WOODLAND HISTORY OF THE COILLTE ESTATE – SURVEY & POLICY DEVELOPMENT

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Introduction

Sites with a continuous history of woodland cover are considered to be of high nature conservation value because they are more likely to support woodland specialist species, i.e. species of plant and animal (primarily invertebrates e.g. insects, spiders, slugs and snails) that require woodland habitats and that have difficulty adapting to open habitats or non-woodland conditions. History of woodland cover – and particularly the length of time a site has supported continuous woodland cover – is widely regarded as a key factor influencing woodland biodiversity (Peterken, 1993). Woodland history and its link to biodiversity has received much attention in research across Europe, while ecological research has produced lists of woodland specialist species for some groups of organisms, e.g. vascular plants (Hermy *et al.*,1999; Honnay *et al,.* 1999). Detailed inventories have been prepared in Britain, from documentary records and maps, of "ancient" woodlands which are defined as sites that have been continuously wooded since 1600 A.D. (England and Wales) or since 1750 A.D. (Scotland) (Peterken, 1993; UKWAS, 2000). This work is now being extended to woodlands in Northern Ireland (S. Thomas, this volume).

In Ireland, the exploration of woodland history in the landscape and its links to woodland biodiversity has been less systematic and there are large gaps in our knowledge. For example, there is no national inventory of ancient woodlands. This may be due to the fact that old Irish maps and documentary records can be difficult to find and access. What evidence does exist indicates that the history of woodland in the Irish landscape is complex and quite different to that found in Britain (Rackham, 1995). Furthermore, our knowledge of many important groups of flora and fauna (e.g. fungi, lichens and invertebrates) in Ireland is incomplete, and so it is difficult to make definitive statements about the correlation between the biodiversity of woodland sites and their woodland history.

Despite these uncertainties, the bulk of available evidence points to the fact that woodlands with a long history support a more diverse complement of woodland-associated species than do plantation forests of recent origin, and this in turn implies that older woodlands are more functional as woodland ecosystems. The importance of old woodlands to biodiversity is recognised in international forest management standards (e.g. IFCG 1999; UKWAS 2000), and appropriate management of these sites is a prominent component of guidelines on Sustainable Forest Management (SFM).

As part of its programme to implement SFM across its estate, Coillte Teoranta, the Irish Forestry Board, is developing policy on the management of sites with a history of woodland cover. As a first step, a woodland history survey was undertaken for the Coillte estate, with the objective of identifying sites that have a history of woodland cover prior to having been planted in the 20th Century. In this paper, the results of this survey are presented, with a discussion on the development of policy on how these sites should be managed. Coillte owns and manages about 60% of the national forest area of the Republic of Ireland (Coillte, 2004), and so its woodland history survey contributes significantly to our understanding of woodland change in the wider Irish landscape within the past 200 years.

Survey Method

The woodland history survey consisted of a desk study in which the historical Ordnance Survey maps were examined and compared with the current Coillte forest inventory (Garrett, 2001). The Ordnance Survey maps were selected as a reference point for this survey because: they provide uniform coverage over the entire country; they were compiled at a large scale (i.e. 6":1 mile); and they were produced to a high level of detail and accuracy, making them readily interpreted. Two editions of the Ordnance Survey maps were examined for this study: the first edition (compiled during the period 1833 to 1844 A.D.); and the third edition (compiled during the period 1900 to 1915 A.D.).

For all Coillte properties, the *extent* of woodland cover shown in the 1st and 3rd editions of the Ordnance Survey maps was traced and digitised into Coillte's GIS (ARCView) database.

The Ordnance Survey maps indicate the type of woodland cover that was present at the time, illustrated by means of quite detailed map symbols which differentiate, for example, between broadleaf and conifer trees. The *woodland type* shown as present in the 1st and 3rd editions of the O.S. maps was recorded and input into the GIS, using a simple recording system specially adapted by Garrett (2001) from the broad landcover categories used in the Coillte inventory and referred to as "LandUse Types" (Table 1).

