

IRELAND'S NATIVE WOODLANDS IN A EUROPEAN CONTEXT

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Abstract

Ireland's woodlands are part of the temperate mesophytic deciduous broadleaved forests that extend across much of Europe between northern Portugal and Scotland in the west and central Russia and northern Ukraine in the east. Based on the recently published Map of the Natural Vegetation of Europe, 4 forest formations with 9 forest units are recognised within Ireland, including acidophilous oak forests, mixed oak-ash-hazel forests and mixed alder-oak-ash forests with willows. These woodlands are examined in terms of their species composition and distribution and compared with similar woodlands in Britain and the continental mainland. It is shown that as a result of the mild, moist climate and the different species composition, especially the absence of numerous species common in Britain and on the continental mainland, Irish woodlands are distinctive and, in some cases, unique at a European and even a global level.

Introduction

Ireland lies within the zone of temperate mesophytic deciduous broadleaved forests, which in the European lowlands extend from the Atlantic coast between northwest Iberia and southern Norway as far east as the Ural Mountains (Bohn *et al.*, 2002). This area of distribution narrows progressively eastwards, eventually dwindling to a narrow band between the boreal (coniferous) forests to the north and steppe vegetation to the south (Fig 1). These forests are typically dominated by beech (*Fagus sylvatica**), hornbeam (*Carpinus betulus*) and species of oak (*Quercus robur* and *Q. petraea*). Other important and widespread constituents include sycamore (*Acer pseudoplatanus*), elm (*Ulmus* species), ash (*Fraxinus excelsior*), birch (*Betula* species) and lime (*Tilia* species). Conifers, such as Scots pine (*Pinus sylvestris*), European spruce (*Picea abies*), silver fir (*Abies alba*) and yew (*Taxus baccata*), play only a limited role. There are considerable variations within these forests associated with climatic and biogeographical differences; Ireland is situated on the extreme western or oceanic edge of their distribution. This paper examines the principal characteristics and the distribution of native Irish woodlands and highlights the differences from, and similarities with, those in Britain and the continent.

General character of Irish woodlands

Continental botanists are often struck by the distinctive character of Irish woodlands**. This is the result of a combination of several factors. Firstly, Ireland has a much smaller species complement compared to both Britain and the mainland of Europe (see for example Webb 1983), a consequence of its island status and recent geological history. Of particular note is the absence or extreme scarcity as native of numerous species that are important constituents of forests in Britain and, to a greater extent, the European mainland. These include many of the trees listed above but in particular beech, the principal forest-forming species over much of temperate Europe (Table 1).

* Nomenclature follows Stace (1997)

** Throughout the text the term 'forest' refers to the formation at a European level. The term 'woodlands' refers to the small remnants of forests remaining in Ireland.

Secondly, as a result of the mild, moist climate, Irish woodlands are characterised by an abundance of so-called 'oceanic' or Atlantic species. These include flowering plants, e.g. bluebell (*Hyacinthoides non-scripta*), ferns, e.g. hay-scented buckler fern (*Dryopteris aemula*) and a large number of mosses and liverworts. In addition there is a suite of sub-Atlantic species which extend eastwards in Europe in cool, moist, montane climates, e.g. honeysuckle (*Lonicera periclymenum*), foxglove (*Digitalis purpurea*) (Roisin, 1969) (Fig 2). Thirdly, a combination of the reduced species diversity and the climate results in some species being very much more abundant and having a much wider ecological amplitude in Ireland than elsewhere in Europe (Webb, 1982). These include common and familiar Irish species such as ash and holly (Table 2). Ash, for example, is widespread across Europe but thrives best on deep, moist soils; as an important component of the canopy it becomes mostly confined to valleys and deep ravines as the climate increases in continentality. In Ireland, however, it is one of the commonest trees (Higgins *et al.*, 2004), occupying the habitat left vacant by the absence of beech (Dierschke, 1982). In contrast, in sub-montane areas of central Europe where the climate is closest to Ireland, beech is the dominant tree, often accompanied by oak, ash, sycamore, elm and hornbeam. It declines in importance or is absent only where the soil is too dry, too wet or too nutrient poor.

Finally, Irish woodlands have a semi-evergreen appearance. This can be attributed to the abundance of evergreen species, such as holly (*Ilex aquifolium*), ivy (*Hedera helix*), both as a liane and in the field-layer, and bramble (*Rubus fruticosus* agg.), but even deciduous trees and shrubs may retain their leaves in sheltered areas until early winter. Grasses, certain herbs, e.g. woodrush (*Luzula sylvatica*), primrose (*Primula vulgaris*), numerous species of fern, and the abundance and luxuriance of mosses, liverworts and lichens, both as epiphytes and on the ground also contribute to the evergreen character. These last are of particular significance in a European context, especially in the west of the country (Kelly, this volume).

