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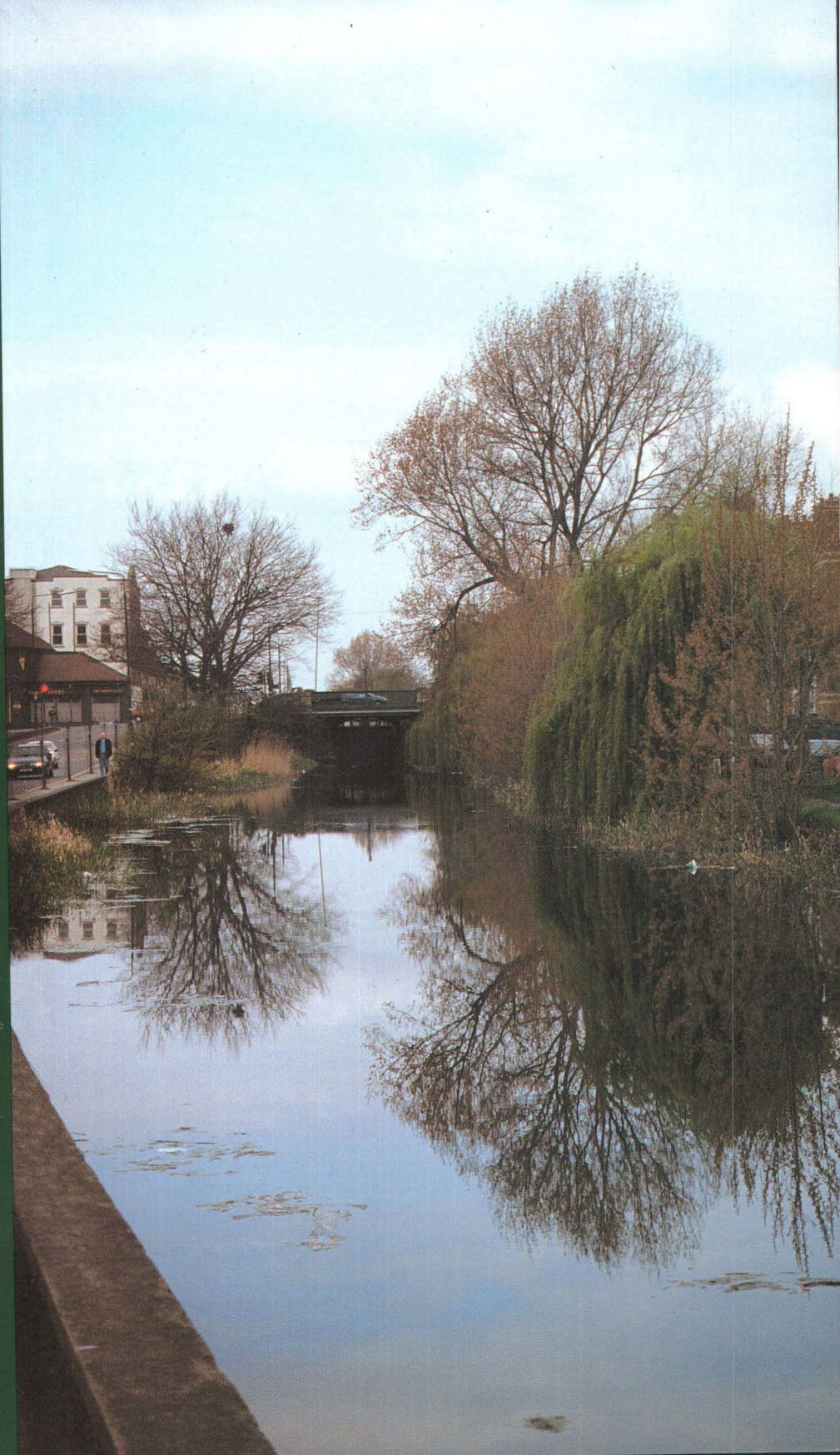

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IRISH FORESTRY

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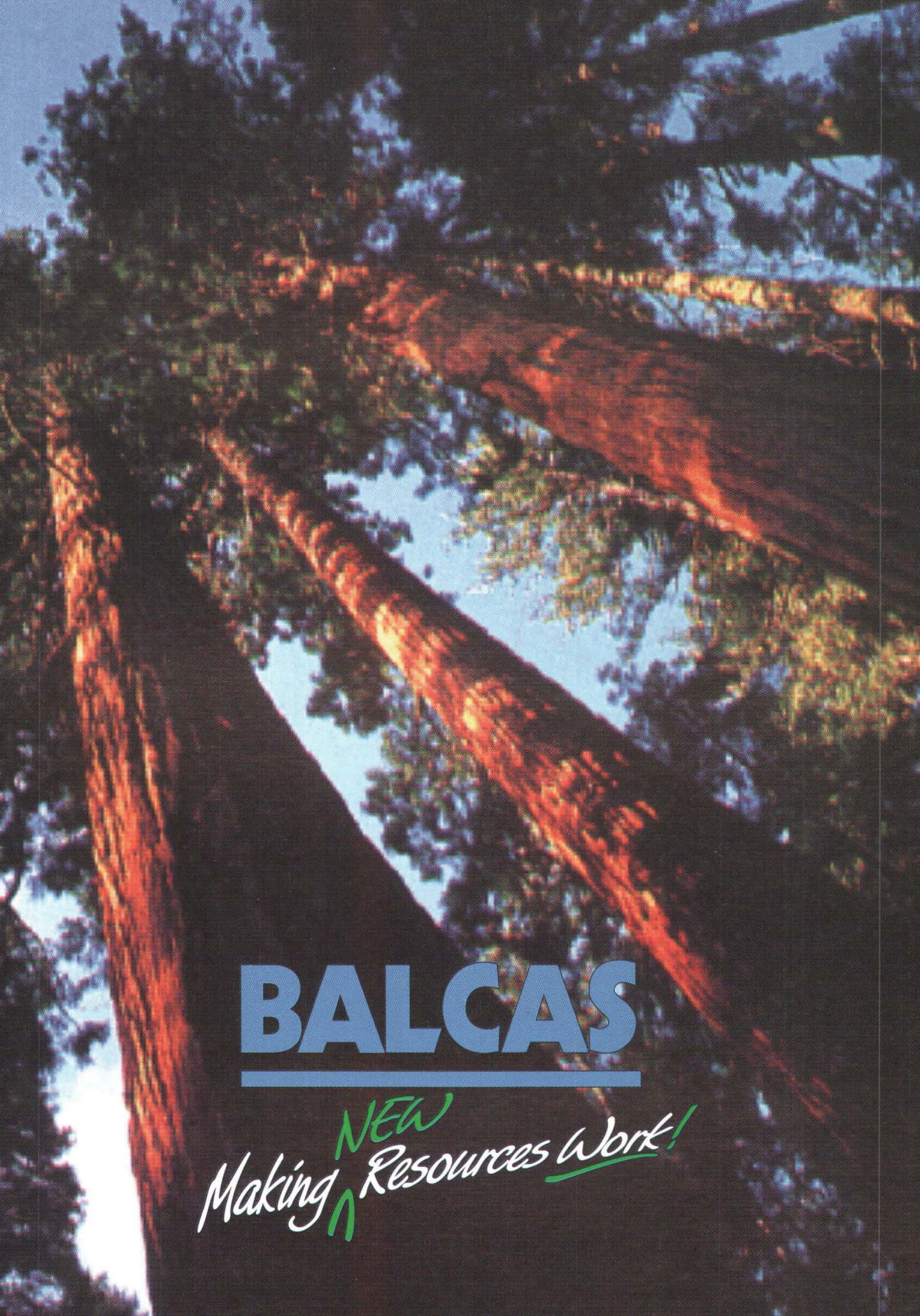
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The main activities of the Society include the organization of symposia, field meetings and study tours on forestry topics, and the publication of *Irish Forestry*, the Society's journal. The Society also organizes forestry shows and exhibitions and has published *The Forests of Ireland* and *Forest Images - Fr. Browne's Woodland Photographs.*

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Authors are requested to observe the following guidelines when submitting material for publication in *Irish Forestry*.

- One complete copy must be submitted in typescript. Correct spelling, grammar and punctuation are expected. Nomenclature, symbols and abbreviations to follow established conventions, with the metric system used throughout.
- A computer disc containing text must be submitted. If applicable, a second disc containing computer generated tables, graphs and illustrations is also required. In both cases, clearly indicate the editing package used.
- Authors submitting scientific papers are requested to indicate whether or not they wish their material to be subjected to peer review. Papers submitted for peer review should include an abstract (max. 150 words) and a list of up to six key words before the main body of text. For general papers, a summary (max. 250 words) is required.
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- Submission of a paper is understood to imply that the paper is original and unpublished and is not being considered for publication elsewhere.

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EDITORIAL

Increased emphasis is being placed worldwide on the use of natural systems as the most effective and cost-efficient way of addressing many of the social, environmental and infrastructural ills of modern life. One such system is the 'urban forest', a collective term describing the entire tree and woodland resource within an urban area. The urban forest contributes immensely to the quality of urban life, as reflected by the monetary evaluation of various benefits arising from the resource, such as pollution control, energy conservation, environmental amelioration, recreation, increased economic investment and savings in public health care. The benefits are such that, in major centres throughout the world, the urban forest is no longer regarded simply as an aesthetic element of the urban landscape, but as a vital component of the urban infrastructure essential in maintaining a liveable and sustainable environment.

Although dealing with a resource dominated by non-woodland components such as street trees and trees on public greenspace, 'urban forestry' – a modern approach to the management of the urban forest – is more closely aligned to traditional forestry than perhaps immediately apparent. As implicit in the term, urban forestry simply adopts the principle of sustained yield, which underpins forestry as a rural landuse, and applies it to the management of the urban forest. It aims to achieve and maintain a balanced age structure within each urban locality, to ensure continuous tree cover and hence, the sustained 'production' of benefits for current and future generations. In effect, trees are managed, not as single isolated entities, but as part of an overall resource, based on their contribution or hindrance to the attainment of a balanced age structure within that resource. Achieving this requires long-term planning, secure resource allocation and detailed surveys, inventories and work programmes. It also requires the co-ordinated input, through agreed practices and strategies, of all those impacting directly and indirectly upon the resource, such as horticulturists, arboriculturists, foresters, landscape architects, planners, legislators, engineers, voluntary sector organisations, developers and utility managers, so as to avoid conflict and replication and to capitalise on all available expertise. Urban forestry is also a social discipline, as it actively encourages and facilitates the participation of urban communities in their local urban forest resource. This yields huge social benefits, not least of which is the empowerment of communities to contribute to their own environment. The net result of urban forestry is a move away from over-maturity and crisis management, towards a younger, healthier resource better equipped to fulfil its role as an essential component of the modern urban infrastructure.

