Clad chlo	Quer robu	Bark	
Lepr inca	Quer robu	Trunk/bark	
Parm perl	Betu pub	Branch/bark	
Ever prun	none	Litter	
Parm perl	Quercus	twig, lignin	
Grap scri	Frax exce	Trunk/bark	
Ever prun	Cory avel	dead twig	
Thel lepa	Frax exce	Trunk/bark	
Grap scri	Crat mono	Trunk/bark	
Grap scri	Frax exce	Trunk/bark	
Leci elae	Frax exce	Trunk/bark	
Parm perl	Unidentified	Dead branches	
Grap scri	Frax exce	Trunk/bark	
Lepr inca	Crat mono	Trunk/bark	
Lepr inca	Quer robu	Trunk/bark	
Parm perl	Frax exce	Trunk/bark	
Grap scri	Sorb aria	Trunk/bark	
Grap scri	Betu pub	Trunk/bark	
Grap scri	Frax exce	Trunk/bark	
Ente cras	Frax exce	Trunk/bark	
Grap scri	Cory avel	Twig/bark	
Thel lepa	Frax exce	Trunk/bark	
Dime lute	Cory avel	Trunk/bark	
Grap scri	Cory avel	Twig/bark	
Grap scri	Frax exce	Trunk/bark	
Parm cape	Alnu glut	Trunk/bark	
Parm perl	Alnu glut	Twig/bark	
Rama fari	Alnu glut	Twig/bark	
Usne subf	Alnu glut	Twig/bark	
Grap scri	Cory avel	Trunk/bark	
Leca chla	Acer pseu	Trunk/bark	
Leci elae	Frax exce	Trunk/bark	
Lepr inca	Frax exce	Trunk/bark	
Thel lepa	Frax exce	Trunk/bark	
Arth cinn	Sali cine	Trunk/bark	

Appendix 9

LICHEN_ID	HOST_SP	SUBSTRATE	ASSOC_SP
Grap scri	Cory avel	Trunk/bark	
Leci elae	Cory avel	Branch/bark	
Arth cinn	Frax exce	Trunk/bark	
Grap scri	Betu pub	Trunk/bark	
Grap scri	Cory avel	Trunk/bark	
Grap scri	Frax exce	Trunk/bark	
Grap scri	Cory avel	Trunk/bark	
Clad coni	Crat mono	Trunk/Lignin	
Grap scri	Frax exce	Trunk/bark	
Parm perl	Betu pub	Trunk/bark	
Parm sulc	Quer robu	Trunk/bark	
Clad coni	Quer petr	Trunk/bark	
Grap scri	Cory avel	Branch/bark	
Leci elae	Betu pub	Trunk/bark	
Thel lepa	Betu pub	Trunk/bark	
Grap scri	Cory avel	Branch/bark	
Thel lepa	Betu pub	Trunk/bark	
Grap scri	Betu pub	Trunk/bark	
Lepr inca	Betu pub	Trunk/bark	
Thel lepa	Alnu glut	Branch/bark	
Grap scri	Betu pub	Trunk/bark	
Thel lepa	Sorb auc	Trunk/bark	
Parm perl	Crat mono	Twig/bark	
Grap scri	Frax exce	Trunk/bark	
Leci elae	Fagu sylv	Trunk/bark	
Parm perl	Alnu glut	Twig/bark	
Grap scri	Frax exce	Trunk/bark	
Grap scri	Frax exce	Trunk/bark	
Parm cape	Crat mono	Branch/bark	
Phys ten	Frax exce	Twig/bark	
Rama fari	Crat mono	Twig/bark	
Xant pari	Frax exce	Twig/bark	
Clad chlo	Alnu glut	Trunk/bark	
Grap scri	Betu pub	Branch/bark	
Parm perl	Alnu glut	Twig/bark	
Thel lepa	Betu pub	Trunk/bark	
Parm perl	Crat mono	Twig/bark	
Thel lepa	Betu pub	Trunk/bark	
Clad coni	Betu pub	Trunk/bark	
Rama fari	Sali cine	Twig/bark	
Grap scri	Frax exce	Trunk/bark	
Arth cinn	Acer pseu	Trunk/bark	
Grap scri	Frax exce	Trunk/bark	
Lepr inca	Alnu glut	Branch/bark	
Thel lepa	Alnu glut	Trunk/bark	
Parm cape	Alnu glut	Trunk/bark	
Usne subf	Alnu glut	Trunk/bark	
Clad coni	Betu pub	Trunk/bark	
Grap scri	Betu pub	Trunk/bark	
Parm perl	Alnu glut	Twig/bark	
Rama fari	not identified	Lignin/Twig	
Xant pari	Crat mono	Twig/bark	
Grap scri	Sorb aucu	Trunk/bark	
Thel lepa	Sorb auc	Trunk/bark	
Arth cinn	Sali auri	Trunk/bark	