Finally, each site that was found to have a history of woodland cover was categorised as a particular *site type* according to its woodland history using the system presented in Table 2. There were four *site types* created for sites with any history of woodland cover (Table 2). A fifth category – "Recent Plantations" – denotes sites that have no recorded history of woodland cover, i.e. were not wooded since the 1830s and were planted on open ground during the 20th century (after 1915). The woodland history data, once collated, were compared with 2004 Coillte inventory data to provide an overview of the current forest composition of these sites.

Results

NOTE: All figures presented are rounded up to the nearest 100 hectares.

The Coillte estate amounts to a total of 444,700 hectares, of which 386,400 hectares currently support forest/woodland cover of various types (Coillte, 2004). In all, 50,100 hectares were found to have some history of woodland cover between the 1830s and the 1910s, of which just over 27,000 hectares constitutes old woodland sites – i.e. sites that have apparently been continuously wooded since the 1830s (Table 3). This latter area amounts to 7% of the forested land owned by Coillte. The majority of forest on Coillte land (i.e. 87%, Table 3) has no recorded history of woodland cover and consists of 20th century plantations (i.e. post-1915).

Comparison of the woodland/forest area present in the 1830s, the 1910s and the present-day (as denoted by Coillte inventory), shows that the general trend since the 1830s has been a significant increase in woodland cover (Figure 1). Between the 1830s and the 1910s, the area of woodland present on land constituting the current Coillte estate had increased by 12,000 hectares, or 36%. This was the cumulative result of clearance of 4,200 hectares of woodland from some areas and of establishment or planting of about 16,400 hectares of new woodland in other areas (Figure 2). Most of what was cleared had been classified as 'brushwood' on the Ordnance Survey 1830s maps (Table 1), but reasonable areas of 1830s mixed high forest and broadleaf high forest, as well as small areas of conifer high forest, had also disappeared by the 1910s. Of the new plantations established between the 1830s and the 1910s, over half (8,500 hectares or 52%) were predominantly of conifers (Figure 2). A substantial area of mixed conifer/broadleaf stands was also established during that time (6,100 hectares or 37%), while very little of what was established consisted of pure broadleaves (900 hectares or 5%).

After the 1910s, the State afforestation programme resulted in an increase of over 340,000 hectares in the area of land supporting forest or woodland – a massive 740% increase in the forest area extant during the 1910s (Figure 1). While the area of broadleaf high forest (BHF) on Coillte land has remained more or less constant, at around 10,000 hectares, since the 1830s, the main trend post-1910s is the large-scale establishment of conifer high forest on open ground.

Focusing on the old woodland sites, i.e. those sites that have been wooded apparently continuously since the 1830s, the main trends observed from analysis of the maps are: a steady decrease in the area of broadleaf high forest as a result either of inter-planting with conifers to form mixed high forest by 1910s or of replacement with conifer high forest by 2004; and a significant decrease in the area of mixed high forest between the 1930s and 2004 as a result of replacement with conifer high forest.

Currently, over half (57%) of the total area of Coillte's old woodland sites support conifer high forest, with broadleaf high forest and mixed high forest accounting for 16% and 18% respectively.

Figure 3 shows the relative abundance of canopy species on those Coillte old woodland sites which currently support "high forest" (i.e. excluding scrub or clearfelled areas). These data were derived from an analysis of "Species 1", or the dominant canopy species, recorded for each forest subcompartment in the Coillte inventory. It should be noted that species present as secondary canopy species in a stand, are not represented here – this is especially important for mixed high forest.

Of the area of old woodland sites that currently support high forest, conifers are the dominant canopy species, accounting for over 77%. The primary function of the Coillte inventory is to record crop species, hence broadleaves, particularly non-commercial species that occur naturally on many of these sites, are under-recorded.