Since the late 1980s, the forestry sector has played a huge part in establishing the concept of urban forestry on this island, and is continuing to actively encourage its adoption by local authorities. As foresters, members of the Society will always have a unique input to offer, not only in the development and management of urban woodlands, but also in providing the long-term planning perspective central to urban forestry. Such involvement will offer a unique opportunity for us to 'showcase', on the very doorstep of the urban dweller, the nature of rural forestry as a sustainable multi-benefit landuse, and to promote an understanding among this increasingly influential portion of Irish society of the necessity of seemingly destructive operations as part of an ongoing cycle of renewal and regrowth. It will also enable the professional forester to take full advantage of exciting new opportunities afforded by the growing application of urban forestry in Ireland, and in doing so, to make an important contribution towards the greening of our towns and cities.

Submissions to *Irish Forestry* are welcome and will be considered for publication. The attention of contributors is drawn to "Guidelines for Submissions". Submissions to be addressed to:

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The breeding bird community of Balrath Wood, Co. Meath, 1996: A preliminary investigation

Brian L. Duffy, John O'Halloran, Thomas C. Kelly and Paul M. Walsh[1]

Summary

During the breeding season of 1996, the birds of Balrath Wood, Co. Meath, were surveyed using the line transect technique. Twenty-four species were found to be present at the site, although four of these were unlikely to rely on the woodland directly. The bird communities of three separate habitats within the woodland, *viz.* woodland ridelines, completely wooded areas and external woodland edges, were compared. Relative abundance values were calculated for each species for each habitat. The overall abundance estimates for each habitat varied between 15.25 and 19.67 birds/ha. Ridelines with a range of early successional stage vegetation were found to contain the greatest number of species and the highest densities of birds. Wooded areas and external woodland edges both contained the same number of species, although density was higher in the latter. A relatively low number of hole-nesting species were recorded, possibly due to a shortage of suitable nesting sites.

Introduction

Woodland, particularly mature climax broadleaf woodland, is an important habitat for terrestrial birds. The productivity and relative stability of this successional stage should allow for the development of avian communities showing a high diversity of species. Apart from a few core studies, however, there are relatively few data published on Irish woodland bird communities. Consequently, this study, while preliminary in nature, is of interest as it is an example of one particular woodland bird community. The study also briefly investigates how the bird community may vary between the different habitat components within a woodland.

Balrath Wood

Balrath Wood is a 21 ha mixed woodland situated in Co. Meath approximately 40 km north of Dublin city (National Grid reference N 99 64). Donated by Coillte, the site is now managed by the Tree Council of Ireland, the objectives being to create a quality broadleaf woodland and to develop an outdoor educational resource aimed at raising public awareness and knowledge of the forest ecosystem, silviculture and general forest management.

The site once comprised a broadleaf woodland dominated by sessile oak (*Quercus petraea* (Matt.) Liebl.). Subsequent felling has resulted in only a few of these older trees now remaining. In 1969, the Forest Service replanted the site with a conifer-broadleaf mixture made up primarily of Norway spruce (*Picea abies* (L.) Karst.) and oak (*Quercus* spp.). Other species also present include common beech (*Fagus sylvatica* L.), common ash (*Fraxinus excelsior* L.), horse chestnut (*Aesculus hippocastanum* L.), grand fir (*Abies*

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grandis Lindl.), common alder (*Alnus glutinosa* (L.) Gaertn.), silver birch (*Betula pendula* Roth), Spanish chestnut (*Castanea sativa* Mill.) and willow (*Salix* spp.). A particularly important feature of the woodland is its two large (approximately 20 m wide) unplanted ridelines supporting a rich herbaceous field layer and edged with bramble (*Rubus fruticosus)* and early successional stage shrubs such as willow which merge with the woodland canopy. The ridelines, which run diagonally in a north-east and north-west direction to subdivide the site into four, were developed during the early 1970s specifically to create an increased edge effect in the woodland and thereby generate greater diversity. The deliberate orientation of the ridelines allows for maximum daily sunshine throughout the year. The area surrounding the woodland is a mixture of arable and pastoral fields. The external edges of the woodland meet directly with the surrounding fields, although any transitional stage between the woodland canopy and the fields is generally lacking.

Objectives

This paper reports on a study commissioned by the Tree Council of Ireland to survey the breeding bird community of Balrath Wood, Co. Meath. The main objectives were to identify the species breeding at the site and to estimate their abundance. Differences within the bird community at the site were also of interest, particularly given the management history of the woodland and the attempts which have been made to attract a greater diversity of species. For this purpose, the woodland was subdivided into three components, *viz.* woodland ridelines, completely wooded areas and external woodland edges. A major consideration throughout was the need for standardisation of those methods used, in order to facilitate future comparable studies aimed at assessing changes in the bird community resulting from management decisions.

Methods

Transects

The line transect method described by Bibby *et al.* (1993) was considered to be the most efficient way of meeting the aims of this study. A total of 10 transects were marked out, four along the ridelines (R1, R2, R3 and R4), four through the wooded areas (W1, W2, W3 and W4) and two along the woodland's external edges (E1 and E2). Transects varied in length between 130 m and 530 m, depending on the extent of the section being sampled. Transects were positioned in order to maximise the sampled area of each habitat while minimising overlap with adjoining habitats. This allowed the bird community in each habitat to be recorded separately.

Data collection

Two visits were made to the site during 1996, the first early in the breeding season (17th May) and the second towards the season's end (20th June). This permitted a survey of both early and late breeding birds. All transects were walked on both dates. Birds seen or heard up to 30 m on both sides of the rideline and wooded transects were recorded. In the case of the edge transects, birds were only recorded on the woodland side, as the adjoining fields were considered to be a different habitat type. Birds seen or heard flying overhead or beyond the 30 m limit were also noted, but were not included in the calculation of relative abundance values. Fieldwork was carried out between 0600 and 1100 BST and only during suitable weather conditions, i.e. no rain, light or no wind.

A separate survey was carried out at dusk on two dates (16th May and 19th June) to detect the presence of crepuscular and nocturnal species such as owl. This count was restricted to the rideline transects, due to the difficulty of moving through a densely wooded area in poor light. The analyses of the resulting data were carried out on a presence/absence basis, due to the difficulty in censusing such species accurately.

Data analyses

Relative abundance values for each species were calculated by dividing the number of birds detected by the area of the habitat sampled. In the analyses of data, the higher of the two count values was used to calculate the density for each species, as it is more likely that abundance would be underestimated. It was also possible that certain migrant species would not have arrived before the first census.

In order to quantify the difference in diversity between habitats, Simpson's and Shannon diversity indices were calculated using the overall abundance estimates for each habitat (Begon *et al.*, 1990). Eveness, i.e. how evenly the densities were distributed among the species, was calculated using the corresponding equitability indices.

Results

In total, 24 species were recorded at the site (Table 1). Four of these - jackdaw (*Corvus monedula*), rook (*Corvus frugilegus*), hooded crow (*Corvus corone*) and starling (*Sturnus vulgaris*) – were detected flying over the transects and therefore may not be using the woodland directly. Only three migrant species – blackcap (*Sylvia atricapilla*), chiffchaff (*Phylloscopus collybita*) and willow warbler (*Phylloscopus trochilus*) – were detected, with most of the recordings made on the rideline transects (see Tables 2-5). Fourteen species were detected on the rideline transects and 13 species on the wooded and the edge transects (Tables 3). Both diversity indices found the rideline transects to be the most diverse and also to contain the most even spread of species densities (Table 4). The Shannon index, however, founded the edge habitat to be more diverse than the wooded habitat, whereas Simpson's index found the reverse to be the case.

The overall abundance estimate was greatest on the rideline transect (19.67 birds/ha) (Table 3), although the highest individual density was found on wooded transect W3 (24.33 birds/ha). The edge transects contained the second highest overall abundance estimate, at 17.35 birds/ha. The wooded transects had an overall abundance estimate of 15.25 birds/ha. Within the ridelines, wren (*Troglodytes troglodytes*) appeared to be the most abundant species, followed in descending order by chaffinch, goldcrest (*Regulus regulus*), woodpigeon (*Columba palumbus*) and robin (*Erithacus rubecula*) (Table 5). In the wooded areas, the order of abundance differed, with goldcrest being the most abundant species, followed by chaffinch (*Fringilla coelebs*), woodpigeon, wren and coal tit (*Parus ater*). Edge transects were also slightly different, with the order of descending abundance being wren, woodpigeon, chaffinch, robin and goldcrest.

The dusk census found long-eared owl (*Asio otus*) to be present at the site, with one individual detected on transect R2.

Discussion

Previous studies on the bird communities of Irish woodlands have mainly relied upon the territory mapping method known as the Common Bird Census (CBC) (e.g. Nairn and Farrelly, 1991; Wilson, 1977; Batten, 1976). While providing detailed results, this method

Table 1. *Species list and migratory status (M=Migrant, R=Resident).*

Species	*Status*
Sparrowhawk (*Accipiter nisus*)	R
Pheasant (*Phasianus colchicus*)	R
Woodpigeon (*Columba palumbus*)	R
Long-eared owl (*Asio otus*)	R
Wren (*Troglodytes troglodytes*)	R
Dunnock (*Prunella modularis*)	R
Robin (*Erithacus rubecula*)	R
Blackbird (*Turdus merula*)	R
Song thrush (*Turdus philomelos*)	R
Blackcap (*Sylvia atricapilla*)	M
Chiffchaff (*Phylloscopus collybita*)	M
Willow warbler (*Phylloscopus trochilus*)	M
Goldcrest (*Regulus regulus*)	R
Long-tailed tit (*Aegithalos caudatus*)	R
Coal tit (*Parus ater*)	R
Blue tit (*Parus caeruleus*)	R
Great tit (*Parus major*)	R
Magpie (*Pica pica*)	R
Jackdaw (*Corvus monedula*)	R
Rook (*Corvus frugilegus*)	R
Hooded crow (*Corvus corone*)	R
Starling (*Sturnus vulgaris*)	R
Chaffinch (*Fringilla coelebs*)	R
Bullfinch (*Pyrrhula pyrrhula*)	R

is time consuming and may require up to 10 site visits (International Bird Census Committee, 1969). Given the aims of this study, the time available and the linear nature of both the rideline and edge habitats, the transect method described above was considered the most suitable. The use of a band system to calculate the detection rates of different species, as proposed by Bibby *et al.* (1993), was discounted, as the distances between adjoining habitats were too small. As a result, the method employed in this study did not compensate for the varying detection rates of different species and it is possible that the number of less conspicuous species may have been underestimated. This effect is, however, likely to have been small at distances of less than 30 m. In any case, comparisons across habitats within the study are not effected.