Appendix 9

LICHEN_ID	HOST_SP	SUBSTRATE	ASSOC_SP
Dime lute	Betu pub	Trunk/bark	
Grap scri	Betu pub	Trunk/bark	
Arth cinn	Frax exce	Trunk/bark	
Grap scri	Frax exce	Trunk/bark	
Grap scri	Frax exce	Trunk/bark	
Leca chla	Quer robu	Trunk/bark	
Rama fari	Frax exce	Twig/bark	
Thel lepa	Frax exce	Twig/bark	
Clad coni	Sali cine	Trunk/bark	
Dime lute	Sali cine	Trunk/bark	
Grap scri	Betu pub	Trunk/bark	
Rama fari	Sali cine	Twig/bark	
Grap scri	Frax exce	Trunk/bark	
Grap scri	Cory avel	Trunk/bark	
Lepr inca	Alnu glut	Trunk/bark	
Grap scri	Tili cord	Trunk/bark	
Grap scri	Fagu sylv	Trunk/bark	
Grap scri	Frax exce	Trunk/bark	
Lepr inca	Sali cine	Trunk/bark	
Parm perl	Alnu glut	Twig/bark	
Grap scri	Sorb aucu	Trunk/bark	
Lepr inca	Betu pub	Trunk/bark	
Grap scri	Fagu sylv	Trunk/bark	
Grap scri	Frax exce	Trunk/bark	
Leci elae	Frax exce	Trunk/bark	
Lepr inca	Quer robu	Dead tree stump	
Grap scri	Quer robu	Trunk/bark	
Grap scri	Frax exce	Trunk/bark	
Parm perl	Crat mono	Twig/bark	
Phys aipo	Crat mono	Twig/bark	
Rama fari	Crat mono	Twig/bark	
Rama fast	not identified	Lignin/Twig	
Thel lepa	Frax exce	Trunk/bark	
Grap scri	Sorb aucu	Trunk/bark	
Lepr inca	Betu pub	Trunk/bark	
Parm perl	Quer robu	Trunk/bark	
Grap scri	Sorb aucu	Trunk/bark	
Lepr inca	Quer robu	Trunk/bark	
Lepr inca	Sorb auc	Trunk/bark	
Grap scri	Frax exce	Trunk/bark	
Grap scri	Ulmu glab	Trunk/bark	
Parm perl	Ulmu glab	Dead twigs	
Grap scri	Crat mono	Trunk/bark	
Parm perl	Q.pet x r	Trunk/bark	
Grap scri	Frax exce	Trunk/bark	
Parm cape	Quer robu	Trunk/bark	
Grap scri	Sorb aucu	Trunk/bark	
Parm perl	Lari deci	Twig/bark	
Grap scri	Sali cine	Trunk/bark	
Parm perl	Betu pub	Trunk/bark	
Parm perl	Sali cine	Twig	
Grap scri	Q.pet x r	Trunk/bark	
Parm perl	Q.pet x r	Twig/bark	
Grap scri	Cory avel	Branch/bark	
Grap scri	Frax exce	Trunk/bark	

Appendix 9

LICHEN_ID	HOST_SP	SUBSTRATE	ASSOC_SP
Lepr inca	Frax exce	Trunk/bark	
Grap scri	Sali cine	Trunk/bark	
Grap scri	Betu pub	Branch/bark	
Grap scri	Sorb aucu	Trunk/bark	
Parm perl	Betu pub	Trunk/bark	
Parm perl	Sorb auc	Trunk/bark	
Grap scri	Cory avel	Branch/bark	
Grap scri	Prun padu	Trunk/bark	
Parm perl	Cory avel	Dead branch	
Grap scri	Cory avel	Trunk/bark	
Thel lepa	Cory avel	Trunk/bark	
Grap scri	Frax exce	Trunk/bark	
Grap scri	Sali cine	Trunk/bark	
Grap scri	Sorb aucu	Trunk/bark	
Chry cand	Sali cine	Bark	
Ente cras	Frax exce	Trunk/bark	
Grap scri	Frax exce	Trunk/bark	
Ever prun	Sali cine	Branch	
Lepr inca	Sali cine	Branch	
Parm perl	Sali cine	Branch	

Appendix 10 - Conservation scores for surveyed woodlands

Site No.	Woodland Name	Vasc. Plant sp.	Bryo. sp.	Lichen sp.	Regeneration	Horizontal diversity	Notable sp.	Area	Natural Habitats	1840s	s-n adjacent habitats	Hydro. Features	Standing dead/damaged wood	Woody debris	Coppice/pollard	Features	Score
0001	Ballynabarny Wood	3	2	1	1	1	1	2	3	1	1	1	0	1	0	0	18
0002	Clone Fox Covert	1	1	0	3	2	1	2	1	1	0	0	0	1	0	0	13
0003	Courtown Dunes and Glen	3	2	1	0	2	0	5	2	1	1	1	0	0	0	0	18
0004	Killoughrum Forest	4	3	2	3	1	1	4	3	1	0	1	0	1	1	1	26
0005	Oaklands	3	2	0	2	1	2	4	0	1	0	1	0	0	0	0	16
0007	Camolin	2	2	1	1	1	0	4	2	1	0	1	0	0	0	0	15
0008	Baggot's Wood	1	2	0	1	2	1	1	1	1	0	0	0	1	0	0	11
0009	Bahana	3	1	0	1	1	1	3	3	1	1	1	0	0	0	0	16
0010	Clogheristick Wood	2	1	0	3	3	0	3	2	1	1	1	0	0	0	0	17
0012	Oakpark	2	2	2	0	1	0	4	2	1	1	1	1	1	1	1	20
0014	Drummond Wood	3	1	0	3	1	1	3	1	1	1	1	0	0	0	0	16
0015	Borris	4	1	1	3	3	1	6	3	1	1	1	1	1	0	0	27
0017	Thomastown	2	3	1	3	1	1	3	1	1	1	1	0	1	1	1	21
0018	Ballykeefe Wood	3	2	1	3	1	0	5	1	1	0	0	0	1	0	0	18
0019	Ballyhighland	2	2	2	1	1	0	4	0	no data	0	0	1	1	0	0	14
0020	Brownstown wood	2	2	0	0	2	0	3	1	1	1	1	0	0	1	1	15
0022	Fiddown	1	1	1	3	2	0	3	1	0	1	1	0	0	1	1	16
0026	Carrickduff Wood	2	1	0	0	2	1	4	0	1	1	1	1	0	0	0	14
0027	Dovegrove Callows	2	1	3	3	1	1	2	1	0	1	1	1	1	1	1	20
0028	Clonfinlough esker	3	2	1	3	1	1	1	1	1	1	0	1	0	1	1	18
0030	Woodville	3	2	1	1	1	1	5	1	1	0	0	0	0	1	1	18
0031	Cloghan Demesne Bog and Wood	3	1	3	3	3	0	3	2	1	1	1	0	0	0	0	21
0033	Camcor Wood/Glinsk	3	2	1	3	1	0	4	1	0	1	1	0	0	0	0	17
0034	Cangort Bog	1	2	0	3	1	0	3	1	0	1	1	0	1	0	0	14
0035	Clorhane Wood	3	1	1	3	1	3	4	1	0	1	1	1	0	0	0	20
0036	Lough Coura	2	2	1	3	1	1	3	2	1	1	1	0	0	1	1	20
0037	Curraduff	2	1	1	1	1	0	2	1	0	1	1	0	1	0	0	12
0038	Graiguebeg	1	1	0	3	1	0	1	1	0	1	0	0	0	1	1	11
0048	Jerpoint Abbey	3	2	1	2	1	0	2	1	0	0	0	0	0	1	1	14