Spruces (both Sitka spruce *Picea sitchensis* (Bong.) Carr. and Norway spruce *Picea abies* (L.) Karst.) are the dominant species over 45% of the area of high forest on old woodland sites. Firs (predominantly Douglas fir *Pseudotsuga menziesii* (Mirb.) Franco), account for 18%; pines (mostly Scots pine *Pinus sylvestris* L.) account for 8%, while larches (mostly Japanese larch, *Larix kaempferi* (Lamb.) Carr.) and other conifers account for 6%. Native broadleaf species are dominant over 13% of the area of high forest on old woodland sites. Dominant species here are oak (both sessile oak, *Quercus petraea* (Mattuschka) Lieblein, and pedunculate oak *Quercus robur* L.), ash (*Fraxinus excelsior* L.) and birch (*Betula pubescens* Ehrh.). Substantial areas (8%) are dominated by beech (*Fagus sylvatica* L.), while other non-native broadleaved species (e.g. sycamore *Acer pseudoplatanus* L.) account for the remaining 2%.

Most of the conifer stands present on old woodland sites are <20 years old, having been planted in the period 1991 to 2000. The age structure varies among conifer species: most of the young stands (<20 years old) are of Sitka spruce, while the Norway spruce stands tend to be older (>40 years). This is likely to be indicative of the fact that many old woodland sites, which were planted with Sitka spruce in the 1950s, were clearfelled during the 1990s, after a 40-year rotation, and replanted with a second crop of the same species.

Discussion

The results of this survey indicate that old woodland sites have a history of plantation and management that goes back at least to the 1830s A.D., for example many sites have had conifers interplanted with broadleaves since at least that time. The old woodland sites themselves are predominantly low-lying, sheltered sites, with soils (mostly brown earths) that are very well suited to growing trees for timber production. The average yield class for conifer species on old woodland sites today is higher than average for the Coillte estate – 19.7 for Sitka spruce and 16.3 for both Norway spruce and Douglas fir – indicating that these sites are, in general, productive. This probably accounts for the very survival of woodland at these sites – people retained or planted woodland on these sites because they were good for growing timber. The direct and indirect influences of human activity on both the extent and character of Irish woodland habitats is likely to extend back in time for thousands of years before the 1830s (Mitchell & Ryan, 1997). Old woodlands should perhaps be viewed as anthropogenic habitats, whose character is closely linked to the forest management or silvicultural practices adopted.

The extent to which Irish old woodland sites can be viewed as "ancient" woodland (in the sense of the UK definitions) is uncertain. Rackham (1995 and this volume), when comparing woodland cover between the 1830s Ordnance Survey maps and the Civil Survey maps of Ireland which date from the mid-1600s, found that only about one-tenth of the 1600s woodland had remained in the same place by the 1830s. This suggests that most old woodland sites originated as pre-1830s plantations – only a minority have a more ancient origin, with some perhaps representing links (albeit highly modified) to the natural forests of pre-history. Rackham (*op. cit.*) emphasised the importance of backing up the examination of maps with field observations when searching for "ancient" woodland in the Irish landscape.

Ecological surveys commissioned by Coillte over portions of its estate have been ongoing since 2001 (O'Sullivan, 2003) and have covered many old woodland sites. Woodland stands were assessed primarily on their vegetation and structure (extent and species composition of canopy, understorey and ground flora). Data from these surveys are not yet fully collated, but the old woodland sites were found to vary widely in terms of their current ecological or habitat quality. Many support a range of typical native woodland flora, while others appear to lack any of the features typically associated with ancient woodland (Pryor *et al.,* 2002). This mirrors results of a similar survey in the UK of ancient woodlands on the Forestry Commission estate (Spencer, 2002).

From an ecological or nature conservation objective, the objective is to manage old woodland sites 'in a manner that retains and enhances their semi-natural characteristics' (IFCG, 1999; UKWAS, 2000). This requires forest managers, whose management efforts are traditionally focused on the trees, to take a broader, 'whole forest' approach to forest management. The semi-natural characteristics of an old woodland site include (Pryor *et al.,* 2002):

- Existing native woodland or scrub habitat
- Diverse stand structure, e.g. presence of an understorey
- Presence of old 'veteran' trees and dead wood
- Habitat diversity, i.e. pockets of wetland (e.g. marsh) or open heath/grassland
- Woodland species present in ground flora and invertebrate fauna
- Intact soil profile and ground topography

Some of these features can be readily identified and mapped by forest managers, and thereby protected as 'biodiversity hotspots' (Pryor *et al.,* 2002), while others are difficult for forest managers to identify and assess (e.g. ground flora, invertebrate fauna) and may require the input of specialists.