Overall abundance estimates (15.25-19.67 birds/ha) (Table 3) appear lower than those recorded in previous Irish studies of oak woodland and both Norway and Sitka spruce (*P.*

Table 2. *Maximum numbers of birds detected on transects during field visits (R=Rideline, W=Wooded, E=Edge).*

Species	*R1*	*R2*	*R3*	*R4*	*W1*	*W2*	*W3*	*W4*	*E1*	*E2*
Sparrowhawk	0	0	0	0	0	0	0	0	0	1
Pheasant	0	0	0	0	0	0	0	0	0	1
Woodpigeon	4	5	2	2	4	2	1	1	5	4
Long-eared owl	0	1	0	0	0	0	0	0	0	0
Wren	7	7	3	4	2	2	1	2	6	3
Dunnock	0	1	2	1	0	0	1	0	1	0
Robin	4	4	2	2	4	0	2	0	2	5
Blackbird	2	2	3	1	2	1	1	0	3	1
Song thrush	2	3	4	1	1	0	1	3	1	0
Blackcap	1	0	1	4	0	0	0	0	0	0
Chiffchaff	1	1	1	1	0	0	1	0	0	0
Willow warbler	0	1	0	0	0	0	0	0	1	0
Goldcrest	5	4	2	3	6	4	4	1	2	4
Long-tailed tit	0	0	0	0	0	0	2	0	0	0
Coal tit	2	0	2	1	1	1	2	1	1	2
Blue tit	1	0	0	2	2	0	0	2	0	3
Great tit	0	0	0	0	0	0	0	0	0	1
Magpie	0	0	1	0	0	0	0	0	0	1
Chaffinch	5	5	4	5	6	1	2	1	3	4
Bullfinch	0	0	0	0	0	0	1	0	0	0

Table 3. *Relative abundance values for each species for each habitat, and overall abundance estimates for each habitat, in birds per ha (R=Rideline, W=Wooded, E=Edge).*

Species	*R-Mean*	*W-Mean*	*E-Mean*
Sparrowhawk	0.00	0.00	0.32
Pheasant	0.00	0.00	0.32
Woodpigeon	2.02	1.56	2.90
Wren	3.31	1.52	2.91
Dunnock	0.67	0.32	0.00
Robin	1.88	1.19	2.23
Blackbird	1.27	0.83	1.30
Song thrush	1.58	1.15	0.33
Blackcap	1.11	0.00	0.00
Chiffchaff	0.66	0.32	0.00
Willow warbler	0.14	0.00	0.33
Goldcrest	2.23	3.26	1.92
Long-tailed tit	0.00	0.64	0.00
Coal tit	0.53	1.24	0.96
Blue tit	1.00	0.74	0.95
Great tit	0.00	0.00	0.32
Magpie	0.17	0.00	0.00
Chaffinch	3.10	1.93	2.24
Bullfinch	0.00	0.32	0.00
Total	19.67	15.25	17.35

Table 4. *Diversity and equitability indices for each habitat (D=Simpson's diversity index, E=Simpson's equitability index, H=Shannon diversity index, J=Shannon equitability index).*

Habitat	*D*	*E*	*H*	*J*
Rideline	9.45	0.68	47.05	17.83
Wooded	9.16	0.65	35.59	13.88
Edge	8.64	0.62	39.13	15.26

Table 5. *Species rank in descending order of abundance.*

Rank	*Habitat*		
	Rideline	*Wooded*	*Edge*
1	Wren	Goldcrest	Wren
2	Chaffinch	Chaffinch	Woodpigeon
3	Goldcrest	Woodpigeon	Chaffinch
4	Woodpigeon	Wren	Robin
5	Robin	Coal tit	Goldcrest

sitchensis (Bong.) Carr.) plantations (Batten, 1976; Wilson, 1977; Nairn and Farrelly, 1991), although differences in methodology must be taken into account. The number of species recorded in Balrath Wood compares favourably with previously studied Norway and Sitka spruce plantations (20 likely breeding species in this study, compared to 14 and eight respectively, in Batten (1976)). The number of species is, however, lower than that found in natural oak woodland (21 breeding species and five species present, but not proven to breed, in Nairn and Farrelly (1991)).

Within Balrath Wood, the rideline habitat contained the greatest number of species (14) (Table 3). When analysed by both Simpson's and the Shannon indices, it was also found to be the most diverse of the three habitats studied. The wooded and edge habitats, each containing 13 species, were less diverse than the rideline habitat, but did not differ greatly from each other in terms of species diversity. The Shannon index found the edge habitat to be more diverse than the wooded habitat, whereas Simpson's index found the reverse to be the case. Further discussion of the significance of these differences is precluded and more detailed censusing would be required to resolve the contrasting results.

Although the same basic group of species dominate all three habitats, the order of abundance in which they occur varies (Table 5). For example, wren was the most abundant species in both the rideline and edge habitats where more dense low cover is available, while goldcrest dominated the high canopy of the wooded areas.

Although occurring at low densities, the fact that the three migrant species (blackcap, chiffchaff and willow warbler) are concentrated on the rideline transects suggests that the incorporation of the ridelines and, in particular, the dense early successional stage vegetation lining the edges of this habitat, have succeeded in attracting species which might otherwise not occur. Blackcaps in particular seem to have benefited from this habitat, being found in it at a mean density of 1.11 birds/ha, while being completely absent from the wooded and edge habitats. It is likely that the edge habitat fails to attract such species

due to its abrupt graduation from woodland canopy to open field, and the lack of early successional stage vegetation.

The apparent absence of treecreeper (*Certhia familiaris*) at the site, together with the low number of great tits (*Parus major*) and blue tits (*Parus caeruleus*) observed, might seem unusual. Given, however, that much of the woodland is dominated by Norway spruce planted in 1969, it is possible that there may be a shortage of suitable nesting sites for these hole-nesting species. Such sites, normally provided by cavities in older or dead trees, may be in short supply in a wood of this age.

Management implications

It appears that the provision of ridelines which merge gradually with more mature woodland canopy to create a mixture of both early and late successional stage vegetation, may provide a habitat where both density and diversity are increased. Such habitat management may also serve to attract species not normally present at a woodland site. Conversely, it appears that an abrupt transition from woodland canopy to open field similar to the edge habitat sampled in this study, is not of the same value as the ridelines and is unlikely to attract the same range of species.

The possible absence of suitable natural nesting sites for hole-nesting species could be compensated for by the provision of artificial sites such as nestboxes (Du Feu, 1993). The retention of a number of overmature and dead trees would, however, be of great and long term benefit to the bird community within the woodland.

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REFERENCES

Batten, L.A. 1976. Bird communities of some Killarney woodlands. Proceedings of the Royal Irish Academy 76B:285-313.

Begon, M., Harper, J.L. and Townsend, C.R. 1990. Ecology: Individuals, Populations and Communities. Blackwell Scientific Publications, Cambridge. 945 pp.

Bibby, C.J., Burgess, N.D. and Hill, D.A. 1993. Bird census techniques. Academic Press, London. 257 pp.

Du Feu, C. 1993. Nestboxes: BTO Guide 23. 2nd Edition. British Trust for Ornithology, Thetford. 80 pp.

International Bird Census Committee. 1969. Recommendations for an international standard for a mapping method in bird census work. *Bird Study*, 16:249-255.

Nairn. R.G.W. and Farrelly, P. 1991. Breeding bird communities of broad-leaved woodland in the Glen of the Downs, Co. Wicklow. *Irish Birds*, 4:377-392.

Wilson, J. 1977. Some breeding bird communities of Sessile oak woodlands in Ireland. *Polish Ecological Studies*, 3:245-256.

Family variation of biomass and root/shoot ratio in Sitka spruce (*Picea sitchensis* (Bong.) Carr.)

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Summary

Twelve families of Sitka spruce (*Picea sitchensis* (Bong.) Carr.) were grown at 1 m x 1 m spacing on a sheltered fertile site in weed-free conditions. After 3 growing seasons, the trees were lifted and growth parameters recorded. There was a wide range of growth rates between families and blocks and significant differences were demonstrated between dry root and dry shoot biomass, root spread and rooting depth. There were no significant differences between root/shoot ratios. Despite breeding for improved above-ground characteristics, there was no evidence of this compromising factors relating to tree stability.

Introduction

It is known that different seed sources and origins of timber species have different growth characteristics. Variation in form and growth rate has been frequently demonstrated in Sitka spruce (*Picea sitchensis* (Bong.) Carr.). A tree can be taller or produce greater main stem volume than its neighbours by reallocating materials from its root system or crown or by actually photosynthesising more quickly and producing more total biomass. A consequence of the first alternative might be a smaller or different root system which might be less successful at anchoring the tree into the soil. Tree stability is already a major problem in Sitka spruce crops in Britain, and the possibility of mechanically less effective root systems arising from tree breeding programmes is of major concern on windy sites. Little is known, however, about the variation in root/shoot ratio (R/S) within this context. Various authors (Cannell, 1974; Cahalan, 1981; Clair, 1993) have demonstrated differences between Sitka spruce families in the partitioning of assimilates between crown and stem. Fraser and Gardiner (1967) demonstrated how the fresh R/S of 10-15 m tall Sitka spruce increased with decreasing soil fertility. In the study, R/S values for brown earth, peaty gley and deep peat were 0.38, 0.54 and 0.61 respectively.

Cannell and Willett (1976) examined R/S in 1 and 2 year old Sitka spruce in nurseries and reported seasonal variation. Coutts and Nicoll (1990) reported clonal differences in Sitka spruce for total root and shoot growth. Nicoll *et al.* (1995) found no evidence of stem biomass improvements taking place at the expense of root growth in 11 year old Sitka spruce. In that study, R/S was a poor indicator of stability when the whole stump was included in the root mass. Nielsen (1992) adopted the idea of "thin" and "thick" R/S to take account of variations in stump size and found "thin" R/S to be more meaningful. Henderson *et al.* (1983) and Deans *et al.* (1992) recorded differences in size and complexity of young root systems of Sitka spruce. Overall, a study of R/S is thus complicated greatly by changing root growth rates and architecture with increasing age, in addition to differing site characteristics.