Irish woodland types and their European significance

The potential natural distribution and character of European forest vegetation is illustrated and described in the Map of the Natural Vegetation of Europe (Bohn *et al.*, 2002). In this map 9 forest units within 4 Formations are recognized within Ireland. These include montane birch forests (of which no extant examples occur), acidophilous oak forests, mixed oak-ash forests and mixed alder-ash-oak forests (Bohn *et al op. cit.*; Cross, 1998). There are, in addition, numerous types of wetland forests, including bog woodlands and alder and birch carr on cutaway peats, most stands of which are very small (Kelly & Iremonger, 1997; Cross & Kelly, 2003) (See Table 1 in Kelly, this vol).

It is important here to emphasize that the forest units referred to above represent the **potential** vegetation, i.e. the hypothetical vegetation that would develop on a particular substrate under the prevailing climatic conditions in the absence of human activity. They should not be confused with the actual vegetation occurring in remnants of forest that exist today, even though they may closely resemble the potential vegetation. Further, potential forest vegetation as indicated by Figs 4 to 8 covers a very much greater area than existing stands.

In this section the principal potential forest units occurring in Ireland are examined in relation to their character and distribution in Europe. For ease of reference the classification unit of Fossitt (2000) is given in brackets. More detailed descriptions of the existing flora of each unit within Ireland, along with a conspectus of Irish native woodland communities according to different classification systems, can be found in Kelly (this vol – see in particular Table 1).

1. Acidophilous oak forests (WN1)

Acidophilous oak forests occur as relatively fragmented stands across central Europe from the Atlantic coast (between Portugal and Scotland) to western Russia and northern Ukraine on free-draining or intermittently moist, poor, acidic, often sandy soils (Fig 3). The most extensive stands lie outside the area of the natural occurrence of beech forests, viz, the West Cantabrian Mountains and Galicia, southwest France, British Isles, Poland, Belarus and Ukraine. Small stands occur locally within beech forests on warm, dry slopes unsuitable for beech regeneration.

Unifying features across Europe are the dominance of oaks (*Quercus petraea* and *Q. robur*) with birches (*Betula pubescens*, *B. pendula*) in the canopy and calcifuges in the shrub and herb layers. The shrub layer typically contains rowan (*Sorbus aucuparia*), alder buckthorn (*Frangula alnus*) (more or less absent within these woodlands in the British Isles), hazel (*Corylus avellana*) and, in more Atlantic regions, holly. A dwarf shrub layer with ericaceous species, e.g. bilberry (*Vaccinium myrtillus*), ling heather (*Calluna vulgaris*), or dwarf broom species (*Genista* species) is also characteristic. Species such as cow-wheat (*Melampyrum pratense*), bracken (*Pteridium aquilinum*) and grasses such as *Agrostis capillaris* and *Deschampsia flexuosa* characterize the herbaceous layer. Bulbous species are rare. The northern forests are much poorer in species than those in the south while Atlantic species are absent from eastern Europe where boreal species, e.g. Scots pine (*Pinus sylvestris*) and cowberry (*Vaccinium vitis-idaea*), play a bigger role. In western Europe, ferns and other moisture-loving species are prominent. Many of these are confined to mountainous areas further east. Lianes are also a striking feature.

In Ireland, acidophilous oak woodlands are largely confined to upland areas of poor, acidic rocks. *Quercus petraea* is the dominant species in the tree layer, typically with *Betula pubescens*, and the shrub layer is dominated by holly. Two units are recognised (Figs 4a, 4b). In drier parts of the country the woodlands are relatively species-poor and characterised by the absence of many of the species occurring further west. Typically, mosses and liverworts are relatively sparse. This drier variant has close similarities with communities in Britain (See note 3). Similar communities on the continent are distinguished by the presence of alder buckthorn, Scots pine and European spruce.

In the hyperoceanic west the flora is richer with a greater abundance of ferns. Of particular note is the luxuriant bryophyte and lichen flora, constituting c.66% of the total flora (Kelly, 1981). These include southern Atlantic species of bryophytes with a Macronesian-tropical world distribution, here reaching their most northerly known localities in the world (Birks, 1996). This hyperoceanic variant is confined to Ireland and Britain (Rodwell, 1991), although an analogue is found in the warmer, hyperoceanic acidophilous oak woodlands of Iberia, albeit with a greater number of 'thermophilous' elements, of which only a few, e.g. *Arbutus unedo*, reach Ireland. The British Isles may therefore be considered as the European headquarters of these woodlands.