As stated earlier, old woodland sites are varied, both in the extent to which semi-natural characteristics are present, and in their pre-1830s history and origin. Likewise, the management prescription required to conserve semi-natural characteristics will vary for each site. For example, some sites will yield significant benefits to nature conservation if restored to native broadleaf cover, while other sites appear to lack any potential for restoration. Add to this the fact that many old woodland sites are popular as recreation areas among local communities, and have a history of access and amenity use. Furthermore, they are productive sites capable of producing high quality hardwood and softwood timber. Old woodland sites, therefore, are complex and varied, and require management prescriptions that address the particular values inherent in each site. For Coillte, development of policy on the management of old woodland sites is challenging. The issue is to achieve balance between environmental, economic and social objectives in managing these sites.

Coillte Policy

The critical factors influencing the conservation of semi-natural characteristics of old woodland sites are: the silvicultural system adopted in stand management; tree species selection; and effective identification and protection of "biodiversity hotspots" (Pryor *et al*., 2002). Coillte's policy on old woodland sites focuses on: adoption of Low Impact Silvicultural Systems (LISS) and reduction in the size of clearfells; tree species diversification, favouring broadleaves and light-crowned conifers; and use of ecological surveys to aid in identification and mapping of 'biodiversity hotspots'.

A range of management options may apply to a particular old woodland site, depending on site characteristics, as follows:

- Retain native woodland cover where it currently exists;
- Restore to native woodland cover, where appropriate[1];
- Broadleaf timber production in areas where quality timber can be achieved;
- Conifer timber production favouring diverse light-crowned species, e.g. pines, larches, Douglas fir;
- Conifer timber production using Norway spruce or Sitka spruce where the site has been found to be of low ecological value and is not silviculturally suited to light-crowned conifers.

Further work will refine the management objectives for old woodland sites, including quantification of the area to be restored to native woodland.

Conclusions

Native woodland conservation is receiving much welcome attention (Forest Service, 2000). A paper such as this, which presents data on large areas of conifer-dominated forest, might seem out of place in a conference concerned with the status and conservation of native woodland in Ireland. However, native woodland biodiversity is not confined to present-day native woodlands – the importance of woodland history should not be ignored. Certain woodland species of vascular plant, e.g. bird's nest orchid (*Neottia nidus-avis* (L.) Rich), appear to thrive under the shade of conifers on old woodland sites. By focusing only on the management and restoration of native woodland, we may be ignoring important aspects of the conservation of native woodland biodiversity. Perhaps we should broaden our view of woodland conservation to be more inclusive of the potential habitat value of mixed and conifer high forest stands, focusing more on the silvicultural techniques adopted in forest stand management.

The following are some suggested measures which would support the conservation of old woodland sites at national level:
Extension of woodland history survey to full national coverage and extension to include examination of the Civil Survey of 1650s ("ancient" woodland);
Surveys of biodiversity of Irish old ancient woodland sites (flora and fauna) and provision of this information to forest owners and managers;
Ongoing development and promotion of forest management skills required for the implementation of LISS and CCF systems;
Support for compilation of long-term management plans for old woodland sites, based on stand inventory and survey as required, incorporating the ful range of management objectives that apply.
Integration of grant schemes focusing on nature conservation, amenity and high quality timber production, in recognition of the fact that management of individual sites frequently entails a combination of all of these objectives.

Old woodland sites represent a significant nature conservation resource. They also have value for amenity/recreation and high quality timber production. With the increasing focus in society on values that are outside economics, old woodland sites should be viewed as sites where investment in their appropriate management will yield tangible environmental and social benefits. Stronger emphasis on their silviculture and conservation at national level is required.