Site No.	Woodland Name	Vasc. Plant sp.	Bryo. sp.	Lichen sp.	Regeneration	Horizontal diversity	Notable sp.	Area	Natural Habitats	1840s	s-n adjacent habitats	Hydro. Features	Standing dead/damaged wood	Woody debris	Coppice/pollard	Features	Score
0049	Grenan Wood	2	2	0	3	2	1	4	0	1	1	0	0	1	0	0	17
0051	Kilfane House	3	1	1	2	1	0	1	1	1	0	1	0	1	0	0	13
0053	Kilcullen	2	1	0	3	1	0	1	1	0	0	1	1	0	0	0	11
0058	Cullentragh	2	2	1	3	1	0	3	1	1	1	1	0	1	1	1	19
0061	Cullaun	2	1	0	3	1	0	2	2	1	1	1	0	1	1	0	16
0065	Bohermore	1	1	0	3	2	0	1	1	1	0	1	0	1	0	0	12
0069	Toberbride	2	2	1	3	1	1	3	1	0	0	1	0	1	0	1	17
0073	Tinnahinch	2	1	1	2	2	0	1	0	1	1	0	1	0	1	0	13
0074	Knockeen	3	1	1	1	3	0	1	1	0	0	0	0	0	0	0	11
0075	Knockduff	1	1	1	3	1	0	1	1	0	1	1	1	0	0	0	12
0076	Ballybeg	1	2	1	2	1	0	1	1	0	1	1	0	0	0	0	11
0078	Ballintemple	1	1	0	0	1	0	2	0	0	0	0	0	0	0	0	5
0079	Doon Demesne	2	2	1	3	2	0	2	0	1	0	0	0	1	0	0	14
0080	Doon Demesne 2	2	3	1	3	2	1	2	1	1	1	0	0	1	0	0	18
0081	Clonascra	2	2	1	3	1	0	1	2	0	1	1	0	0	0	0	14
0082	Clongawny more	3	3	1	3	1	1	1	2	0	1	0	0	1	0	1	18
0083	Taylors Cross	2	2	1	3	2	0	1	1	0	0	1	0	0	1	0	14
0084	Boolinarig	3	2	1	3	1	0	3	1	0	1	0	0	1	0	1	17
0085	Ballyhealy	2	2	1	3	1	1	2	1	1	0	0	0	1	1	0	16
0086	Clooneen	3	3	3	3	1	1	3	2	1	1	0	0	1	0	1	23
0089	Ballincor Demesne bogwood	1	1	1	3	1	0	3	2	1	1	0	0	0	1	0	15
0091	Bigwood (no tree data)	1	3	0	0	2	0	4	1	0	0	1	0	0	1	0	13
0095	Drummin (Red Bog)	1	2	0	3	1	0	1	1	0	0	1	0	1	0	1	12
0096	Kyleadohir Wood	4	2	0	3	1	1	5	1	1	0	1	0	1	0	1	21
0100	Tomnafunshogue	3	3	1	0	1	0	1	2	1	0	1	0	1	1	0	15
0102	Ballycrystal	1	2	0	3	2	0	3	2	1	0	1	0	0	1	1	17
0103	Bolamore	2	1	1	3	1	0	2	1	1	0	1	0	1	0	0	14
0106	Tombrick Lower	1	1	0	1	2	0	1	1	1	0	0	0	1	1	0	10
0108	Troyswood	3	1	1	1	2	0	2	1	1	0	1	0	1	0	0	14
0109	Jenkinstown Park	3	1	1	3	3	0	4	1	1	0	0	0	1	0	0	18

Site No.	Woodland Name	Vasc. Plant sp.	Bryo. sp.	Lichen sp.	Regeneration	Horizontal diversity	Notable sp.	Area	Natural Habitats	1840s	s-n adjacent habitats	Hydro. Features	Standing dead/damaged wood	Woody debris	Coppice/pollard	Features	Score
0110	Ballyrafton	2	1	0	3	3	1	3	0	0	0	0	0	0	0	1	14
0112	Maddockstown/ Nore Cottage	3	2	1	2	3	1	3	1	1	0	1	0	1	0	0	19
0113	High Rath	2	2	1	3	1	0	1	1	0	1	0	0	0	1	0	13
0114	Gowran	2	2	1	2	1	0	2	1	1	0	1	0	0	0	0	13
0116	Fanningstown Wood	2	1	1	1	1	0	2	1	1	0	1	0	1	0	0	12
0117	Mountain grove	3	1	1	1	2	0	4	0	0	0	1	0	0	0	0	13
0122	Creakan Lower	1	1	0	3	1	0	1	1	0	1	1	1	1	0	1	13
0123	Stokestown Bridge	2	3	1	2	1	0	1	2	0	1	0	0	0	0	0	13
0124	Ballyleigh	2	2	1	3	2	0	1	3	0	0	1	0	0	1	0	16
0125	Ballynacoolagh	1	2	1	3	2	0	2	1	1	1	0	0	1	0	0	15
0126	Curraun	2	1	1	2	1	0	1	1	0	0	1	0	1	0	1	12
0127	Archersgrove	3	2	0	3	2	1	1	1	1	0	1	0	1	0	0	16
0128	Browns Wood	2	2	1	2	1	0	3	2	1	0	1	0	1	1	1	18
0130	Monarche Commons 2	2	2	1	3	2	0	2	0	0	0	1	1	1	0	0	15
0131	Greatwood	2	2	1	2	1	0	1	1	1	0	1	0	1	1	0	14
0135	Coill na Fhaltaigh	1	1	1	1	2	0	3	0	1	1	1	0	1	0	0	13
0136	Rossenarra	3	1	1	3	3	0	2	1	1	1	1	0	1	0	0	18
0137	Knockadrina	3	3	1	3	2	0	4	2	no data	0	1	0	0	0	0	19
0138	Castlemorres Demesne	2	2	1	3	2	0	4	0	1	0	1	1	1	0	0	18
0139	Twenty Acres	2	2	1	1	1	0	1	0	0	1	1	0	1	0	0	11
0141	Johnstown Castle	1	1	1	3	2	0	1	1	1	1	1	1	1	0	0	15
0145	Ballybrennan House	3	1	1	3	1	0	1	1	1	1	1	1	1	0	0	16
0147	Ballycross Apple Farm	2	1	0	1	2	0	1	0	1	0	1	0	0	0	0	9
0148	Ballyfad	1	1	1	3	3	0	4	3	1	0	1	0	0	0	0	18
0151	Bricketstown House	3	3	1	3	2	0	4	2	1	0	1	1	1	1	0	23
0153	Ballyvalogue	2	1	1	3	1	1	1	1	0	0	1	1	1	0	1	15
0154	Ballyboggan Lower	4	3	1	2	1	1	4	2	1	1	1	1	1	0	0	23
0155	Soldier's Hole	2	2	1	1	1	0	1	1	1	0	1	0	0	0	0	11