2. Oak-ash forests (WN2)

European oak-ash forests centre on the British Isles with a southern outlier in the foothills and interior of the Pyrenees and Cantabrian Mountains in southwest France and northern Spain (Fig 5). There are isolated occurrences in northwest France and on the west coast of southern Norway. They occur on base-rich, often calcareous soils, in regions with year-round precipitation, mild winters and cool to warm summers, outside the natural area of oak-hornbeam forests and beech forests. They are very much richer in species than the acidophilous oak forests. Oak (*Q. petraea*, *Q. robur*) and ash are the dominant trees, with occasional lime and locally sycamore, beech and yew. There is a species-rich shrub layer, typically dominated by hazel with hawthorn and holly, although the last is very much less abundant than in the acidophilous oak forests. The herb layer is characterised by an abundance of spring-flowering species, of which bluebell is a prominent feature.

A characteristic and striking feature of the Irish oak-ash woodlands is the absence of a number of species that play an important role elsewhere. The Norwegian unit, for example, contains boreal elements of the flora, e.g. *Ribes spicatum*, *Alnus incana*. The British woodlands contain field maple (*Acer campestre*), hornbeam and lime (*Tilia cordata*) in the tree layer, dog's mercury (*Mercurialis perennis*) in the herb layer and the lianes clematis (*Clematis vitalba*) and black bryony (*Tamus communis*) (Rodwell 1991). Mediterranean elements, e.g. butcher's broom (*Ruscus aculeatus*) and spurge-laurel (*Daphne laureola*), are characteristic in southwest France and northern Spain.

In Ireland, ash plays an important and often dominant role in the canopy, although this is partly anthropogenic. The shrub and herb layers are characteristic for the type with bluebell, primrose and the ferns *Polystichum setiferum* and *Phyllitis scolopendrium* finding optimal conditions. Occasional Mediterranean-Atlantic species, e.g. madder (*Rubia peregrina*), also occur. At least 3 variants can be recognised:

Q. petraea woodlands with bluebell on base-rich acidic soils (Intermediate between Fossitt Units WN1 and WN2). This is a transitional type to the acidophilous oak woodlands. It is widespread in the lowlands across much of the southern and northeastern parts of the island. Very similar woods occur in Britain and the extreme northwest of France but *Quercus robur*, rather than *Q. petraea*, is the dominant species. They do not occur outside these areas (Fig 6).

Oak (*Quercus robur*)-ash-hazel woodlands on calcareous soil with wood speedwell (*Veronica montana*) and a species-rich field layer (Fossitt Unit WN2). They are widespread across the central lowlands. The absence of the numerous species occurring in Britain distinguishes the Irish woodlands, which are very distinctive and may even be considered an endemic community (Fig 7).

A variant of b) above occurs on shallow, often rocky soils. The canopy is typically low and extensive areas are dominated by hazel scrub, such as is found in the Burren. Similar vegetation occurs in parts of northwest England but again the presence of additional species differentiates them from the Irish communities. Yew is locally frequent, in places forming small, monodominant stands (WN3 of Fossitt). According to Thomas and Polwart (2003) yew only appears to form single-species stands in the oceanic climates of Ireland, Britain, the Crimea and Caucasus and locally also in Sardinia and Corsica.

3. Alder-ash-oak forests with willows (WN4)

Forests of alder, ash and oak with willows, poplars and elms occur on river flood plains (alluvial forests) and other wet lowlands, principally on mineral soil. Alluvial forests occur throughout Europe but they display marked floristic variations depending on the temperature, precipitation and flooding regimes. The plants and communities are adapted to the mechanical stress of flowing water and periodic flooding at different seasons. The soil may be well drained, and dryout between flooding episodes. Forests with a similar species composition also occur on heavy, poorly drained gleyed clays not subject to flooding but which dry out superficially in the summer.

In Ireland (Fig 8) these woodlands are characterised by a canopy of alder, ash and oak (*Q. robur*) with a shrub layer of hazel and willow (mostly *Salix cinerea* ssp. *oleifolia*) and a species-rich herb layer. The vegetation on alluvial sites is very similar to that on heavy, wet clay soils such as occur on drumlins and they are usually classified as the same vegetation type, although there are differences in species composition and physical attributes.

The river channels in alluvial forests are typically fringed by a belt of so-called gallery forests (Fossitt WN5), dominated by willows (e.g. *Salix fragilis*, *S. alba*) *S. cinerea* ssp. *oleifolia*, *S. viminalis*). The nutrient input from flooding encourages the growth of tall herbaceous perennials such as nettle (*Urtica dioica*) and reed canary-grass (*Phalaris arundinacea*). This vegetation type occurs in Britain, although the extent of both alluvial and non-alluvial forest is very small and they differ from Ireland in that they contain a suite of other species, such as lime, field maple and dog's mercury. On the continent there is a much richer flora with, among other species, hornbeam and the elms *Ulmus laevis* and *U. minor*. The Irish woodlands are, therefore, distinctive and possibly unique.

