

## NATIVE WOODLANDS AND THE USE OF NATIVE PROVENANCES

John Fennessy, Research Programme Manager, COFORD  
The National Council for Forest Research and Development  
Arena House, Arena Road  
Sandyford, Dublin 18  
Tel: 01 2130725  
Fax: 01 2130611  
Email: john.fennessy@coford.ie

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### Abstract

Ireland has a very limited range of tree species despite having an ideal climate for tree growth. Forest cover, while once extensive, reached an all time low of approximately 1% at the start of the twentieth century. This was due to a number of factors including climate change, the development of agricultural practices and over-exploitation of the forests by man. Today, forest cover has increased to almost eleven percent of the land area, predominantly comprising exotic conifers. In recent times, however, there has been an increased interest in native species, which has resulted in the development of the Native Woodland Scheme. This scheme encourages the restoration of existing native woodlands and the planting of new woodlands.

A requirement of the Native Woodland Scheme is that all planting stock must originate from indigenous and heterogeneous sources within Ireland. Practical difficulties, however, arise in obtaining reproductive material of native species as substantial quantities have been imported from Europe and beyond for some time. Protecting and developing Ireland's source of native tree seed, in conjunction with the renewed interest in, and commitment to, native species, will ensure that this valuable natural resource will be conserved for future generations.

### Introduction

Situated on the western extremity of the European mainland, Ireland's climate is strongly influenced by the North Atlantic Ocean, which gives the country a typical west maritime climate. The North Atlantic drift, moving northwards from the warm regions of the Caribbean, brings with it warm waters, warm winds, and ever-changing frontal systems and depressions to give mild damp winters and cool cloudy summers, with frequently varying daily climatic conditions. This type of climate with its absence of extremes is favourable to the growth of a wide range of crops (O'Carroll, 1984). In these conditions a great number of trees and shrub species from many parts of the world can be grown successfully.

### Historical perspective

As the ice sheet retreated northwards at the end of the last glaciation period some 10,000 years ago, Ireland began to be colonised by species migrating from the continent. Ash and elm migrated across Britain into Ireland while oak, alder and pine are thought to have come across a land bridge from France. Beech and sycamore failed to reach this country before the land bridge disappeared; their presence here is as a result of importation. Between 5,000 and 7,500 years ago woodland probably covered about 80% of the land surface of Ireland. The distribution of tree species consisted of alder, ash, birch, elm, oak, as well as pine; minor species included hazel, holly, juniper, cherry, willow and yew. Towards the end of this period, Neolithic farmers began a limited clearance with minimal impact. During the Bronze Age (4,500-2,500 BP), agricultural pressure on the better soils became more widespread. At that time, the climate became wetter and cooler, with the result that peat bogs spread and many of the forests of pine, birch, oak and yew were suppressed.

Table 1. Native Irish tree species

Common name	Botanical name
Common alder	<i>Alnus glutinosa</i>
Strawberry tree	<i>Arbutus unedo</i>
Silver birch	<i>Betula pendula</i>
Downey birch	<i>Betula pubescens</i>
Hazel	<i>Corylus avellana</i>
Hawthorn	<i>Crataegus monogyna</i>
Spindle	<i>Euonymus europaeus</i>
Ash	<i>Fraxinus excelsior</i>
Holly	<i>Ilex aquifolium</i>
Crab apple	<i>Malus sylvestris</i>
Aspen	<i>Populus tremula</i>
Wild cherry	<i>Prunus avium</i>
Bird cherry	<i>Prunus padus</i>
Blackthorn	<i>Prunus spinosa</i>
Sessile oak	<i>Quercus petraea</i>
Pedunculate oak	<i>Quercus robur</i>
Purging buckthorn	<i>Rhamnus catharticus</i>
White willow	<i>Salix alba</i> *
Sally	<i>Salix atrocinerea</i>
Goat willow	<i>Salix caprea</i>
Bay-leaved willow	<i>Salix pentandran</i>
Elder	<i>Sambucus nigra</i>
Rowan	<i>Sorbus aucuparia</i>
Whitebeam	<i>Sorbus hibernica</i>
Yew	<i>Taxus baccata</i>
Elm	<i>Ulmus glabra</i>

Source: Cross 1987

(\* possibly introduced)

From the beginning of the Iron Age, about 2,500 BP, man began to contribute significantly to the destruction of forest cover. The popular belief that Ireland still had substantial areas of ancient oak forest at the beginning of the 17<sup>th</sup> century is subject to controversy. It is agreed, however, that they were heavily overexploited. The latter half of the 18<sup>th</sup> century saw an attempt to restore woodland cover. However by 1906 the estimated area of woodland had dwindled to about 100,000ha or 1.0% of the land area. Today, Ireland has approximately 685,000 ha of forest, representing almost 11% of the land area, with approximately 18% of this area made up of broadleaved woodland, much of it native species (Coggins, 2003)

## Why use native species?

There are many reasons why native tree species should be favoured. They arrived here naturally after the most recent Ice Age and have adapted over many generations to the Irish environment. Most have very broad natural range, suggesting a very high level of variability and thus associated adaptability. They are the dominant canopy species of the natural vegetation of most of Ireland and support unique communities of plants and animals. They add to the rich genetic, species and ecosystem biodiversity and are part of our natural heritage, giving us an important cultural identity and uniqueness of our landscape.