[1] The decision to restore to native woodland cover is based either on presence of semi-natural woodland characteristics as highlighted by Coillte's ecological surveys (O'Sullivan, 2003) or on independent evidence that the site has an "ancient" woodland history.

Table 1. *Categories adopted to record woodland type, as indicated by map symbols on 1st and 3rd Editions of Ordnance Survey maps (scale 6":1 mile). An asterisk in column 1 indicates labels that do not exist as a "LandUse Type" in Coillte's inventory, i.e. labels devised specifically for the woodland history survey.*

Label – Woodland Type	Full Name – Woodland Type	Description of map legend
BHF	Broadleaf High Forest	Broadleaves = ~90%-100% woodland canopy
MHF	Mixed High Forest	Broadleaves and Conifers each = 10%-90% woodland canopy
CHF	Conifer High Forest	Conifers = ~90%-100% woodland canopy
BRUSHWOOD*	Brushwood	Scrub-like broadeaves. Either young, immature stand of trees or scrub vegetation.
SCRUB	Scrub	Lower-density scrub-like broadleaves
PARKLAND *	Parkland	Scattered mature broadleaves on open ground.
OPEN *	Open	No trees or shrubs present.

Table 2. *The history of woodland cover between the 1830s and 1910s A.D., recorded broadly as "site types". See Table 1 for explanations of woodland types listed for each edition of the Ordnance Survey maps.*

Site Type Recorded	1st Edition O.S. 1833-1844 A.D.	3rd Edition O.S. 1900-1915 A.D.
Old Woodland Site (OWS)	BHF/MHF/CHF/ BRUSHWOOD/SCRUB	BHF/MHF/CHF/ BRUSHWOOD/SCRUB
Interrupted Old Woodland (IOW)	BHF/MHF/CHF/ BRUSHWOOD/SCRUB	OPEN
Parkland (PKLAND)	PARKLAND	PARKLAND
Long-Established Plantation (LEP)	OPEN	BHF/MHF/CHF/ BRUSHWOOD
Recent Plantation (RP)	OPEN	OPEN

Table 3. 1 *Summary results of woodland history survey of entire Coillte estate, as recorded from Ordnance Survey maps (Scale 6":1 mile). Area figures rounded up to nearest 50 hectares.*

Woodland History	Area (hectares)	Area (% Total Coillte Estate)
Old woodland site	27,100	7%
Interrupted old woodland	4,250	1%
Parkland	2,400	(<)1%
Long-established Plantation	16,400	4%
Recent plantation	336,250	87%
TOTAL area of forested land on Coillte Estate	386,400	100%