4. Other woodlands

Numerous other woodland types, mostly small in extent and occurring on poorly drained soils, are found throughout the island. Of particular note are the alder woodlands in areas subject to lake flooding, ash-alder woodlands in seepage areas and birch woodland on former raised bogs. These last are complex and varied stands, strongly influenced by peat depth and hydrological conditions. While downy birch is typically the commonest tree species, alder may occur in sites influenced by ground water and various shrub willows characterise the shrub layer (van der Sleesen & Poole, 2002). Their distribution reflects that of the former raised bogs and they are therefore largely restricted to Ireland, parts of England, the Netherlands and northwest Germany. Small stands of birch woodland occur on a few intact raised bogs; these are extremely rare, even in Ireland and with the destruction of similar Atlantic raised bogs elsewhere in Europe they may be considered unique (Cross, 1987).

Discussion

While attention tends to focus on the biodiversity of tropical forests, it is often overlooked that Europe has a great diversity of forests rich in species. Some species, e.g. *Quercus petraea* and its associated plant communities, are restricted to Europe (Anon., 2000) and consequently they may be considered to be of global significance. Public perception, however, and even that of conservationists and foresters, is that Irish woodlands are relatively unimportant, with a few notable exceptions, e.g. the Killarney Woods. Part of this prejudice may be attributed to the small size of individual stands, the overall scarcity of the resource and the poor quality of the timber.

Even at a European level their significance is not fully recognised. Several types are listed for protection under the EU Habitats Directive, including 'Old oak woods with *Ilex* and *Blechnum* in the British Isles' (acidophilous oak woodland), 'residual alluvial forests' (alder-ash-oak forests with willows), '*Taxus baccata* woods' and 'Bog woodland'. Strangely, and regrettably, however, the oak-ash woodlands and the alder-ash-oak woodlands, other than the alluvial stands, are not included, even though these are some of the rarest and most distinctive woodland types in western Europe. They cannot therefore be designated for protection in their own right as Special Areas for Conservation (SACs), although some are included within other categories, e.g. ash-hazel woodland on limestone pavement, and several are protected at national level within nature reserves or national parks or are listed as potential Natural Heritage Areas.

The importance of protecting examples of all our woodland types cannot be overstated. Ireland, along with Britain, has the greatest concentration of Atlantic acidophilous oak woods in Europe and unique stands of oak-ash forests and alder-ash-oak forests with willows. There is also a variety of wetland woods, the exact importance of which still has to be determined. On-going national surveys may identify additional woodland types and help to elucidate the significance of those already recorded.

Table 1. Species common or important in woods in Britain or on the European mainland that are absent or very rare as native within Irish woodlands.

Trees	Shrubs	Herbs
Beech (<i>Fagus sylvatica</i>) Elms (<i>Ulmus minor</i> , <i>U. laevis</i> , <i>U. procera</i>) Field maple (<i>Acer campestre</i>) Hornbeam (<i>Carpinus betula</i>) Lime (<i>Tilia</i> species) Sycamore (<i>Acer pseudoplatanus</i>)	Cornelian cherry (<i>Cornus mas</i>) Medlar (<i>Mespilus germanica</i>) Alder buckthorn (<i>Frangula alnus</i>) Wayfaring tree (<i>Viburnum lantana</i>)	Wood small-reed (<i>Calamagrostis epigejos</i>) Touch-me-not-balsam (<i>Impatiens noli-tangere</i>) Dog's mercury (<i>Mercurialis perennis</i>) Herb Paris (<i>Paris quadrifolia</i>)

Table 2. Atlantic species occurring in woods which are more abundant in Ireland and western Britain than on the European mainland.

Trees and lianes	Dwarf shrubs, herbs and ferns
Ash (<i>Fraxinus excelsior</i>) Holly (<i>Ilex aquifolium</i>) Grey willow (<i>Salix cinerea</i> ssp. <i>oleifolia</i>) Ivy (<i>Hedera helix</i>)	Ling heather (<i>Calluna vulgaris</i>) Bluebell (<i>Hyacinthoides non-scripta</i>) Great wood-rush (<i>Luzula sylvatica</i>) Hay scented buckler fern (<i>Dryopteris aemula</i>) Water dropwort (<i>Oenanthe crocata</i>) Filmy ferns (<i>Hymenophyllum</i> species) Hard fern (<i>Blechnum spicant</i>) Royal fern (<i>Osmunda regalis</i>)