Site No.	Woodland Name	Vasc. Plant sp.	Bryo. sp.	Lichen sp.	Regeneration	Horizontal diversity	Notable sp.	Area	Natural Habitats	1840s	s-n adjacent habitats	Hydro. Features	Standing dead/damaged wood	Woody debris	Coppice/pollard	Features	Score
0156	Garryricken (North)	3	3	0	3	1	0	3	1	1	0	1	0	1	0	0	17
0157	Ballynoe (no timber data)	1	2	1	0	no data	0	1	2	1	1	1	0	1	1	0	12
0158	Altamont	2	2	0	3	3	0	2	1	0	1	1	0	0	0	0	15
0160	Ballywilliam	2	3	1	3	1	0	3	1	0	1	0	0	1	0	0	16
0162	Guernal	3	2	1	3	1	0	1	1	1	0	0	0	1	0	0	14
0163	Tombrick Wood	2	2	1	3	1	0	1	1	1	0	0	0	0	0	1	13
0166	Wilton North	2	1	0	3	3	1	1	1	1	1	1	0	1	0	0	16
0167	Wilton South	2	1	1	0	3	0	1	2	1	0	1	0	1	0	0	13
0168	Ballinvally Wood	2	1	1	3	1	0	1	1	0	0	1	0	1	0	0	12
0169	Coonogue Wood	1	1	0	2	1	0	1	1	1	0	0	0	1	1	1	11
0170	Coolpuck Wood	2	1	1	1	2	1	4	0	1	0	0	0	1	0	0	14
0172	Ballingarry Wood	1	2	0	3	1	0	3	1	1	0	1	0	1	0	1	15
0173	Golden Grove	3	2	1	0	1	0	4	1	1	0	0	0	0	0	1	14
0174	Drumakeenan School	2	1	1	3	1	0	3	1	1	0	0	0	0	0	1	14
0175	Townparks	2	2	3	3	1	1	1	1	1	1	1	0	1	0	0	18
0176	Cushcallow	4	2	2	3	1	1	3	2	1	1	1	1	1	1	0	24
0177	Corclogh	1	1	1	3	1	0	1	3	1	1	0	1	1	0	0	15
0178	Orchard	2	2	1	3	2	0	2	2	0	0	1	0	1	1	1	18
0179	Clonogan Wood	2	2	1	3	1	0	2	1	1	0	1	0	0	1	0	15
0180	Glandoran Upper/ Carthy's Wood	3	3	0	3	2	0	2	1	1	0	1	0	0	1	0	17
0183	Clogrenan Wood	3	2	0	0	1	0	3	0	1	0	1	0	0	0	1	12
0184	Lisnevagh	1	1	1	0	3	0	2	1	0	0	0	0	0	0	0	9
0186	Drumgoogle	1	1	0	1	3	0	1	0	1	0	1	0	0	0	0	9
0187	Ballymore Demesne	1	1	1	0	1	0	1	2	1	1	1	0	1	1	0	12
0189	Wells East	1	1	0	1	2	0	3	0	1	1	0	0	1	0	0	11
0190	Wells West	2	1	1	1	1	0	1	0	1	0	1	1	1	0	0	11
0191	Island House	2	1	1	3	1	0	2	1	1	0	1	1	1	1	0	16
0192	Litterbeg	2	1	1	1	2	0	2	1	1	0	1	0	1	0	1	14
0197	Milltown	2	2	1	2	3	0	1	1	1	1	1	0	1	0	0	16