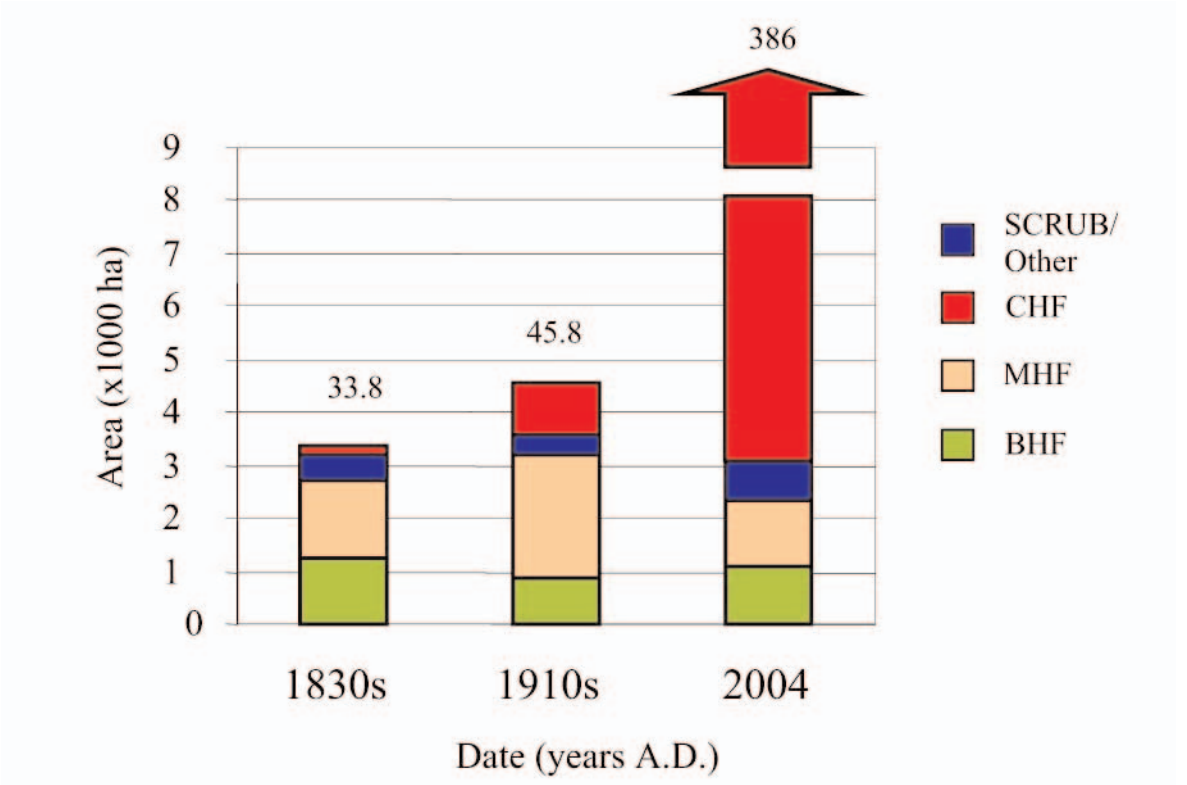

Figure 1. *Area and type of woodland recorded on the Coillte estate since the 1830s A.D. Data for the 1830s and 1910s were recorded from Ordnance Survey maps. Data for 2004 were obtained from Coillte inventory.*