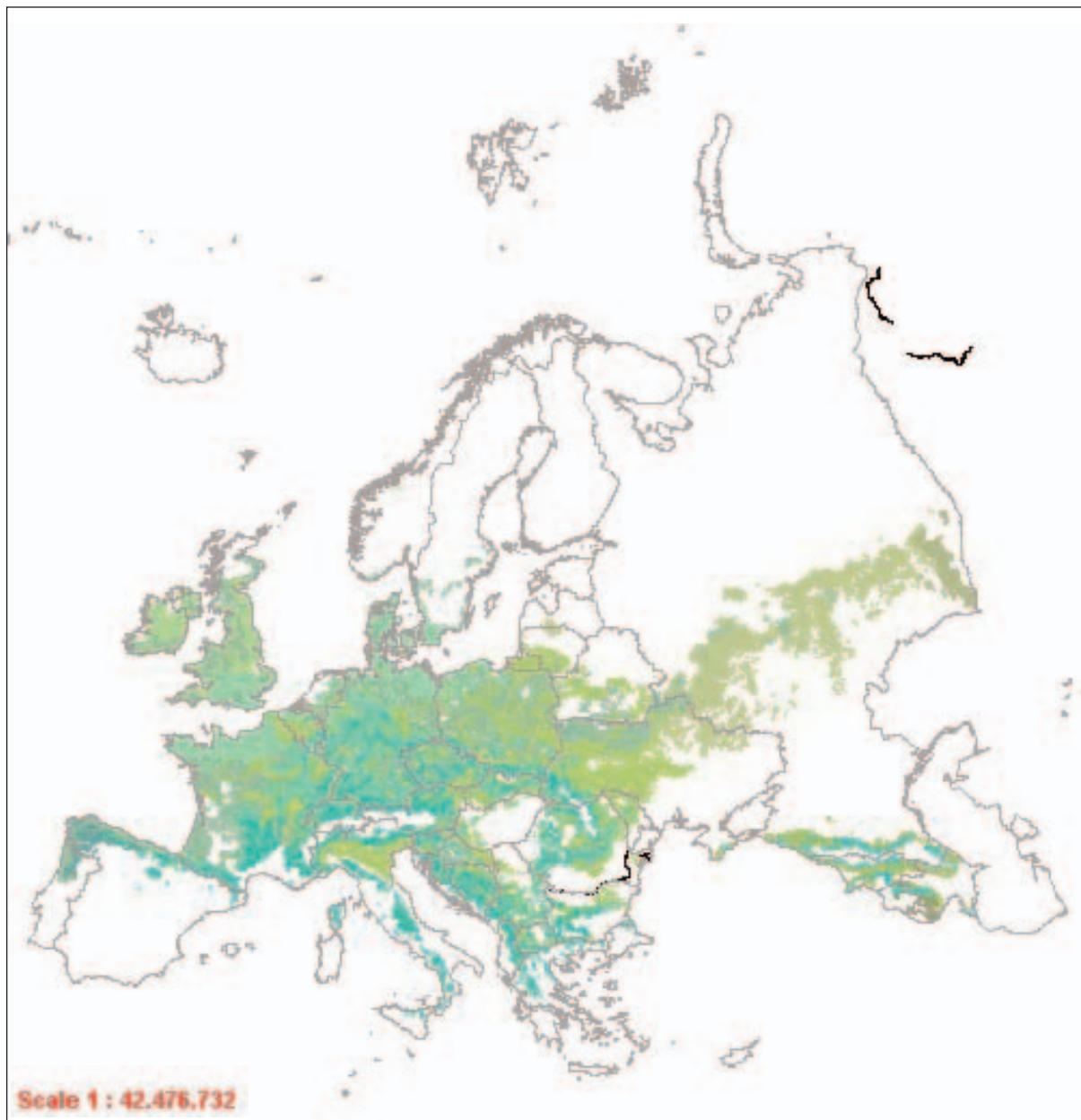


Figure 1. Potential distribution of temperate deciduous forest in Europe.