Site No.	Woodland Name	Vasc. Plant sp.	Bryo. sp.	Lichen sp.	Regeneration	Horizontal diversity	Notable sp.	Area	Natural Habitats	1840s	s-n adjacent habitats	Hydro. Features	Standing dead/damaged wood	Woody debris	Coppice/pollard	Features	Score
0198	Castletown House	1	1	0	3	2	0	2	0	1	0	1	0	0	0	1	12
0199	Kilmacow	2	1	1	3	1	0	4	2	no data	1	1	0	0	0	0	16
0200	Ballytobin / Ballaghtobin	3	2	1	2	2	0	3	1	1	0	1	0	0	0	1	17
0201	Foulkscourt	3	1	1	3	1	0	3	1	0	0	1	0	0	0	0	14
0203	Coolroebeg	2	3	1	3	1	0	3	1	0	1	1	0	1	1	0	18
0204	Shankill	4	1	1	3	1	0	2	2	1	0	1	0	1	1	0	18
0205	Raheendonore	2	1	1	1	1	0	3	1	0	0	1	0	1	0	0	12
0206	Ballinrush	2	2	1	3	1	0	2	1	0	0	0	1	0	0	0	13
0208	Crane Bridge	2	2	1	1	1	0	1	1	1	0	1	1	1	1	0	14
0209	Mackmine Wood	3	1	1	3	1	0	2	2	no data	0	1	1	1	0	0	16
0210	Ballynahillen	1	1	1	1	1	0	1	1	1	0	0	1	0	1	0	10
0211	Newtown Lower	4	2	1	3	2	0	3	2	1	1	1	1	1	0	1	23
0213	Seskinamadra	2	1	1	1	1	1	2	1	0	0	1	0	1	0	0	12
0219	Ballypierce	3	2	1	3	1	0	3	2	0	0	1	0	1	0	1	18
0221	Kilmacoliver	2	1	1	3	2	0	2	1	0	0	1	0	1	0	0	14
0223	Johnswell	2	2	0	2	1	0	2	2	1	0	1	1	1	0	0	15
0225	Newrath	2	1	0	3	1	0	2	2	1	0	1	1	1	0	0	15
0226	Skehana	2	2	1	3	1	0	2	1	1	0	1	0	0	0	0	14
0227	Lisdowney Wood	1	1	1	1	1	0	3	1	1	0	1	1	1	0	0	13
0228	Crumlin & Tulla	2	1	1	1	2	0	1	1	0	0	0	0	0	1	0	10
0229	Castle Bernard Demense	3	3	1	1	3	0	4	0	1	0	1	0	1	0	0	18
0230	Ballymack	2	1	1	3	2	0	2	1	0	0	1	0	0	1	0	14
0234	Monassa	3	1	1	3	2	0	1	1	0	0	0	0	1	0	1	14
0236	Flagmount North	2	1	1	2	1	0	1	1	0	1	0	0	0	0	0	10
0237	Broughal	1	2	1	3	1	1	3	1	1	1	0	0	1	0	0	16
0238	Barnaboy	1	2	1	2	1	0	3	1	0	1	0	0	1	0	1	14
0240	Clonmacnoise	1	2	0	2	1	0	1	1	0	1	1	0	0	0	1	11
0241	Clonassy Wood	1	2	0	3	1	0	3	1	1	0	0	0	0	0	1	13
0242	Grantstown Wood	4	3	1	1	2	0	4	1	0	1	1	1	1	0	0	20

Site No.	Woodland Name	Vasc. Plant sp.	Bryo. sp.	Lichen sp.	Regeneration	Horizontal diversity	Notable sp.	Area	Natural Habitats	1840s	s-n adjacent habitats	Hydro. Features	Standing dead/damaged wood	Woody debris	Coppice/pollard	Features	Score
0245	Dunamase Woods	2	2	1	1	2	1	3	1	1	0	0	0	1	0	0	15
0246	Rock of Dunamase	1	2	1	3	1	0	1	2	1	1	0	1	1	1	0	16
0249	Clopook wood	2	2	1	3	1	0	1	2	1	0	0	0	1	1	0	15
0250	Clopook Valley	3	3	3	2	1	0	1	2	1	1	1	0	1	0	0	19
0251	Timahoe eskers	2	3	1	3	1	0	3	1	1	0	0	1	1	0	0	17
0252	Clonaslee eskers	1	2	1	0	2	0	3	1	1	0	0	0	1	1	0	13
0253	Kilteale Hill	2	1	1	3	1	0	3	1	1	0	0	0	1	1	1	16
0254	Knockbawn	4	3	1	3	1	0	3	3	0	1	1	1	1	1	0	23
0255	Mortons Grove	3	3	1	3	1	0	4	2	1	1	1	0	1	0	1	22
0256	Coolnamony	3	3	2	3	3	0	3	1	0	1	1	1	1	0	0	22
0257	Capard	2	3	1	3	1	0	1	1	1	1	1	1	1	0	1	18
0258	Brittas	2	3	1	2	1	0	1	1	1	1	1	0	1	0	0	15
0259	Garryhinch Demesne	3	2	1	3	1	1	1	1	1	1	1	0	1	0	0	17
0260	Ballyfin Demesne	3	3	1	2	2	0	3	2	1	1	1	0	1	0	0	20
0262	Rathcoffey	4	2	1	3	1	1	3	1	0	1	1	0	1	0	1	20
0263	Vicarstown	3	3	2	1	1	0	2	3	1	1	1	0	1	1	1	21
0265	Ballhuppahane	3	3	1	3	1	0	2	4	0	1	1	1	0	0	0	20
0266	Cush Upper	2	1	0	3	1	0	2	2	0	1	1	1	1	1	0	16
0268	Cappagh North	3	2	1	3	1	0	2	1	0	1	1	0	1	0	1	17
0269	Glenmalyre Demesne	3	3	1	3	2	0	1	2	1	0	1	0	1	1	1	20
0270	Ballybeg Mill	2	2	1	3	1	0	1	2	0	1	1	1	1	0	1	17
0273	Barkmill	3	2	1	3	1	1	1	1	0	0	1	0	1	0	0	15
0274	Bughorn	2	2	1	3	1	0	2	4	0	1	1	1	1	0	1	20
0275	Ballina	1	2	1	3	1	0	2	2	0	1	1	0	1	1	0	16
0276	Maidenhead	3	2	1	3	1	0	2	1	1	0	1	0	1	1	0	17
0277	Ashfield	2	3	1	3	2	0	2	2	no data	0	1	0	1	0	0	17
0278	Derrykearn	2	1	1	2	1	0	2	1	0	1	1	0	1	0	0	13
0280	Kilcruise	2	2	1	3	2	0	2	1	1	0	1	0	0	1	0	16
0281	Kilkoke	3	1	1	3	1	0	2	1	1	0	1	0	1	1	0	16
0282	Castledurrow Demesne	2	1	0	3	3	1	1	1	1	0	1	0	0	1	1	16