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The objective of this study was to investigate differences in R/S and other growth parameters between different phenotypically improved families of Sitka spruce grown to 1.5 m height under similar site conditions.

Method

Twelve seed sources of Sitka spruce were used in the experiment, 11 from families of genetically improved Queen Charlotte Islands origin (phenotypically selected for height, diameter and stem form), and a control of an unimproved import from Washington (Table 1). Seed was provided from the UK Forestry Commission's Forest Research tree improvement programme. The experiment was laid out at Nant Porth Nursery near Bangor, Wales, on a well-cultivated, well-drained and fertile clay loam above limestone. Rooting depth remained unrestricted throughout the duration of the trial. The site, sheltered and fairly frost-free, experiences a rainfall of approximately 1,000 mm/yr. The 1+1 transplants were pit-planted at 1 m x 1 m spacing in late March 1993.

Table 1. *Sitka spruce seed sources used in biomass and root/shoot ratio trial.*

Type of plant	*Full code*	*Treatment No.*
Unimproved import from Washington (control)		W
Screened polycross family	SS 1572 SSPO	15
	SS 1766 SSPO	17
Screened open pollinated family	SS 692 SSOP	6
	SS 1083 SSOP	10
Non-screened polycross family	SS 1892 SSPO	18
	SS 2125 SSPO	21
	SS 280 SSPO	2
Non-screened open pollinated family	SS 765 SSO	7
	SS 814 SSOP	8
	SS 1182 SSOP	11
	SS 1344 SSOP	13

The experiment design was a complete randomised block with four trees in a linear plot and five blocks (total 240 trees). There were three linear plots per row. The experiment was surrounded by a one-row buffer of unimproved Sitka spruce, planted at 1 m spacing. No irrigation or fertilisers were used. Complete weed control was maintained through the application of non-residual herbicides and hand picking. Trees were sprayed with permethrin according to need, in order to reduce aphid infestation. Individual mortalities were replaced with trees of the corresponding family at the end of the first growing season. Height (cm), survival and stem diameter (mm) (measured 10 cm above ground level) were recorded. Tree form was assessed subjectively out of a total score of 25, based on five parameters (*viz.* apical dominance, stem straightness, forking, lean and branchiness) individually scored on a scale of 1 to 5 (bad to good). Foliage colour was assessed subjectively on a scale of 1 to 5 (yellow to blue). Trees were hand lifted at the end of the third growing season

(1995) prior to the onset of serious between-plant competition at root or shoot level. Root depth (cm) and root spread (cm) (mean of two orthogonal directions recorded to a minimum of 2 mm root diameter) were measured. Root systems were severed from the shoots and both dried separately in paper bags in a kiln at 105°C to constant weight. R/S was then calculated. All data were found to be normally distributed, except for survival which became so following angular transformation. All data were subjected to two-way analysis of variance. Tukey's tests were carried out and 5% LSD values calculated.

Results

All trees established poorly, with extensive defoliation and poor growth experienced during the first year (1993). Only 15 of the 240 plants, however, required replacement, with no significant treatment or block differences. The results after the third year are summarised in Table 2.

Table 2. *Mean tree values after 3 growing seasons (August 1995).*

Treatment	*Height cm*	*Stem diameter mm*	*Tree form score/25*	*Foliage colour score/5*	*Dry root weight g*	*Dry shoot weight g*	*Dry R/S*	*Root depth cm*	*Root spread cm*
W	125.3	25.9	23.9	3.2	187	464	0.42	19.8	100
15	119.8	25.9	23.0	4.4	170	409	0.44	20.3	100
17	148.0	29.2	23.7	4.0	221	576	0.40	23.5	115
18	128.5	25.1	23.5	3.8	154	362	0.44	23.1	123
21	139.5	31.6	23.8	3.7	241	638	0.38	23.3	110
2	143.0	28.5	23.9	3.7	257	569	0.46	22.1	115
6	143.4	30.7	24.5	3.4	257	639	0.41	24.0	110
10	135.8	28.6	24.1	3.8	235	546	0.44	21.8	113
7	143.0	29.1	24.5	4.0	224	567	0.40	27.9	110
8	142.7	30.4	24.3	4.3	246	662	0.38	30.0	97
11	141.1	29.2	24.2	3.5	242	620	0.42	23.5	94
13	122.3	25.8	22.8	3.7	188	429	0.47	24.7	95
Mean	136.0	28.3	23.8	3.8	219	540	0.42	23.7	107
5% LSD	28.3	4.9	1.5	0.8	73	205	NS	9.7	21
Block									
1	157.5	31.7	24.0	3.3	287	729	0.39	25.5	116
2	141.3	29.3	24.3	4.0	227	565	0.41	26.3	115
3	134.2	28.2	23.9	3.7	204	501	0.42	26.4	109
4	115.8	25.4	23.3	3.6	183	434	0.44	22.2	99
5	131.3	26.8	23.7	4.3	193	472	0.41	17.9	95
5% LSD	15.3	2.6	NS	0.4	39	110	NS	3.6	11

There was a wide range of individual tree heights after 3 years of growth (63.0-257.0 cm). The mean treatment tree height values varied from 119.8 cm (family 15) to 148.0 cm (family 17), with only these two treatments just being significantly different from each other. Tree height in the control was well below the overall mean. There were significant

block differences, with block 4 being of much lower mean height. Stem diameter showed significant treatment differences. Again, block 4 was much smaller in this regard. The foliage was not as blue as might have been expected from other trees on the site, even though the trees grew vigorously, with mean treatment height increments in year 3 in the range of 57.0-73.0 cm. Although there were significant differences, trees were generally of excellent form, with small variation.

Treatment mean dry root weights varied greatly from 154 g (family 18) to 257 g (families 2 and 6), with some significant differences. Blocks also varied. Values for treatment dry shoot weight varied from 362 g (family 18) to 662 g (family 8), with many significant differences. Mean dry R/S varied only a limited amount, with no significant differences between blocks or treatments.

Root growth was mainly within the top 20-25 cm of soil. Families 7 and 8, however, stand out as having penetrated deeper (28 cm and 30 cm respectively). Rooting depth of the control was the lowest (20 cm), although these trees were shorter in height. Block 5 had a significantly lower mean rooting depth of 18 cm. Root spread at a mean of 107 cm demonstrated little between-tree competition, although it varied significantly between treatments, with block 5 again having a low mean value.

Discussion

This experiment was established to investigate the concern of forest managers that tree stability in terms of root biomass may be prejudiced by an overemphasis on above-ground parameters as criteria of success in tree breeding. Since all the improved families used were derived from selected superior phenotypes in terms of height, diameter and stem form, it is not surprising that many of them were found to have much greater height and stem diameter after 3 years than the unimproved control. Similarly, it is perhaps to be expected that tree form was good and differences between improved families were not great. The differences in foliage colour were relatively large, with the unimproved control being the least healthy in terms of being yellowish (although yellowing did not relate significantly to tree growth). There were substantial block differences in foliage colour, suggesting site differences between blocks which might affect root growth and R/S.

Despite the wide variation in both dry root and dry shoot weights between families and blocks, the R/S remained remarkably constant in the range 0.38-0.47, with no significant differences. The value of 0.42 for the unimproved Washington control was very similar to the figure of 0.418 obtained by Mayhead and Jenkins (1992) on the same site for 3 year Sitka spruce of Washington origin with a mean height of 2.0 m. However, the lowest R/S in the present study did not necessarily arise from small root systems but as much from the presence of large shoots (e.g. families 8 and 21). This experiment failed to demonstrate any significant differences in R/S between the improved families and the unimproved import. Of considerable interest is the substantially greater root depth achieved by some families (e.g. families 7 and 8) and the greater root spread found in other families (e.g. families 17 and 18). Families 7 and 8 were among the tallest trees, while family 18 was among the shortest.

Forest managers seek high shoot growth and high tree stability and it is possible to identify more interesting families on the basis of this study. For example, family 2 displayed above average height, stem diameter, tree form, dry root weight, dry shoot weight and root spread. This family also displayed the second highest R/S (0.46). By comparison, family 13 had the highest R/S (0.47), but displayed a well-below average root spread, very poor height growth and low root and shoot production. Family 17 is the tallest with above

average root and shoot weights, below average R/S, below average rooting depth and excellent root spread. Perhaps the most interesting point is that the unimproved Washington import was below average for all parameters except tree form. It appears that all families from the improvement programme based on QCI origin could be more stable than the reasonable forest management alternative of Washington seed source.

Conclusion

The experiment demonstrated a wide range of biomass production, height and stem diameter growth between improved Sitka spruce families of QCI origin grown under sheltered, fertile and weed-free conditions. Although significant differences in root spread and rooting depth were demonstrated, there was no evidence of significant differences in root/shoot ratio or that trees selected for above-ground vigour have an inferior rooting system. This indicates that current practices within the tree breeding programme are not having a detrimental effect on tree stability, as measured by root/shoot ratio.

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REFERENCES

Cahalan, C.M 1981. Provenance and clonal variation in growth, branching and phenology in *Picea sitchensis* and *Pinus contorta*. *Silvae Genetica*, 30:40-46.

Cannell, M.G.R. 1974. Production of branches and foliage by young trees of *Pinus contorta* and *Picea sitchensis*: Provenance differences and their simulation. *Journal of Applied Ecology*, 11:1091-1115.

Cannell, M.G.R. and Willett, S.C. 1976. Shoot growth phenology, dry matter distribution and root:shoot ratios of provenances of *Populus trichocarpa*, *Picea sitchensis* and *Pinus contorta* growing in Scotland. *Silvae Genetica*, 25:49-59.

Clair, J.B.S. 1993. Family differences in equations for predicting biomass and leaf area in Douglas fir. *Forest Science*, 39:743-755.

Coutts, M.P. and Nicoll, B.C. 1990. Growth and survival of shoots, roots and mycorrhizal mycelium in clonal Sitka spruce during the first growing season after planting. *Canadian Journal of Forest Research*, 20:861-868.

Deans, J.D., Mason, W.L. and Harvey, F.J. 1992. Clonal differences in planting stock quality of Sitka spruce. *Forest Ecology and Management*, 49:101-107.

Fraser, A.I. and Gardiner, J.B.H. 1967. Rooting and stability in Sitka spruce. Forestry Commission Bulletin 40. HMSO, London.

Henderson, R., Ford, E.D., Renshaw, E. and Deans, J.D. 1983. Morphology of the structural root system of Sitka spruce. 1. Analysis and quantitative description. *Forestry*, 56:121-135.