2a



2b



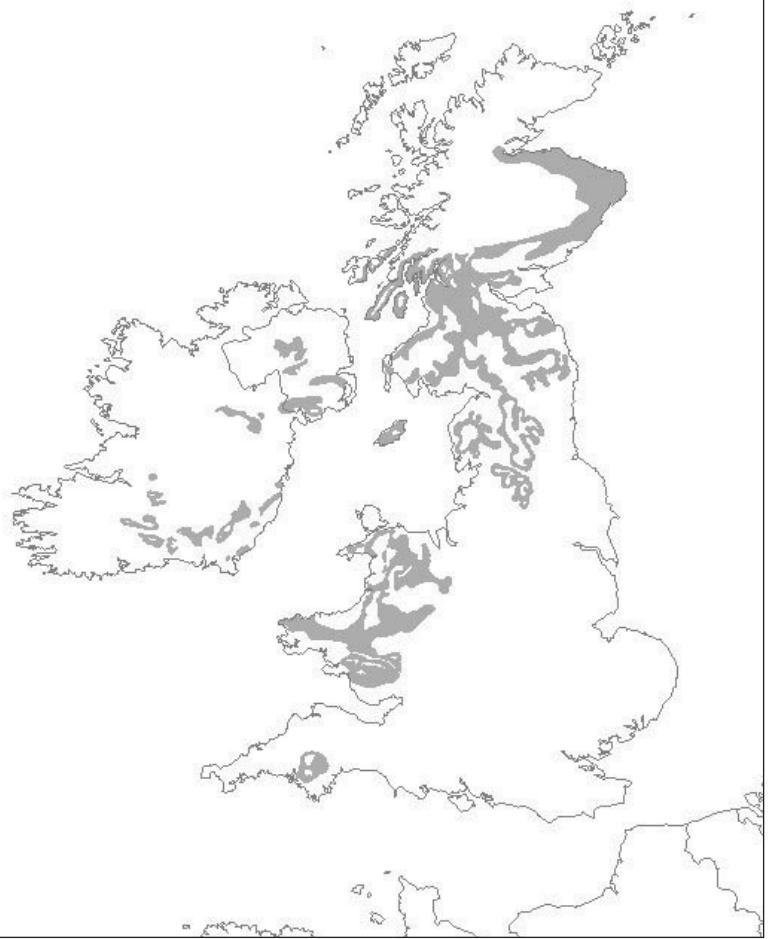
Figure 2. The distribution of a) bluebell (*Hyacinthoides non-scripta*) and b) hay-scented buckler fern (*Dryopteris aemula*) in Europe.



Figure 3. Potential distribution of acidophilous oak woodland in Europe.

4a

Scale 1 : 6.742.288



4b

Scale 1 : 5.390.194



Figure 4b. Potential distribution of acidophilous oak woodland in Ireland and Britain; a) drier variant b) hyperoceanic variant.



Figure 5. Potential distribution of oak-ash forests in Europe.



Figure 6. Potential distribution of oak woodlands with bluebell.