Site No.	Woodland Name	Vasc. Plant sp.	Bryo. sp.	Lichen sp.	Regeneration	Horizontal diversity	Notable sp.	Area	Natural Habitats	1840s	s-n adjacent habitats	Hydro. Features	Standing dead/damaged wood	Woody debris	Coppice/pollard	Features	Score
0283	Dunmore Demesne	2	2	1	3	1	0	5	0	1	1	1	0	1	0	0	18
0284	Course Wood	3	2	0	3	2	2	1	1	1	1	1	0	1	1	0	19
0286	Knocknatrina Wood	3	2	1	2	2	1	4	0	1	1	1	0	0	0	0	18
0287	Knockbeg College	2	1	1	2	1	0	1	1	0	0	1	0	1	0	0	11
0289	Crush Wood	1	1	1	3	1	0	1	1	0	0	0	1	1	0	0	11
0290	Warren Hill	3	1	1	1	2	0	3	0	1	0	1	0	0	0	0	13
0294	Scotchrath House	2	1	1	1	2	0	1	0	1	0	0	0	1	0	0	10
0296	Corbally	2	2	3	3	2	0	2	3	1	1	1	0	1	0	1	22
0297	Killeany	1	3	1	3	2	0	2	1	0	1	0	0	1	1	0	16
0300	Ballaghmore Upper	2	2	1	3	1	0	1	1	1	0	1	0	0	0	0	13
0302	Garryricken Nature Reserve South	3	1	1	3	1	0	3	2	1	0	0	0	1	0	1	17
0303	Harperstown	1	1	1	2	2	0	1	1	1	1	1	0	1	0	0	13
0304	Garrylough Lower	2	2	1	3	1	0	2	1	0	0	1	1	1	0	0	15
0305	Pollfur Bridge Wood	2	1	1	3	2	0	1	1	no data	1	1	0	1	0	1	15
0307	Donore House Wood	2	1	0	1	2	1	1	1	1	0	1	0	0	0	1	12
0308	Barleagh Wood	1	1	1	3	1	0	3	1	1	0	1	1	1	0	0	15
0309	Emmel west	1	1	1	2	1	0	1	1	0	1	1	0	0	0	0	10
0310	Coolaphuca	3	2	1	2	2	1	4	1	1	1	1	0	0	1	1	21
0311	Barnadown Wood	1	2	1	3	1	0	1	0	1	0	0	0	1	0	1	12
0313	Kilballyskea Bog	1	1	0	1	1	0	1	1	no data	1	0	0	1	0	0	8
0316	Ballynattin	3	3	1	3	1	0	2	1	1	0	1	0	1	1	0	18
0320	Big Wood	1	2	0	3	2	0	1	1	1	0	0	0	1	0	0	12
0321	Brownstown	4	2	1	3	1	2	3	2	1	1	0	1	1	0	0	22
0322	North Brow	2	3	1	3	1	0	1	2	1	0	1	0	1	1	0	17
0324	Cloghscregg	2	1	1	3	1	1	1	1	0	0	1	0	1	1	0	14
0326	Brownstown East	1	2	1	3	1	1	1	1	0	1	0	0	1	0	0	13
0327	Carrhill Wood	1	2	0	2	3	0	2	0	1	0	0	0	0	0	0	11
0328	Lisheen	1	2	1	3	1	1	2	2	0	1	1	0	0	1	0	16
0329	Clondallow	2	2	1	2	1	0	1	2	0	1	1	0	0	1	0	14
	Maximum Score	**4**	**3**	**3**	**3**	**3**	**3**	**6**	**4**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**36**

Appendix 11 - Threat scores for the surveyed woodlands

Site	Woodland Name	Invasive Shrubs	Grazing	Non-native Canopy	Damaging activities	% species introduced	Score	*Shape No.
0001	Ballynabarny Wood	0	0	0	0	1	1	2.83
0002	Clone Fox Covert	0	1	0	0	2	3	1.4
0003	Courtown Dunes and Glen	2	0	1	1	3	7	no data
0004	Killoughrum Forest	0	0	0	1	2	3	no data
0005	Oaklands	2	0	1	0	3	6	no data
0007	Camolin	1	0	0	1	3	5	no data
0008	Baggot's Wood	0	2	0	1	1	4	no data
0009	Bahana	0	1	0	0	1	2	no data
0010	Clogheristick Wood	2	0	0	0	3	5	2.41
0012	Oakpark	1	0	1	0	4	6	no data
0014	Drummond Wood	0	1	1	1	2	5	no data
0015	Borris	2	0	1	3	3	9	no data
0017	Thomastown	0	0	1	1	3	5	1.82
0018	Ballykeefe Wood	0	0	0	2	3	5	1.43
0019	Ballyhighland	0	1	1	1	3	6	no data
0020	Brownstown wood	0	0	0	0	2	2	no data
0022	Fiddown	0	1	0	0	3	4	1.6
0026	Carrickduff Wood	2	1	1	0	3	7	no data
0027	Dovegrove Callows	0	2	0	0	3	5	1.47
0028	Clonfinlough esker	0	0	0	0	1	1	no data
0030	Woodville	1	2	0	3	3	9	no data
0031	Cloghan Demesne Bog and Wood	0	0	0	1	3	4	no data
0033	Camcor Wood/Glinsk	0	0	0	0	1	1	no data
0034	Cangort Bog	2	0	0	0	3	5	no data
0035	Clorhane Wood	0	0	0	0	3	3	1.18
0036	Lough Coura	0	0	0	0	0	0	no data
0037	Curraduff	0	1	0	0	1	2	no data
0038	Graiguebeg	0	3	0	0	1	4	1.19
0048	Jerpoint Abbey	0	1	0	1	1	3	no data
0049	Grenan Wood	0	1	1	0	2	4	no data
0051	Kilfane House	2	0	0	0	3	5	no data
0053	Kilcullen	0	1	0	1	1	3	1.27
0058	Cullentragh	1	2	0	0	2	5	no data
0061	Cullaun	1	0	1	1	2	5	no data
0065	Bohermore	0	1	0	0	1	2	1.37
0069	Toberbride	0	0	1	0	2	3	1.57
0073	Tinnahinch	0	1	1	0	2	4	no data
0074	Knockeen	0	1	0	0	1	2	no data
0075	Knockduff	0	1	0	0	0	1	no data
0076	Ballybeg	0	2	0	0	0	2	1.55
0078	Ballintemple	2	0	1	0	3	6	1.44
0079	Doon Demesne	2	0	0	1	4	7	1.32
0080	Doon Demesne 2	2	0	0	0	3	5	1.72
0081	Clonascra	0	0	0	1	2	3	2.14
0082	Clongawny more	0	0	0	0	1	1	1.92
0083	Taylors Cross	0	3	0	1	1	5	1.84
0084	Boolinarig	1	0	0	0	1	2	2.15
0085	Ballyhealy	0	0	0	0	2	2	1.47
0086	Clooneen	2	0	0	0	2	4	no data