Mayhead, G.J. and Jenkins, T.A.R. 1992. Growth of young Sitka spruce (*Picea sitchensis*) and the effect of stimulated browsing, staking and treeshelters. *Forestry*, 65:453-462.

Nicoll, B.C., Easton, E.P., Miller, A.D., Walker, C. and Coutts, M.P. 1995. Wind stability factors in tree selection: Distribution of biomass within root systems of Sitka spruce clones. *In: Wind and trees*. Edited by Coutts, M.P. and Grace, J. Cambridge University Press. pp 276-292.

Nielsen, C.C.N. 1992. Will traditional conifer breeding for enhanced stem production reduce wind stability? *Silvae Genetica*, 41:307-318.

The development of urban forestry in the Republic of Ireland[1]

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Summary

The development of urban forestry in the Republic of Ireland is described, from its origins through to the early part of 1997. It begins by charting how the concept was initially promoted through a few pioneering projects and with the first Urban Forestry Conference, Dublin, 1991. Government recognition and support for the concept was evident from an early stage, most notably through the Forest Service's grant aid schemes for urban woodland. The Tree Council of Ireland has acted as a catalyst for action on urban forestry in a wide range of activities. The Environmental Conservation Organisation (ECO), one of its member organisations, has also played a leadership role in promoting the concept nationally and by building a network of interested organisations and individuals. The Second National Conference on Urban Forestry, held in Limerick, 1996, heralded the beginning of an urban forestry movement throughout Ireland and has stimulated interest in the development of comprehensive urban forest management systems by local authorities in the Republic.

Introduction

This paper charts the development of urban forestry in the Republic of Ireland, from its origins through to the early part of 1997. It draws on published literature from relevant journals and periodicals, conference and seminar proceedings, and from the local and national press. Unpublished material has also been used, mainly in the form of internal reports, promotional literature and committee minutes. These secondary sources have been supplemented by a considerable amount of original research. A questionnaire about urban forestry was circulated to delegates at the Second National Conference on Urban Forestry, held in Limerick, March 1996. Although only 10 replies were received, these contained some useful material which formed the basis of further research. A series of seven tape-recorded interviews were subsequently conducted with six individuals who had played a prominent role at various stages of the development of urban forestry in the Republic.

Although the concept of urban forestry emerged in North America in the late 1960s, it was not until the beginning the 1990s that it began to be recognised by many relevant professionals in the Republic of Ireland. A literature search of relevant Irish journals and periodicals undertaken for this study revealed no papers or articles on the subject and little mention of the term before that time. There may be a number of reasons for this. The Republic is a predominantly rural country with few major urban centres. The initial perception of urban forestry, as it was being developed and promoted in North America during the 1970s and 1980s, may have been of a concept that was primarily concerned

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with multi-million dollar programmes focusing on major cities (Johnston, 1996a). This may not have been regarded as relevant to the vast majority of the country, especially when much of central and local government was operating under severe financial constraints.

The position of the professions most relevant to urban forestry, i.e. forestry itself and arboriculture, has traditionally been different throughout Ireland to that of either Britain or North America (Johnston, 1996b and 1997). Irish forestry had always been concerned almost exclusively with commercial timber production in rural areas (Neeson, 1991), often with a public image that was not entirely sympathetic to environmental considerations (Fearon, interview, 1996). While this position has some parallels with forestry in Britain, the preoccupation with rural areas has been even more accentuated. The forestry profession in the Republic of Ireland had never sought a role in the management of urban trees and is only now beginning to consider this as the urban forestry movement develops.

Urban trees and woodland in the Republic are the overall responsibility of local authorities which employ a wide range of professionals, such as horticulturists, landscape architects and engineers, to undertake their management (Boylan, interview, 1996). Very few of these professionals are foresters and, more significantly, very few are arboriculturists. As a profession, arboriculture in the Republic has no independent representative body or recognised structure. The specialist post of Tree or Arboricultural Officer within a local authority, common in Britain and North America, does not exist to any extent. Those responsible for urban trees are invariably not specialists in this field and usually have a range of additional responsibilities (Mulloy, interview, 1996). The lack of specialist posts within local authorities may have been responsible for the slow adoption of new developments in urban tree management. Until the mid-1970s, standards of maintenance and management, even in Dublin, were frequently outdated (Boylan, interview, 1996) and invariably based around the individual tree with little perspective of the overall tree resource (Mulloy, interview, 1996).

In 1982, the publication of the first Irish textbook on urban trees represented an important contribution to the dissemination of knowledge on the subject (Mulloy, 1996). Entitled *A Manual on Urban Trees* and written by John McCullen and Richard Webb (1982), this is still used as a standard reference work (Webb, pers. comm., 1996). It contained little mention, however, of the overall management of the urban trees and the term 'urban forestry' was not used.

A major advance in promoting discussion and action about trees and forests at a national level came with the formation of the Tree Council of Ireland in September 1984 (Boylan, 1996). Although concerned with trees in both urban and rural situations, the Tree Council immediately began to play a major role in promoting urban tree planting and management. The structure and aims of the organisation were similar to its counterpart in Britain, with representatives from relevant public, professional and voluntary sector organisations and a brief to act as a national 'umbrella' body for trees. The initial funding to establish the Tree Council came from the Forest and Wildlife Service of the Department of Fisheries and Forestry.

The same month as the Tree Council was founded, the first public lecture on urban forestry to be given in the Republic was delivered by Andy Lipkis of the TreePeople project in Los Angeles (Boylan, interview, 1996). While visiting Ireland, Andy and Katie Lipkis contacted Jan Alexander, who had been inspired by TreePeople's work and who was now organising some small projects in the rural north-west. A few years later, Alexander and Ciaran McGinley formed a new voluntary organisation, Crann, to promote

tree planting throughout Ireland (Trench, 1987). Crann's first project was a forestry training scheme for the young unemployed, based in Co. Leitrim (Neeson, 1991; Anon., 1986). In planning and undertaking the training scheme, it gained advice and assistance from the Forest of London Trust (Hickey, 1988; Anon, 1987a) which was developing a city-wide urban forestry initiative in England (Johnston, 1991). The Tree Council also assisted Crann with the donation of tools and equipment (Boylan, interview, 1996). Through its early association with TreePeople and the Forest of London Trust, Crann was to have a significant impact on the initial development of urban forestry in the Republic.

Crann sa Chathair

Although Crann was concerned more with rural areas, in early 1987 it began to consider developing a community based urban forestry project in Dublin. Aware of the progress being achieved by TreePeople and the Forest of London Trust, it had also been looking at ways of involving its rapidly growing Dublin membership. As the city's Millennium was to be celebrated in 1988, this was seen as an opportune time to launch a major project as part of those celebrations. To promote the project, Crann persuaded the Tree Council (1987a) to invite a director of the Forest of London Trust to give a public lecture on urban forestry in Dublin, June 1987. The Trust also agreed to act as technical advisers to the proposed project (Tree Council, 1987b).

In September 1987, Crann (1987) produced a proposal for a major tree planting project in Dublin entitled Crann sa Chathair ('tree in the city'). The document, which was largely copied from the Forest of London's own project proposal, was distributed to interested organisations. It would be a community based project that aimed to plant 10,000 trees, divided equally between 10 districts throughout the city. This modest target was regarded as achievable and one which would reflect the theme of the millennium celebrations. The trees would be planted by local community groups, mainly on publicly owned land in their area. With the help of Crann's Dublin members, the groups would raise much of the funding to purchase the trees, thus hoping to ensure they were more valued as a community asset (Alexander, 1988). Although Crann had initiated the project, Crann sa Chathair would operate as a partnership of public and voluntary sector organisations, co-ordinated by a Steering Committee.

The proposed project received a major boost in October 1987, when Allied Irish Bank (AIB) agreed to provide IR£20,000 in sponsorship to fund its core administration (Anon., 1987b). The Tree Council (1987b) was also very supportive and offers of assistance were made, including the identification of suitable planting sites. Crann sa Chathair was formally launched in December 1987 at a civic reception in Dublin, attended by An Taoiseach and the city's Lord Mayor (Anon., 1988). The event attracted wide media coverage and gave a tremendous boost to the project's public profile.

The Crann sa Chathair project spanned the whole Millennium year and eventually succeeded in its aim of planting 10,000 trees. It also included some educational and arts events, designed to raise awareness and appreciation of trees among community groups (Johnston, 1992). Unfortunately, the project suffered from poor organisation which severely limited its impact, particularly in its practical tree planting work. Although significant in being the first project in the Republic to be promoted as an urban forestry initiative, its achievements remain the subject of debate (Boylan, interview, 1996). It undoubtedly promoted the concept of urban forestry in its project proposal and literature (Fearon, interview, 1996). The widespread media coverage it received certainly raised the

profile of urban trees in the minds of many Dubliners, thousands of whom were involved directly in planting and educational events. The project was able to respond to the increased environmental awareness among the city's population at that time and to demonstrate the potential for a practical expression of this through community tree planting (Maddock, interview, 1996).

In its practical aim of establishing 10,000 trees, the project was not successful (Boylan, interview, 1996). Although no complete survey of the plantings has been undertaken, it has been estimated that 90% of the trees had died within 6 months of being planted (Maddock, interview, 1996). This assessment is supported by local authority staff (Boylan, interview, 1996). Although a study of a few sites was undertaken, the results were never compiled into a report (Forrest, pers. comm., 1996).

The failure of the tree plantings was largely due to the project's organisational difficulties, in particularly, its poor relationship with the local authorities on whose land many of the trees were to be planted (Boylan, interview, 1996). The failure to form the proposed Steering Committee raises doubts about whether Crann (1988) had intended the project to be a partnership initiative. While the project generated tremendous publicity, Crann appeared unwilling to share this with its potential partners, something which might have encouraged them to respond more positively. Crann also failed to mobilise its Dublin membership to provide fund-raising support for the community groups, with the result that most of the trees were eventually purchased out of AIB's funding for administration. Although the Forest of London Trust had provided advice and material support for the project, this advice was invariably not followed (Johnston, 1992).

Although Crann sa Chathair had been conceived as an urban forestry initiative, its organisational difficulties resulted in it being more of a limited community tree planting and educational project. While many professionals were disappointed with its lack of success, there was also a feeling that the experience gained from the project could be usefully applied in future initiatives (Fearon, interview, 1996).