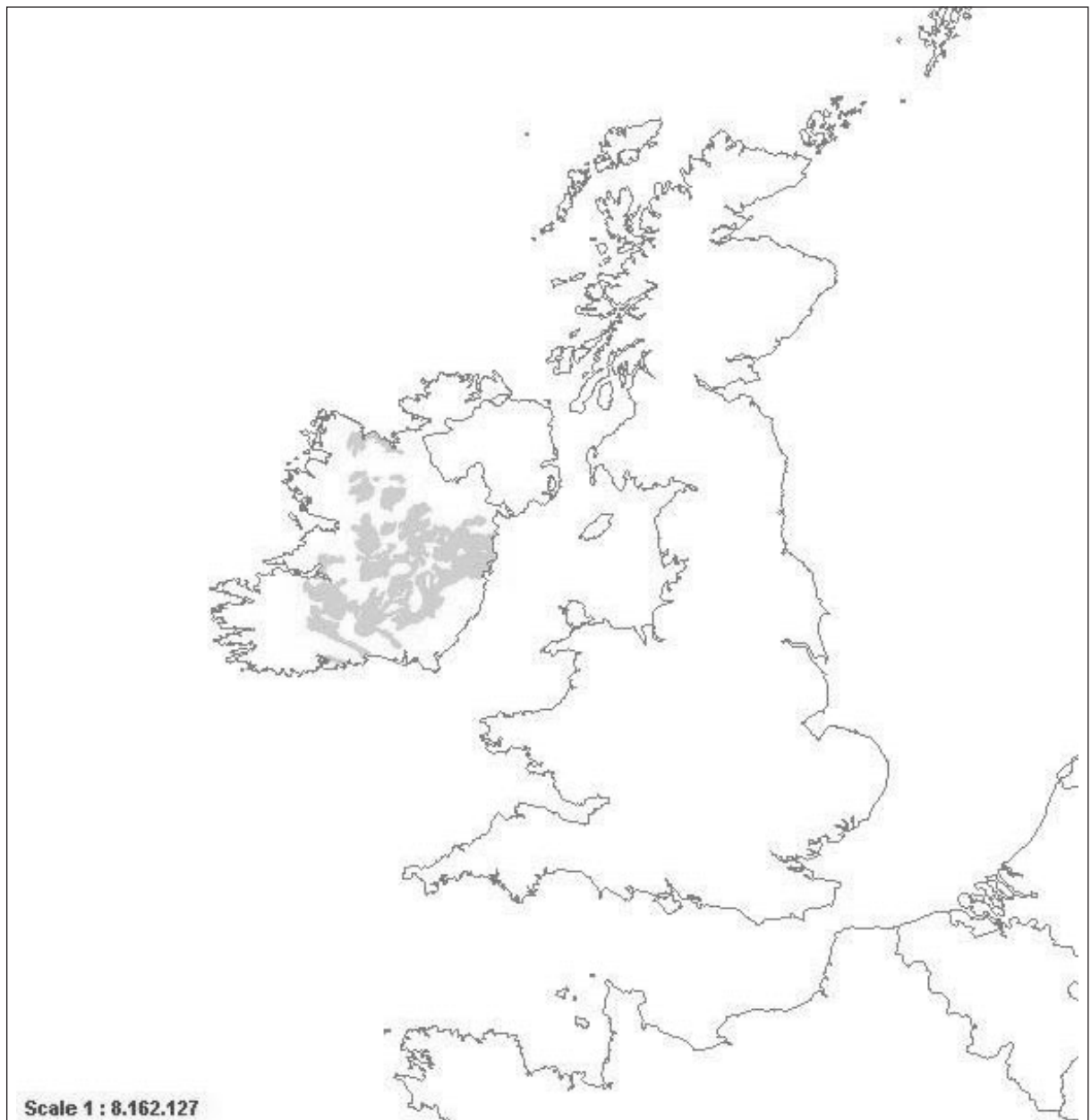


Figure 7. Potential distribution of oak-ash-hazel woodlands in Ireland.