Site	Woodland Name	Invasive Shrubs	Grazing	Non-native Canopy	Damaging activities	% species introduced	Score	*Shape No.
0089	Ballincor Demesne bogwood	0	1	0	0	3	4	no data
0091	Bigwood (no tree data)	0	0	0	0	1	1	1.79
0095	Drummin (Red Bog)	1	1	0	0	0	2	1.3
0096	Kyleadohir Wood	1	0	0	0	2	3	1.5
0100	Tomnafunshogue	0	3	0	1	2	6	1.89
0102	Ballycrystal	2	0	0	0	3	5	2.1
0103	Bolamore	1	1	0	0	2	4	1.97
0106	Tombrick Lower	0	1	0	0	3	4	1.46
0108	Troyswood	0	0	0	0	1	1	1.28
0109	Jenkinstown Park	0	0	0	0	1	1	no data
0110	Ballyrafton	0	0	0	1	2	3	1.51
0112	Maddockstown/ Nore Cottage	1	2	1	1	2	7	no data
0113	High Rath	2	0	0	0	2	4	1.22
0114	Gowran	0	0	0	0	3	3	no data
0116	Fanningstown Wood	0	1	0	0	2	3	no data
0117	Mountain grove	1	0	1	0	3	5	1.87
0122	Creakan Lower	0	1	0	0	2	3	1.7
0123	Stokestown Bridge (Dunganstown)	0	0	0	0	2	2	1.8
0124	Ballyleigh	0	2	0	0	1	3	1.25
0125	Ballynacoolagh	0	1	0	0	2	3	no data
0126	Curraun	0	1	0	0	1	2	no data
0127	Archersgrove	0	1	1	0	1	3	1.54
0128	Browns Wood	0	0	0	1	2	3	2.6
0130	Monarche Commons 2	2	0	0	1	3	6	1.41
0131	Greatwood	2	3	0	0	2	7	1.43
0135	Coill na Fhaltaigh	0	1	0	0	0	1	no data
0136	Rossenarra	0	1	0	0	1	2	no data
0137	Knockadrina	0	0	1	1	3	5	no data
0138	Castlemorres Demesne	1	1	0	0	2	4	no data
0139	Twenty Acres	2	1	1	0	3	7	no data
0141	Johnstown Castle	1	1	0	0	2	4	2.88
0145	Ballybrennan House	1	1	0	0	3	5	no data
0147	Ballycross Apple Farm	1	1	1	0	3	6	no data
0148	Ballyfad	1	0	0	0	3	4	no data
0151	Bricketstown House	2	1	0	0	2	5	3.06
0153	Ballyvalogue	0	1	0	1	1	3	2.84
0154	Ballyboggan Lower	2	1	1	0	3	7	no data
0155	Soldier's Hole	2	1	0	1	2	6	1.75
0156	Garryricken (North)	0	0	0	0	1	1	1.96
0157	Ballynoe (no timber data)	0	0	0	0	1	1	1.69
0158	Altamont	1	0	0	0	2	3	3.42
0160	Ballywilliam	0	0	0	0	1	1	2.48
0162	Guernal	0	1	0	0	1	2	1.35
0163	Tombrick Wood	0	1	0	1	1	3	1.25
0166	Wilton North	0	1	0	0	2	3	2.24
0167	Wilton South	0	1	0	2	2	5	1.6
0168	Ballinvally Wood	0	0	0	1	2	3	1.39
0169	Coonogue Wood	0	2	0	0	1	3	1.33
0170	Coolpuck Wood	0	1	1	0	2	4	no data
0172	Ballingarry Wood	2	1	0	1	4	8	no data