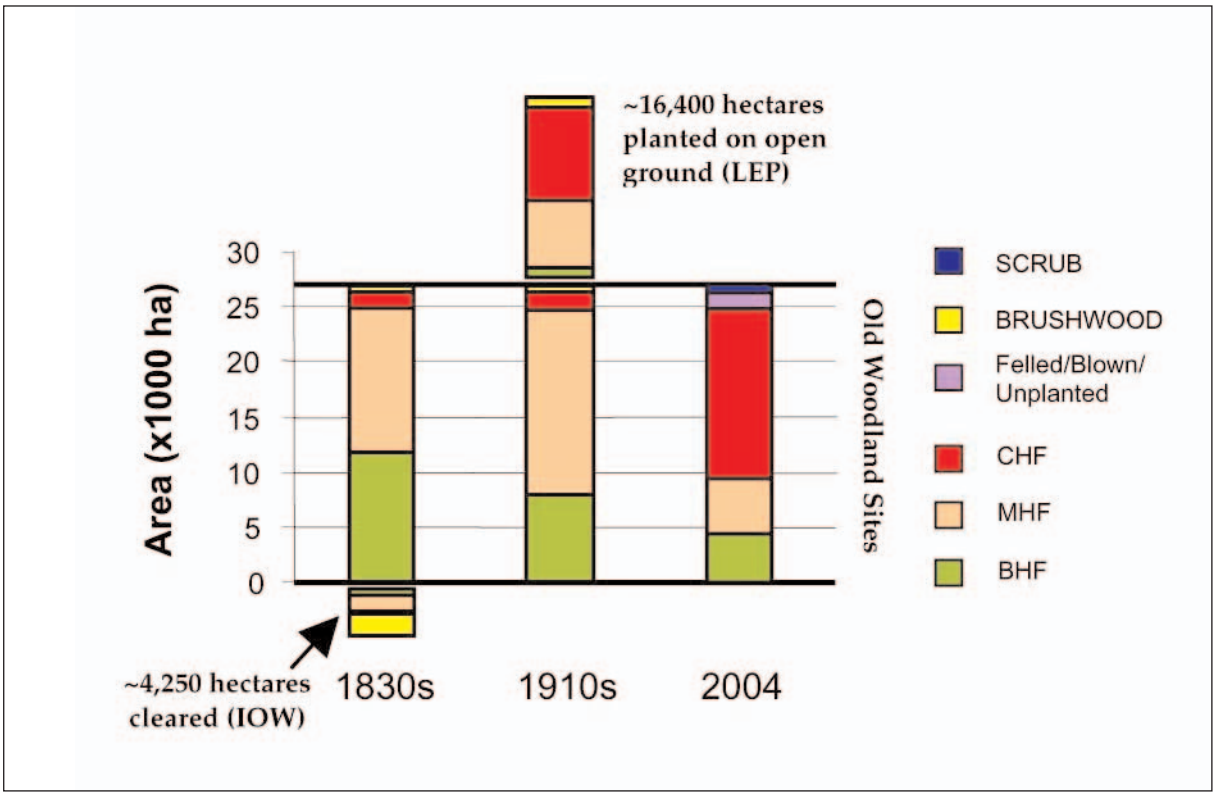

Figure 2. *Changes in the composition of woodland recorded on Coillte sites with a history of woodland cover between 1830s and present-day. Present-day composition of LEP or IOW sites (see Table 2) is not shown.*