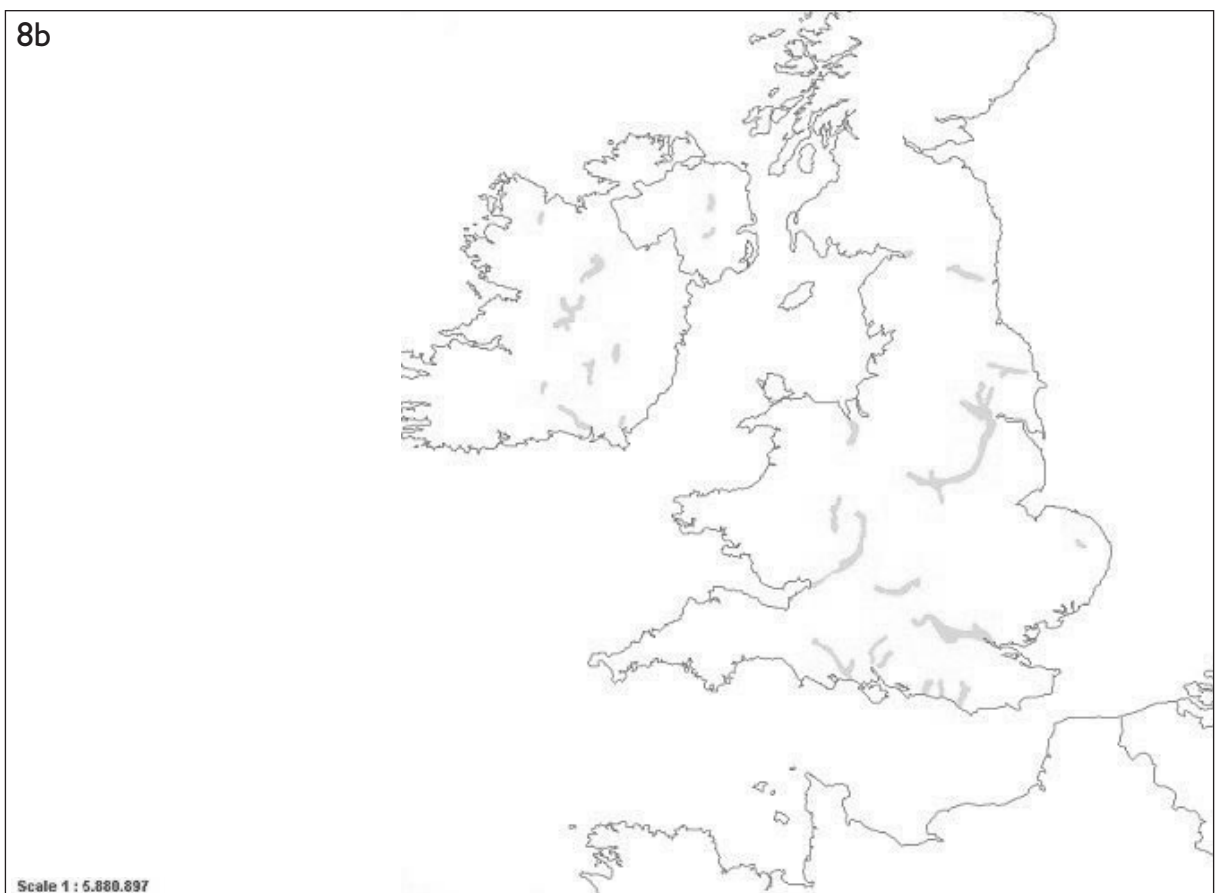
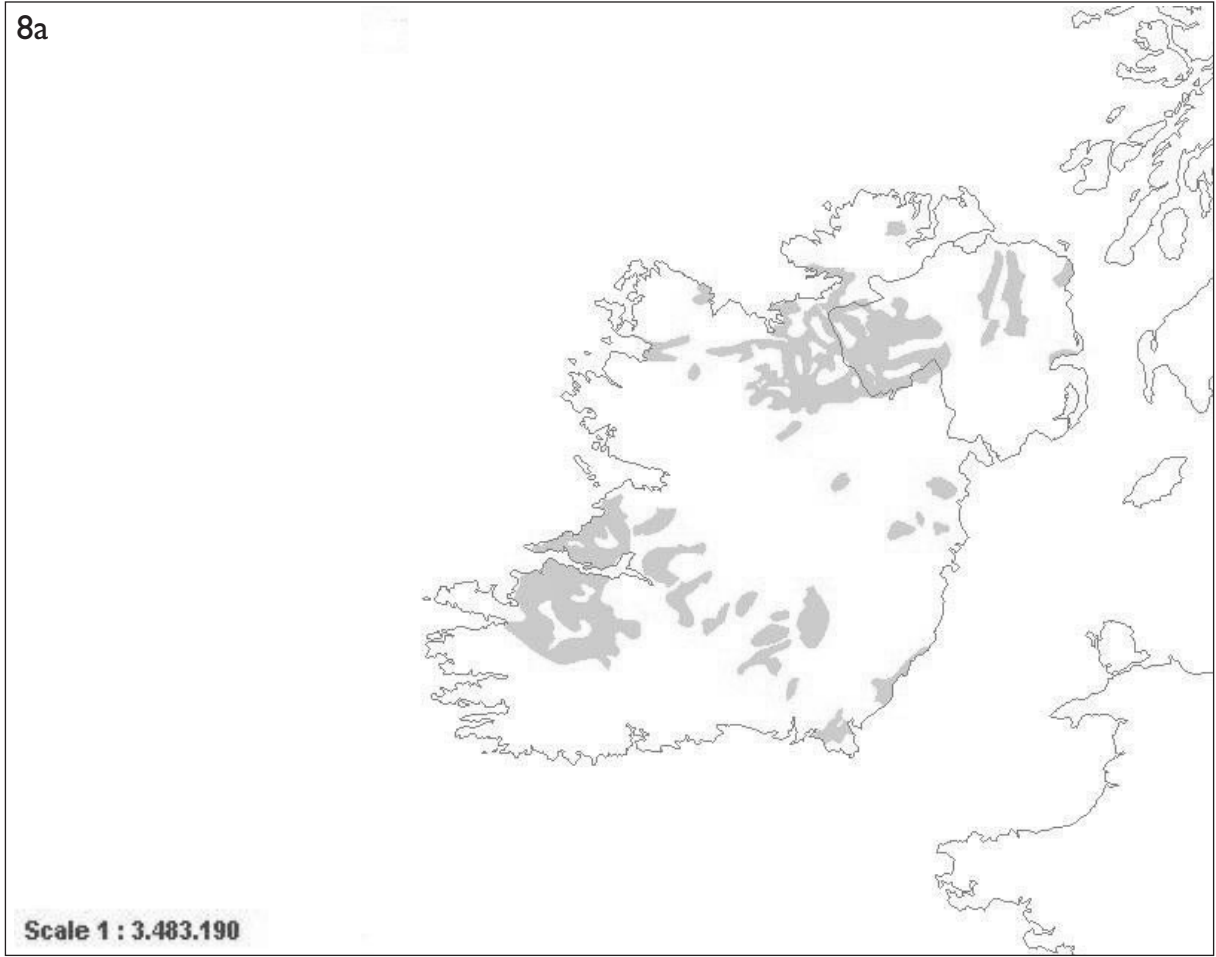


Figure 8. Potential distribution of alder-ash-oak woodland on a) non-alluvial soils b) alluvial soils.

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