## Native species in Irish forestry

In 1996 a strategic plan for the development of the forestry sector in Ireland – “Growing for the Future” (Anon., 1996) was published. Up to that time, native species had been somewhat neglected in Irish forestry, however, late in 2001 the “Native Woodland Scheme” was launched with a revival and a renewed interest in native species. The Scheme was aimed at the proactive protection and expansion of Ireland’s native woodland resource and associated biodiversity, using appropriate close-to-nature silviculture.

As part of the requirement of the Native Woodland Scheme, all planting stock must originate from indigenous seed sources (Anon., 2001). This requirement necessitated the development of a system to identify, protect and manage suitable seed sources, to provide an adequate supply of forest reproductive material for the Scheme on a sustainable basis. A constant seed supply of native species, however, has proven problematic in the past as a result of the periodicity of seed years, particularly in oak, as well as the difficulties of long-term seed storage. Furthermore, the infrastructure for seed collection has never been fully developed, and while a new state of the art seed store was built in Ballintemple, some years ago, seed collection teams, covering the entire country have yet to be put in place. As a result of these difficulties, there has been extensive importation of oak seed over the past number of decades. Records in the Forest Service show substantial importation in the 1940s through to the 1980s (Table 2). A similar pattern of importation continues to the present day. The effects of this continuing importation of foreign sources of seed in native tree material are unknown but undoubtedly have the potential to cause severe contamination to native gene pools. One such example is the recent arrival of the narrow-leaved, or “brown bud” ash (*Fraxinus angustifolia*), which readily hybridises with the native common ash (*Fraxinus excelsior*). Narrow-leaved ash is a thermophilous tree species mainly occurring in southern Europe (Heurtz., 2003). It is a smaller tree (up to 25 m tall) than common ash (up to 40 m), and its wood is of lower quality (Picard., 1983). These two ash species have been reported to commonly hybridise in southeastern France and hybrid individuals are also found in nurseries there, among seedlings of common ash (Picard., 1983).

Table 2. Oak seed imports to Ireland from 1940 to 1980<sup>1</sup>

Species	Year	Source	Quantity (kg)
Pedunculate oak	1933	Holland	230
Sessile oak	1933	Germany	230
Pedunculate oak	1934	Holland/Germany	450
Sessile oak	1935	Germany	340
Pedunculate oak	1935	Holland	680
Sessile oak	1936	Germany	1130
Pedunculate oak	1936	Holland	1130
Pedunculate oak	1937	Holland	1360
Oak (unspecified)	1939	Central Europe	3750
Oak (unspecified)	1940	Europe	1000
Sessile oak	1954	Germany	10
Sessile oak	1962	France	1130
Sessile oak	1963	Germany	900
Pedunculate oak	1964	Germany	900
Pedunculate oak	1965	Germany	900
Sessile oak	1965	Germany	900
Pedunculate oak	1967	Belgium	900
Sessile oak	1967	Germany	450
Pedunculate oak	1968	Belgium	1180
Sessile oak	1968	Germany	200
Pedunculate oak	1972	Holland	460
Pedunculate oak	1974	Germany	400
Sessile oak	1974	Germany	100
Pedunculate oak	1975	Germany	300
Sessile oak	1975	Germany	80
Pedunculate oak	1977	Germany	300
Pedunculate oak	1980	Germany	560

While there are strong arguments in favour of using local provenances, the answer to the question “how local is local” has yet to be determined.

Ireland has always been classified as one region of provenance for forestry purposes, which has led to some debate among foresters and ecologists. The issue is however kept under review and should evidence emerge that the country needs to be divided into a number of different ecological regions then division will be considered. Currently, such evidence does not exist.

<sup>1</sup> Register of seed purchased by Forest Service over the period 1930 – 1980, available from COFORD.