Developments with the Tree Council

In its efforts to promote urban trees, the Tree Council continued to be involved in a number of initiatives focusing on urban areas (Boylan, 1996). Many of these took place during National Tree Week, which had now been established as an annual event to promote trees and their planting and care. During Dublin's millennium year of 1988, the Tree Council and Dublin Corporation established a 16 ha Millennium Arboretum at St. Anne's Park in the city. In 1990, the Council supported the work of the Tidy Towns Committees, a series of partnership bodies carrying out civic improvements throughout the country. It offered every Committee a special discount on the purchase of trees for their projects and also distributed some 10,000 trees among the winning towns in the previous 1989 Tidy Towns Competition.

The Tree Council was also keen to promote high standards of tree management, particularly in urban areas, through its educational activities (Boylan, 1996). In June 1990, it organised a seminar on tree care at University College Dublin (UCD), addressed by Alex Shigo of the United States Forest Service. The seminar, which was highly attended, was followed by a 4-day workshop attracting 20 participants. Both events were a great success and played a significant role in convincing Irish professionals of the need to adopt more modern methods of tree care. National publicity for Shigo's visit was obtained when he was interviewed on a popular television programme.

Although the Tree Council had yet to embrace the concept of urban forestry, one of its member organisations was to play an important role in gaining recognition for this through a highly successful community involvement project in Finglas, Dublin.

The Finglas Community Tree Nursery

In April 1990, the Environmental Conservation Organisation (ECO), a national voluntary organisation for young people, launched its Community Tree Nursery in Finglas, a district in north-west Dublin (Finnegan, 1996). As well as propagating trees for use in the Finglas area, the project aimed to work with local schools in environmental education programmes and to involve community groups in the planting and care of trees. The tree nursery was located on a small plot of land donated by a local convent (Finnegan, interview, 1996). Rory Finnegan of ECO was appointed as the project supervisor and a further six staff were provided by Foras Áiseanna Saothair (FÁS), a government training agency (Cassells, 1990). The trainees would undertake the practical work of developing the nursery and would also received regular practical and theoretical instruction as part of a structured course (Finnegan, interview, 1996). A large number of young seedlings were donated by a Crann member with some additional stock donated by Dublin Corporation. Having an instant supply of young trees meant that the nursery could distribute these immediately rather than having to wait for its own stock to develop from seed.

As the first community tree nursery to be established in the Republic, it soon gained widespread publicity for its work (Finnegan, interview, 1996). As well as distributing trees to local schools, it began to attract requests for trees from schools throughout the country. Every effort was made to include an environmental education programme for each school in addition to simply providing it with trees. Many local schools regularly visited the nursery to help with practical work. In the project's second year, contacts were built with local community groups and, with the agreement of Dublin Corporation Parks Department, it began to involve groups of residents in the planting and initial maintenance of trees on publicly owned land. This was very successful, due largely to the good working relationship the project had established with the Parks Department. From residential gardens and small groups of trees in nearby open spaces, the work then expanded to establishing a small community woodland on local authority land.

The project's funding from FÁS supported the supervisor's post, the trainees and much of the materials and equipment (Finnegan, interview, 1996). An additional two staff each year were provided by the Schools Industrial Link Scheme. The project also raised IR£10,000 in sponsorship from local businesses, an impressive achievement which demonstrated the project's high standing in the local community. In the first few years of its operation, the project won a number of awards, including the AIB Better Ireland Award worth IR£5,000. In early 1995, the nursery relocated to a new site in nearby Glasnevin.

While not attempting to be a comprehensive urban forestry initiative, ECO's project made a significant contribution to promoting the concept in the Republic. Finnegan (interview, 1996), the driving force behind the initiative, was enthusiastic about urban forestry and particularly keen to explore the potential for community involvement in urban tree planting and management. As ECO's representative on the Tree Council, he was able to build personal contacts within many relevant organisations to promote not only the Finglas nursery but the concept of urban forestry (Fearon, interview, 1996). Most importantly, the project was an outstanding success which impressed and inspired many professionals (Collins, interview, 1996).

The Forest of Limerick project

The early interest in urban forestry in the Republic came to the attention of two individuals in the Department of Energy's Forest Service, John Fearon and Fergal Mulloy. Both were to play an important role in the concept's future development. Fearon (interview, 1996), a senior civil servant, was trying to promote a more positive environmental image for the forest industry which was being criticised in the media for some of its commercial plantations in rural areas. He was initially attracted to the term 'urban forestry' as he believed this might be a way of promoting urban residents' understanding and appreciation of forestry practice in rural areas. As Fearon researched the subject, he immediately recognised its value in improving the quality of the urban environment through the development of a strategic approach to the management of all urban trees and woodland. Fearon's interest in urban forestry was shared by Fergal Mulloy of the Environment and Research Branch of the Forest Service, and the two began to discuss how the concept could be developed practically in towns and cities in the Republic.

Fearon recognised that a very effective way of promoting urban forestry was through the various forestry grant aid schemes administered by the Forest Service. While previously limited to rural forestry, there was scope to extend these into urban areas under the government's EU-cofinanced 1989-1993 Forestry Operational Programme (Mulloy, interview, 1996). After drafting proposals for a new grant scheme for urban woodland, Fearon submitted these to the Minister for Energy, Robert Molloy, who became enthusiastic about the proposals and about urban forestry in general.

Fearon (interview, 1996) decided that the best way to promote urban forestry, and to pioneer the new grant scheme, was to find a major urban centre where the local authority and other relevant agencies could be sufficiently enthused to develop a practical project. Initially, he found some resistance to the concept as most professionals viewed trees from either a forestry or parks perspective. For them, forestry was something which belonged in the countryside and urban trees were the province of parks management. They had difficulty in understanding the relevance of this form of forestry which aimed to embrace entire urban areas. Fearon, however, eventually met David Deighan of Shannon Development who was enthusiastic about the concept. Shannon Development then approached Limerick Corporation, with which it worked closely, with a proposal to develop a partnership urban forestry project for the city (Madden, 1996). This was welcomed by the local authority as it had been considering ways to utilise its substantial areas of vacant land in and around the city. The full proposal, which emphasised large scale tree planting, seemed to offer a solution for much of this land. There was also an opportunity to launch a project that would have considerable public and media appeal. In 1991, the city would be celebrating the 300th anniversary of the Treaty of Limerick, creating an opportunity to link the project with the city-wide celebrations.

Following initial discussion among interested parties, it was agreed to launch a project entitled the Forest of Limerick (Madden, 1996). The Forest of Limerick Advisory Group (FLAG) was then established to develop the project with representatives from the Forest Service, Limerick Corporation, Shannon Development and local community and business groups. While developing plans for the project, Fearon (interview, 1996) and Mulloy undertook a study tour of the Forest of Cardiff project in Wales. They were impressed by its community and promotional activities, aspects of the project which influenced the development of their own proposals.

To provide the staff necessary to implement the project, Mulloy suggested that it should incorporate a training programme for unemployed people (Fearon, interview, 1996).

Together with Deighan, he secured the agreement of a local training agency, People Action Against Unemployment Limerick (PAUL), to engage 10 trainees each year to work on the project, during which they would receive instruction in forestry and horticultural skills. A suitable course was designed and a forester from Coillte, Jim Gibbs, was seconded to the project to act as supervisor and instructor.

A detailed proposal produced by FLAG succeeded in securing funding for the Forest of Limerick as a pilot project under the 1989-1993 Forestry Operational Programme (Madden, 1996). As it was envisaged that the project might eventually be replicated in other urban areas, it was agreed that it should be closely monitored by the Forest Service. This would ascertain the level and type of grant assistance appropriate to encourage urban forestry projects elsewhere in Ireland.

The Forest of Limerick was launched in March 1991 by Minister Molloy, to coincide with the 300th anniversary of the Treaty of Limerick (Madden, 1996). Tree planting began on four separate sites totalling approximately 15 ha. While three of these were established with little difficulty, the fourth proved less successful, due mainly to waterlogging and methane seepage arising from its former use as a landfill site (Collins, 1995). Several community planting activities were organised, including an imaginative scheme to dedicate the trees on one of the sites to local children born during the city's tercentenary year (Mulloy, interview, 1996).

After two successful years, the PAUL training scheme ended in 1993 when the initial sites had been planted (Madden, 1996). This seemed to trigger a loss of momentum in the project and the FLAG advisory group dissolved as a formal body soon afterwards (Collins, interview, 1996). The responsibility for the new woodland then passed to Limerick Corporation. Due to lack of resources, however, the local authority was not able to undertake all the necessary maintenance or develop any new sites.

The first two years of the Forest of Limerick gave the Forest Service encouragement to continue its promotion of urban forestry and to develop new grant schemes for urban woodland (Fearon, interview, 1996). It had achieved its objective of demonstrating the potential of urban forestry in a major urban area, particularly the value of an effective partnership of organisations working together and involving the local community and business. The early success of the Forest of Limerick did more to promote urban forestry in the Republic than any previous initiative and it clearly defined a model for urban forestry practice that could be replicated in other towns and cities (McConville, pers. comm., 1996). One of the most successful aspects of the project was the PAUL training course which resulted in 17 of the 20 trainees obtaining permanent employment (Madden, 1996). The course also helped to create a positive image for the project as it was seen to address the problem of high unemployment, a major concern among the local community. The loss of momentum in the project since 1993, however, has meant that its plans to develop into a comprehensive urban forestry initiative, with a strategic approach to the management of Limerick's entire urban tree resource, have yet to be realised.

The Urban Forestry Conference, Dublin, 1991

A firm commitment to the concept of urban forestry was now evident among a small group of professionals working with some national organisations, most of whom were also involved with the Tree Council. Following the success of the Forest of Limerick as a pilot project, the government now wanted to introduce and promote its new Planned Recreational Forestry Scheme, a grant package introduced into the 1991-1993 Forestry

Measures of the Operational Programme for Rural Development. To promote both the scheme and urban forestry in general, the Tree Council and the Forest Service agreed to jointly organise a national conference on the subject. Although a major conference on forestry and the environment had been organised by the Royal Dublin Society in October 1990, this had hardly mentioned urban forestry (RDS, 1990). A conference devoted solely to the subject was viewed by the organisers as a 'voyage of discovery' as there was still little knowledge of the concept in Ireland (Mulloy, interview, 1996).

The Urban Forestry Conference was held in UCD, June 1991. This one-day event attracted nearly 50 registered delegates, although the numbers actually attending the event may have been significantly greater. In the opening address, Minister Molloy (1991) outlined the forthcoming Planned Recreational Forestry Scheme, aimed at promoting the amenity and multi-objective aspects of forestry. The Minister also urged local authorities to take the lead in developing urban forestry projects, and emphasised the need for the local community to be involved at all stages in these initiatives.