Site	Woodland Name	Invasive Shrubs	Grazing	Non-native Canopy	Damaging activities	% species introduced	Score	*Shape No.
0173	Golden Grove	0	1	1	0	2	4	no data
0174	Drumakeenan School	2	1	1	0	2	6	no data
0175	Townparks	0	1	0	0	3	4	2.71
0176	Cushcallow	0	0	0	1	1	2	1.96
0177	Corclogh	0	3	0	0	2	5	1.39
0178	Orchard	0	0	0	1	2	3	no data
0179	Clonogan Wood	0	0	0	0	2	2	1.85
0180	Glandoran Upper/ Carthy's Wood	0	0	0	1	1	2	2.91
0183	Clogrenan Wood	0	1	1	0	2	4	no data
0184	Lisnevagh	1	2	1	3	4	11	no data
0186	Drumgoogle	2	1	1	1	3	8	2.22
0187	Ballymore Demesne	2	1	0	2	2	7	1.52
0189	Wells East	2	1	0	0	3	6	no data
0190	Wells West	2	1	0	0	3	6	no data
0191	Island House	0	0	0	0	3	3	no data
0192	Litterbeg	0	1	0	0	3	4	2.19
0197	Milltown	0	1	1	1	2	5	2.76
0198	Castletown House (Building Wood)	2	1	0	1	4	8	1.88
0199	Kilmacow	0	1	0	0	2	3	4.45
0200	Ballytobin / Ballaghtobin	0	1	0	1	1	3	1.56
0201	Foulkscourt	2	0	0	0	2	4	1.89
0203	Coolroebeg	0	0	0	0	0	0	1.78
0204	Shankill	0	0	0	1	2	3	2.64
0205	Raheendonore	0	1	0	0	1	2	2.33
0206	Ballinrush	0	1	0	0	1	2	1.4
0208	Crane Bridge	1	0	0	0	2	3	1.92
0209	Mackmine Wood	0	1	0	0	1	2	no data
0210	Ballynahillen	0	2	0	0	1	3	1.37
0211	Newtown Lower	2	0	0	0	3	5	no data
0213	Seskinamadra	0	0	0	1	1	2	no data
0219	Ballypierce	0	1	0	0	1	2	no data
0221	Kilmacoliver	0	1	0	0	1	2	no data
0223	Johnswell	0	1	0	0	1	2	2.33
0225	Newrath	1	1	0	1	2	5	2.67
0226	Skehana	0	0	0	1	1	2	2.03
0227	Lisdowney Wood	0	1	1	1	2	5	no data
0228	Crumlin & Tulla	0	2	0	0	1	3	1.76
0229	Castle Bernard Demense	2	0	1	1	3	7	no data
0230	Ballymack	0	0	0	1	1	2	1.18
0234	Monassa	0	1	0	0	1	2	1.12
0236	Flagmount North	0	0	0	0	1	1	1.4
0237	Broughal	0	1	0	0	2	3	2.07
0238	Barnaboy	0	1	0	0	1	2	1.73
0240	Clonmacnoise	0	2	0	0	2	4	1.35
0241	Clonassy Wood	0	1	0	0	1	2	no data
0242	Grantstown Wood	2	0	1	0	3	6	1.97
0245	Dunamase Woods	0	0	0	0	2	2	no data
0246	Rock of Dunamase	0	0	0	0	1	1	no data
0249	Clopook wood	0	0	0	0	1	1	1.99

Site	Woodland Name	Invasive Shrubs	Grazing	Non-native Canopy	Damaging activities	% species introduced	Score	*Shape No.
0250	Clopook Valley	0	0	1	0	1	2	no data
0251	Timahoe eskers	0	0	0	0	3	3	no data
0252	Clonaslee eskers	0	0	0	0	2	2	no data
0253	Kilteale Hill	0	0	0	1	2	3	1.76
0254	Knockbawn	0	0	0	1	1	2	no data
0255	Mortons Grove	2	2	0	0	2	6	no data
0256	Coolnamony	0	0	0	0	1	1	2.88
0257	Capard	0	0	0	0	2	2	1.25
0258	Brittas	0	0	0	0	1	1	1.33
0259	Garryhinch Demesne	0	1	0	0	2	3	no data
0260	Ballyfin Demesne	1	0	0	1	3	5	no data
0262	Rathcoffey	0	0	0	1	1	2	2.11
0263	Vicarstown	0	0	0	1	1	2	2.05
0265	Ballhuppahane	1	0	0	0	1	2	1.73
0266	Cush Upper	0	0	0	1	1	2	2
0268	Cappagh North	0	0	0	1	1	2	2.62
0269	Glenmalyre Demesne	1	0	0	0	3	4	1.54
0270	Ballybeg Mill	0	0	0	0	1	1	no data
0273	Barkmill	0	1	1	0	2	4	1.72
0274	Bughorn	0	0	0	0	1	1	no data
0275	Ballina	0	1	0	0	1	2	no data
0276	Maidenhead	0	0	0	0	1	1	2.24
0277	Ashfield	0	0	0	0	2	2	2.13
0278	Derrykearn	0	0	0	0	2	2	1.69
0280	Kilcruise	0	1	0	0	2	3	no data
0281	Kilkoke	0	1	0	1	2	4	1.65
0282	Castledurrow Demesne	0	1	0	0	1	2	no data
0283	Dunmore Demesne	0	1	1	0	3	5	no data
0284	Course Wood	0	1	0	1	2	4	1.96
0286	Knocknatrina Wood	0	1	1	0	2	4	no data
0287	Knockbeg College	1	0	0	0	3	4	1.83
0289	Crush Wood	0	0	0	0	2	2	1.55
0290	Warren Hill	1	1	1	0	3	6	3.05
0294	Scotchrath House	1	1	1	0	2	5	1.24
0296	Corbally	0	0	0	0	1	1	no data
0297	Killeany	0	1	0	0	2	3	1.41
0300	Ballaghmore Upper	0	2	0	0	1	3	2.02
0302	Garryricken Nature Reserve South	1	1	0	0	2	4	no data
0303	Harperstown	0	0	0	0	2	2	1.26
0304	Garrylough Lower	0	1	0	0	2	3	2.91
0305	Pollfur Bridge Wood	0	1	0	0	3	4	2.1
0307	Donore House Wood	0	2	0	1	1	4	1.12
0308	Barleagh Wood	0	1	1	0	4	6	1.61
0309	Emmel west	0	1	0	0	1	2	1.28
0310	Coolaphuca	0	0	0	1	3	4	no data
0311	Barnadown Wood	0	0	0	0	1	1	no data
0313	Kilballyskea Bog	0	1	0	0	0	1	1.57
0316	Ballynattin	0	1	0	0	0	1	2.34
0320	Big Wood	0	1	0	1	3	5	no data

Site	Woodland Name	Invasive Shrubs	Grazing	Non-native Canopy	Damaging activities	% species introduced	Score	*Shape No.
0321	Brownstown	0	1	0	1	1	3	no data
0322	North Brow	0	2	0	0	2	4	no data
0324	Cloghscregg	1	1	0	0	2	4	no data
0326	Brownstown East	1	1	0	0	1	3	no data
0327	Carrhill Wood	0	1	1	0	4	6	no data
0328	Lisheen	0	0	0	0	2	2	no data
0329	Clondallow	0	0	0	0	0	0	**no data**
	Maximum Score	**2**	**3**	**1**	**3**	**4**	**13**	

Appendix 12 is taken directly from the Project Database.

Please contact NPWS for further information.