## Provenance trials in some native species

Provenance selection is usually based on information collected from specially established provenance trials, which determine the variation in adaptability and growth performance of seed origins of a particular tree species under a range of growing conditions. These trials also show the degree and level of genetic diversity within and between populations, which has developed in adaptation to local environments. Knowledge of this variation and the plasticity of adaptive traits are useful when carrying out seed transfers as it allows the genotypes to be matched to their new environmental conditions

When provenance trials are not available, an alternative but less reliable system is the study of the performance of crops growing in a locality.

The provenance-testing programme on broadleaved species in Ireland began in 1984 with collection of native oak from semi-natural stands throughout the country.

Native oak provenance trials were established in Ireland in 1988 when 29 provenances were planted in four field trials at Camolin, Co Wexford; Durrrow, Co Laois; Belturbet Co Cavan and Donadea Co Kildare (Pfeifer, 1994). This collection is unique, since it is the first attempt at comparing the performance of different sources of native oak in this country. A recent preliminary assessment of these experiments has shown significant variation in performance between provenances, including discontinuous variation, especially the particularly strong contrasts between geographically adjacent sources (Felton, 2002). Following the success of the oak collection, a native ash collection was made in 16 sites across the country in 1985 and field trials were established in Drumsna Co Leitrim and at Clonegal Co Wexford. Recently, COFORD has funded improvement work on birch (O'Dowd, 2004)

## Regulatory framework

On becoming members of the European Union in 1973, Ireland like all the other member states was required to adhere to regulations on forest tree seed. In 1966 the European Union (EU), then the European Economic Community, adopted Directives<sup>2</sup> on forest reproductive material. These Directives were designed to ensure that only seeds and plants of acceptable quality and known origin were offered for sale within the Community. However, these two Directives were adopted when the EU consisted of only six Member States. The aims and philosophy of forestry in these Member States at that time were very similar and climate and ecological conditions were not too diverse. These Directives required that a system of registered seed stands be established covering 13 species and one genus, *Populus*. With increased membership of the EU, now 25 and the more than doubling of forest area in Europe, these Directives need to be updated to reflect the change. On 1<sup>st</sup> January 2003, the new Directive, 1999/105/EC came into force in all Member States. Recent changes in this regulation have increased the number of species to 46 as well as *Populus*. To date a large area of seed stands has been selected (Table 3), and the process of selection is continuing.

To have a stand considered for registration, the owner is required to contact the regulatory authority, which in Ireland's case is the Forest Service, to arrange for an inspection. If the stand meets the specified selection criteria it will be issued with a unique stand number and listed in the official National Catalogue of Seed Stands for Ireland.

Under the new regulation seed suppliers and collectors must be registered with the Forest Service. Collection permits must be obtained from the regulatory authority as well as permission from the forest owner, before any collection commences. Information on all aspects of this process is available from the Forest Service.

Under the new regulation four categories of approved material are recognised:

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<sup>2</sup> Directives 66/404/EEC and 71/161/EEC on the marketing of forest reproductive material (FRM).

Table 3. Area of native broadleaf seed stands, including source identified areas, selected in Ireland (Sept. 2004)

Species	Number of stands	Area (ha.)
Alder	3	85
Ash	7	140
Birch	2	11
Pedunculate oak	29	543
Sessile oak	36	1358

- Source Identified – reproductive material derived from basic material, which may be either a seed source or stand located within a single region of provenance. This is the lowest genetic category in commercial forestry.
- Selected – reproductive material derived from basic material from a stand located within a single region of provenance, which has been phenotypically selected at the population level.
- Qualified – reproductive material derived from basic material from seed orchards, parents of families, clones or clonal mixtures which have been phenotypically selected at individual level but where testing has not yet been undertaken or completed.
- Tested – reproductive material derived from basic material consisting of stands, seed orchards, parents of families, clones or clonal mixtures that have been proven to be genetically superior by scientific testing.

### Future considerations

The emphasis on the use of native species, especially broadleaves, is likely to increase substantially in the future. A consequential increase in demand for native forest reproductive material is expected, which will necessitate the continuation of new stand identification and registration. The entire system of seed collection and processing may also need to be reviewed and further developed. While first class facilities for seed processing and storage are now in place at the Coillte nursery in Ballintemple, a comprehensive seed collection team network has yet to be fully established through out the country. As seed collection is rather seasonal, with no crop occurring in some years, there are many difficulties, including high cost associated with the maintenance of permanent seed collection teams.

Meanwhile, as new stands are identified there is a growing need to evaluate the performance of these stands. To implement this process, new provenance trials must be established, covering those native species that have not been studied to-date. This process is both costly and takes a long time.

To protect native genetic resources, present systems of control under current EU regulations for the importation of forest reproductive material must also be reviewed on a regular basis, to ensure that the regulation is serving our needs. Furthermore, stands of unique genetic value must be preserved as permanent gene conservation resources for future generations.

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