The conference programme included several papers on various aspects of urban forestry given by both Irish and overseas speakers. The keynote address was by Fergal Mulloy of the Forest Service, with other contributions from Mark Johnston of the Forest of London Trust, Mike Kirby of the Countryside Commission in Britain, Ken Ellis from the Northern Ireland Forest Service, Neils Bundgaard from the Ministry of the Environment, Denmark, and Simon Bell of the Forestry Commission in Britain (Tree Council, 1991).

The conference's most significant achievement was in marking the government's official recognition of urban forestry, as clearly stated in the Minister's opening address (Molloy, 1991). The presence of the Minister undoubtedly contributed to the media coverage the conference received in the national press (Walsh, 1991). The fact that the event had been organised by the Forest Service and the Tree Council and addressed by the Minister, substantially increased the credibility of urban forestry in the eyes of many professionals. The presence of speakers from outside the Republic also demonstrated that urban forestry was a concept that was recognised internationally. Prior to the conference, understanding of urban forestry among professionals in the Republic had been quite limited, and the event was an important learning experience for those attending (Mulloy, interview, 1996). It also stimulated interest in urban forestry throughout the Republic, particularly its potential for community involvement (Sweeney, 1991; Henderson, 1992). In September 1992, a seminar on urban forestry entitled Trees in Town and the Urban Forest was organised by Crann in association with Tipperary NR County Council, the Tree Council and the Irish Tree Society, at Roscrea (Collins, 1995).

Grant aid and urban woodland projects

As previously mentioned, the Forest Service's Planned Recreational Forestry Scheme, which had been announced at the conference, was introduced into the 1991-1993 Forestry Measures of the Operational Programme for Rural Development (Collins, 1995). The scheme was designed specifically to encourage the planting of predominantly broadleaf woodland which facilitated public access and incorporated public recreational facilities. Grant assistance was also available to upgrade neglected woodland for recreational purposes and to encourage community involvement and educational work.

The scheme was significant in being the first time that grant aid could be obtained for the recreational and community development of woodland in the Republic. It was also an

opportunity for local authorities to develop their own woodland for these purposes, particularly those in and around urban areas. Despite the attractive grant levels, the scheme experienced a slow uptake initially, possibly due to concerns among public and private landowners regarding public liability (Collins, 1995). Another factor limiting its uptake in urban areas was the exclusion of the Dublin area from the scheme.

With the widespread publicity given to the new scheme, interest in urban forestry in the Republic began to focus increasingly on the development of urban woodland. A number of local authorities outside the Dublin area began to develop urban woodland initiatives to take advantage of the grants. In Clonmel, Co. Tipperary, the Corporation proposed to plant 10 ha of woodland on three separate sites near the town centre (Collins, 1995). The first site, at Carrigeen, was planted in the 1993/94 season, with the other two sites completed the following season. In order to safeguard the long term survival of the woodlands and to ensure their compatibility with future residential and industrial development, they were incorporated into the Clonmel Municipal Borough Development Plan. The project was complemented by high levels of community involvement in the management of publicly owned trees and open spaces within surrounding residential areas.

In Co. Wexford, two separate initiatives were developed by Wexford Corporation and Wexford County Council (Collins, 1995). At Trespan Rock Park, near Wexford town centre, the Corporation commissioned Coillte to produce planting proposals to improve the amenity value of the park, increase visitor numbers and to involve local community groups in practical conservation work. The planting was carried out during the 1993/94 season with grant aid from the new scheme. At a tree planting ceremony at Trespan Rock Park in advance of National Tree Week in February 1993, Wexford County Council announced the launch of an initiative to plant one million trees throughout the county over the next 10 years (Pepper, 1993). Although the planting would eventually be carried out in both rural and urban situations by a wide range of public, private and voluntary organisations, the proposals did include two urban woodland projects on land owned by the County Council at Carcur, Wexford Town, and at Creagh, near Gorey (Collins, 1995).

ECO's leadership in urban forestry

ECO's early interest in urban forestry had grown following the success of its Finglas Community Tree Nursery. In January 1992, the organisation issued a document entitled *Growing in the City*, which outlined its urban forestry policy and its intention to promote the concept throughout Ireland (ECO, 1992). Later that year, ECO approached the Forest Service (then located within the Department of Agriculture, Food and Forestry) with a proposal to initiate a postgraduate study of urban forestry in Ireland at UCD. John Mc Loughlin, ECO's Chairperson and activist on the Tree Council, was keen to promote urban forestry and he was to play a major role in encouraging ECO to become more closely involved. Mc Loughlin had recognised the potential of urban forestry in improving the quality of the urban environment through his permanent post as Coillte's Chief Environmental Officer. The Forest Service agreed to fund the research proposal, with support from the EU under the 1989-1993 Forestry Operational Programme. Professor John Gardiner of UCD subsequently approached one of its recent graduates in forestry, Kevin Collins (pers. comm., 1996), with the suggestion that he undertake the study as a postgraduate research thesis in the Department of Crop Science, Horticulture and Forestry. After reading some British literature on urban forestry in the university library, Collins became enthusiastic and agreed.

The research initially involved discussing the topic with leading members of the Tree Council and other relevant organisations. The fact that research on urban forestry was now being conducted at UCD and funded by the Forest Service, helped to give credibility to the project. As part of the research, Collins and Mc Loughlin undertook a study tour of the Forest of Belfast project, an urban forestry initiative that had recently been launched in Northern Ireland (Johnston, 1995). Their study tour of the project, and the subsequent involvement of several organisations from the Republic in its Tree Fair event in June 1993, was the first significant cross-border contact between professionals in Ireland in the field of urban forestry.

The research thesis, submitted in August 1994, was the first major review of urban forestry in the Republic of Ireland (Collins, 1994). In addition to a detailed review of the concept of urban forestry, the thesis included a case study of the potential for urban woodland creation in the form of an urban woodland proposal for Finglas. Based on a series of detailed site and community surveys, the so-called Finglas Wood project was intended to demonstrate how the principles of community involvement and urban woodland design and management could be applied in practice.

In September 1994, ECO (1995a) launched its Urban Forestry Programme to promote the concept's application in the Republic among local authorities, relevant organisations, community groups, young people and the general public. The programme would provide support to local authorities and other organisations wishing to develop urban forestry projects under the forthcoming grant aid for urban woodland contained in the Operational Programme for Agriculture, Rural Development and Forestry, 1994-1999. As part of this programme, ECO appointed a Community Forestry Officer, later retitled Urban Forester, to lead the initiative. This was the first post to be specifically created to promote urban forestry in the Republic and was funded, together with the rest of ECO's Urban Forestry Programme, by the Forest Service under the 1989-1993 Forestry Operational Programme.

In March 1995, ECO launched a report entitled *A Strategy for Urban Forestry in Ireland*, based on the research thesis (Collins, 1995). At the launch of the report, Jimmy Deenihan (1995), Minister for State at the Department of Agriculture, Food and Forestry, stressed the complimentary nature of ECO's Urban Forestry Programme with the efforts to promote urban forestry and urban woodland being undertaken by the Forest Service. Nearly 200 copies of the report were distributed to relevant organisations and individuals (ECO, 1995a). The report played an invaluable role in promoting urban forestry throughout the Republic and established ECO as a leading organisation in the field. It also included an account of the Finglas Wood project as a model for urban woodland creation and community involvement for organisations wishing to develop their own initiatives.

Following the launch of the report, ECO (1995a) undertook a series of talks on urban forestry to a wide range of organisations and community groups. As a national youth organisation, ECO was particularly keen to involve young people with urban tree planting and management and a special effort was made to promote practical projects among ECO's associated clubs and schools. In May 1995, ECO launched its *Community Forestry Resource Pack*, a pack aimed at post-primary level students and members of the public interested in becoming involved with trees and urban forestry in their locality (ECO, 1995b). Sponsored by the Electricity Supply Board (ESB), some 2,000 copies were distributed to ECO members, affiliated schools and interested community groups.

Through its Urban Forestry Programme, September 1994 to December 1996, ECO was able to play a leadership role in the development of urban forestry throughout the Republic (Collins, 1996c). This was particularly important at a time when the pioneering Forest

of Limerick project had lost momentum. With the support of other national bodies such as the Tree Council and the Forest Service, it kept interest in urban forestry alive, by developing its own initiatives, advising on those of other organisations and community groups, and by initiating and maintaining the beginnings of a national urban forestry network of interested organisations and individuals. ECO was to continue this work and play a leading role in several subsequent initiatives.

Further grant aid for urban woodland

In February 1995, the Forest Service launched two new forestry grant schemes which gave further emphasis to the recreation and amenity potential of woodland. The first, the Urban Woodland Scheme, was aimed at supporting the establishment or development of urban woodland by local authorities, specifically for public enjoyment and recreation (DAFF, 1995a). The second scheme, the Amenity Woodland Scheme, was available to other woodland owners and was aimed at supporting a wide range of recreational projects (DAFF, 1995b). Both schemes were supported by the EU under the Operational Programme for Agriculture, Rural Development and Forestry, 1994-1999.

The Urban Woodland Scheme was specifically designed to encourage urban woodland projects within the context of the growing interest in urban forestry (Collins, interview, 1996a). Due to the limited funding available for the scheme and its termination at the end of 1999, grants would be made selectively (Connelly, 1996). To ensure that as many local authorities as possible should benefit from the scheme, it specifically included the Greater Dublin area. While technical assistance on the development of a suitable project would not be available from the Forest Service, local authorities could obtain this advice from forestry consultants or from ECO.

Ireland's Second National Conference on Urban Forestry, Limerick, 1996

With the growth of interest in urban forestry since the first conference, the Tree Council began to consider holding a second event (Collins, interview, 1996a). The first conference had been organised largely with the aim of promoting the Planned Recreational Forestry Scheme and as work was proceeding on the development of the Urban Woodland Scheme, it seemed appropriate to organise a second event to coincide with its launch. In the summer of 1995, a conference organising committee was formed. It was decided to hold the conference in Limerick, partly in the hope that this might give fresh momentum to the Forest of Limerick project. Funding for the event, jointly organised by the Tree Council and ECO, was then obtained from the Forest Service and the EU, and Shannon Development.

As the first conference had focused on the theoretical aspects of urban forestry, it was decided to ensure that the majority of presentations at this conference highlighted practical examples of current urban forestry projects (Collins, interview, 1996a). As no comprehensive projects had yet been developed in the Republic and early initiatives were concerned mainly with urban woodland, speakers from seven separate ongoing initiatives in Britain, Northern Ireland and the United States were included in the programme.