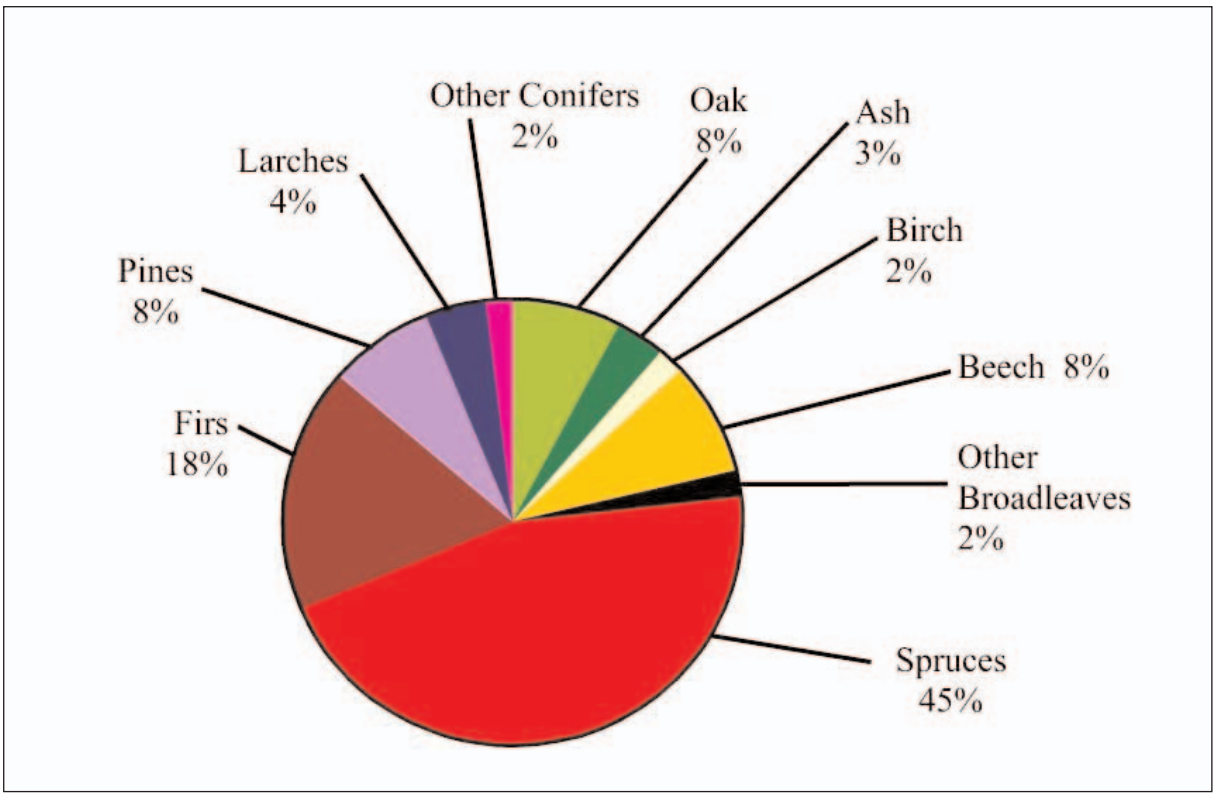

Figure 3. *Breakdown of dominant canopy species by area on old woodland sites. Data from Coillte inventory, 2004.*

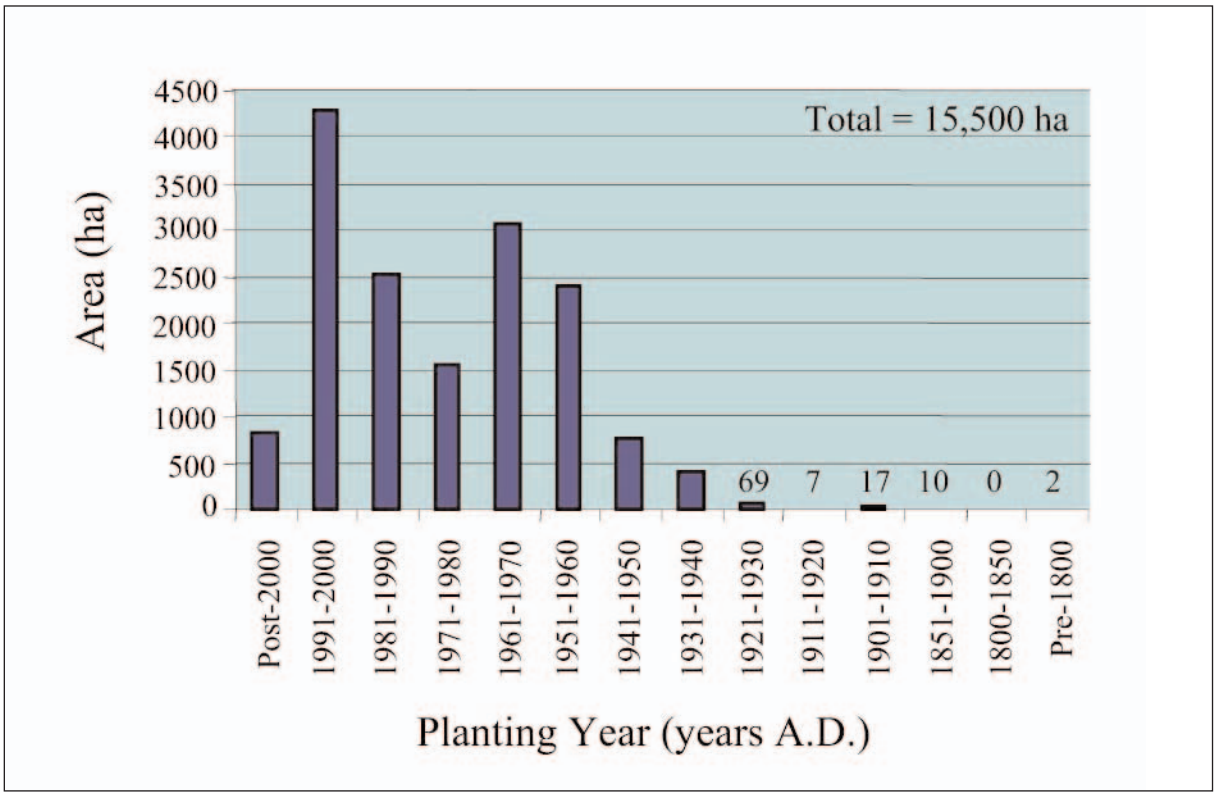

Figure 4. *Age-class distribution of conifer stands on old woodland sites. Stand age is presented in terms of the year in which the stand was planted.*

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