Ireland's Second National Conference on Urban Forestry, held in Limerick City, 27th-29th March 1996, was attended by 119 delegates (Tree Council, 1996). The opening address was given by Minister Deenihan, underlining the government's continuing support for urban forestry. The programme of speakers was supplemented with a field trip to one of the sites of the Forest of Limerick project and discussion workshops on various

aspects of urban forestry. The event was considered a tremendous success by its organisers (Collins, interview, 1996a). The broad scope of the programme ensured that delegates were left in no doubt that urban forestry included all the trees in and around urban areas, and not just urban woodland. As the event took place over a 3-day period, there was much time for delegates to mix informally and to exchange experiences, ideas and opinions.

The Second National Conference on Urban Forestry heralded the beginning of an urban forestry movement in Ireland. While the first conference in 1991 had generated much interest and there had been a number of significant developments since that event, it was at the second conference that the diffuse network of individuals, organisations and projects came together and matured into a clearly identifiable movement. As urban forestry is essentially a local authority function, the presence of many local authority delegates at the conference had also marked a 'coming of age' for urban forestry. The presence of 10 delegates from Northern Ireland, including two speakers, illustrated the all-Ireland nature of the event, reinforcing the early contacts that had been made between professionals either side of the border. The publication of the conference proceedings was also a landmark in Irish urban forestry literature (Tree Council, 1996).

Developments since the Second National Conference

In April 1996, a month after the Limerick conference, Crann (1997) held a one-day seminar in Dublin entitled Trees in Urban Spaces. A large part of the proceedings comprised a discussion forum on community involvement in urban forestry, the overall theme of the seminar. While the Limerick conference had been a national event aimed primarily at professionals, the seminar was designed to attract representatives of voluntary and community groups in the Dublin area with the aim of increasing their involvement in the planting and caring of trees (Collins, interview, 1997).

Crann also continued to be involved in practical tree projects in the Dublin area. In November 1996, it organised a highly successful parade through the city centre on the theme of trees involving musicians, theatre groups and the general public (Anon, 1996). The publication of Crann's seminar proceedings in May 1997 was another major contribution to Irish literature on urban forestry (Crann, 1997). The increase in professional interest in urban forestry immediately following the second conference was also reflected in the publication of two articles on the subject in the widely-read trade magazine, *Irish Timber and Forestry* (Larkin, 1996; Collins, 1996d).

In early 1996, the Royal Dublin Society introduced an Urban Forestry category to its prestigious Irish Forestry Award (RDS, 1996). These annual awards, which aim to encourage good practice, are funded by the Forest Service and the EU. In its first year, the urban forestry category focused on outstanding examples of urban woodland development but in 1997 this was broadened to all aspects of urban forestry, including city-wide projects and street tree programmes (RDS, 1997).

In July 1996, the Department of Agriculture, Food and Forestry issued a policy document entitled *Growing for the Future: A Strategic Plan for the Development of the Forestry Sector in Ireland* (DAFF, 1996). This was the first time that such a strategy document had been produced for the entire Irish forestry sector. However, it contained no detailed reference to urban forestry, a surprising omission given the Forest Service's now substantial involvement in the field.

In January 1997, the Tree Council embarked on a 3-year programme specifically aimed at promoting urban forestry among local authorities throughout the Republic. The

programme, which included the establishment of a new post of Urban Forester, is funded by the Forest Service with the support of the EU under the Operational Programme for Agriculture, Rural Development and Forestry, 1994-1999. This initiative by the Tree Council represents one of the most significant advances yet made in the overall development of urban forestry in the Republic. It recognises that the participation of more local authorities is crucial to further progress, something originally highlighted by Minister Molloy (1991) in his opening address to the first conference in 1991. In the absence of specialist Tree Officer posts, it is unlikely that many authorities currently have a sufficient level of expertise or resources to become significantly involved (Brogan, pers. comm., 1996). The Urban Forester will provide some of this technical support, although the time devoted to individual local authorities will be quite limited (Collins, interview, 1997). The aim is to establish a small number of model projects with selected local authorities that can then be used to illustrate the benefits of urban forestry practice to other interested local authorities. Local authorities are also now becoming more aware of their obligations under Agenda 21 of the United Nations 1992 Earth Summit and there is an opportunity to promote the role of urban forestry in fulfilling these obligations, both in creating a sustainable urban environment and in encouraging greater public participation in achieving this (Collins, interview, 1996a).

In March 1997, the Tree Council (1997) launched its National Tree Week with the theme of ReLeaf Our Towns. Not only did this theme aim to highlight the importance of urban trees and woodland but the Council's promotion of the event clearly stated its continuing commitment to the concept of urban forestry (Powers, 1997). At the end of Tree Week, Conservation Volunteers Ireland (CVI), a leading practical conservation organisation, announced its Millennium Urban Forest Campaign (CVI, 1997). President Mary Robinson formally launched the project which had secured substantial sponsorship from Bord Gáis. Although CVI had always been involved in urban tree planting activities, this high-profile project signalled its much closer involvement in urban forestry (Collins, interview, 1997). Focusing on Dublin's urban areas, the project aims not only to plant 50,000 trees by the year 2000, but to achieve this through an extensive community involvement and education programme (CVI, 1997), The project has already developed partnership arrangements with South Dublin County Council and Dún Laoghaire-Rathdown County Council regarding the management of urban woodland in Tymon Park, Tallaght and Rathmichael Wood, Shankill. Although at an early stage, these partnerships are proving successful in effectively managing the woodlands, clearly indicating the potential for local authority and voluntary sector co-operation (Collins, interview, 1997). CVI have also appointed an Urban Woodland Officer with responsibility to support this work (CVI, 1996).

International contacts, research and education

The early development of urban forestry in the Republic was influenced more by initiatives in Britain than by those in North America, where the concept first originated. This is evident from the replies given in the research questionnaire and interviews conducted for this study. It was not until the Urban Forestry Conference in 1991, however, that regular contact between Irish and British professionals began to blossom. In August 1993, nine delegates from the Republic attended the 3rd UK Conference on Urban Forestry, Manchester, contributing substantially to the network of professional contacts between the two countries.

Regular contact on urban forestry between professionals in the Republic and the United States did not begin until the summer of 1992, when the Tree Council considered developing a Global ReLeaf programme in Ireland (Boylan, 1996). Global ReLeaf was an international tree planting initiative co-ordinated by American Forests, a national voluntary organisation based in Washington DC which had played a leading role in the development of urban forestry in the United States (Johnston, 1996b). The Tree Council's contacts with American Forests led to its Director, Paddy O'Kelly, attending the Sixth US National Urban Forestry Conference in September 1993, the first Irish professional to attend one of these events.

The early contacts between urban forestry professionals in the Republic and those in other countries were much expanded by ECO through its Urban Forestry Programme. Following the publication of its strategy report, copies were sent to several leading overseas academics in the field (ECO, 1995a). As overseas interest in developments in the Republic increased, ECO organised several study tours for visiting individuals and groups, including delegations from Finland, California and England. In September 1995, its Urban Forester attended the Seventh US National Urban Forestry Conference in New York and held discussions in Washington with senior officers of American Forests (ECO, 1996). As a result of ECO's efforts, developments in the Republic gained widespread recognition within the international urban forestry movement.

Academic research in the subject has begun to reflect the growing interest in urban forestry in the Republic. While the research project at UCD was completed in 1994, another significant project had been initiated much earlier. In 1990, Dublin Chamber of Commerce considered a proposal to undertake an assessment of the city's environment, including a major survey of Dublin's tree resource (Dick, pers. comm., 1996). The Dublin Urban Forest Project eventually began in 1993 and involved compiling an inventory of over 6,000 of the city's street trees and other trees and woodland in selected parks (COFORD, 1996). This was the first time such a survey had been undertaken in the Republic and its completion has provided the city authorities with an opportunity to use the information as the basis of a comprehensive urban forest management plan.

In April 1993, forestry research in the Republic was given a major boost with the launch of COFORD, the government's National Council for Forest Research and Development (Anon., 1993). The formation of COFORD indicated the government's recognition of the need to promote and co-ordinate forestry research throughout the Republic. The aims of its initial five-year research programme were clearly set out in its publication entitled *Pathway to Progress: A Programme for Forest Research and Development* (COFORD, 1994). Although directly concerned with rural commercial forestry, some research is being conducted into tree planting on difficult sites that has a direct application to urban trees (Mulloy, interview, 1996). There is a possibility that COFORD might extend its research into urban tree management when its current research programme ends in 1999.

Further opportunities for urban forestry research have recently emerged through the COST programme (Collins, interview, 1997). This is a pan-European research co-operation initiative within different sectors of industry, including the forestry sector. The forestry sector of the programme is itself divided into several different COST Actions studying different aspects of the industry. COST Action E12, entitled Urban Forests and Trees, aims to promote co-operation and regular liaison in research into urban trees and woodland among the member counties that have signed the Action's Memorandum of Understanding, which include the Republic of Ireland. While the COST Action is still at

an early stage, its European dimension and the involvement in its working groups of some leading Irish academics, promises to substantially raise the profile of urban forestry research in the Republic.

Academic education in urban forestry has also recently received some attention. The undergraduate courses in forestry and horticulture offered at UCD recently included some elements of urban forestry (Collins, interview, 1997). There is also a steady growth of interest among postgraduate students wanting to undertake research projects in the subject. However, there are not yet any distinct courses in urban forestry at any college or university in the Republic.

Conclusions

Since the beginning of the 1990s, steady progress has been made in the development of urban forestry in the Republic of Ireland. An ever-increasing number of organisations have come together, at a national and local level, to promote the concept as a modern approach to the management of the Republic's urban tree resource. An effective partnership of relevant public, private and voluntary sector organisations, so crucial to this approach, has been a feature of almost all initiatives since Crann sa Chathair, the Republic's first urban forestry project.

Of the various professions that are relevant to urban forestry, forestry itself has played a leading role and much progress has been due to the commitment of a small number of foresters. In the absence of arboriculturists and specialist Tree Officer posts within local authorities, the participation of other professionals directly involved in the planning and management of the urban tree resource, such as planners, landscape architects and parks managers, will be crucial to further progress.

Local authority involvement at a practical level remains largely confined to urban woodland, encouraged by the availability of grant aid. Their involvement has yet to embrace the management of other urban trees and these are still widely regarded as outside the remit of 'forestry'. For many professionals, urban forestry has had the appearance of a 'grant driven bandwagon' to promote urban woodland rather than as a planned, systematic and integrated approach to the management of the entire urban tree resource (Webb, pers. comm., 1996). The strategic aspects of urban forestry have yet to be widely recognised or implemented. The number of local authority delegates at the Second National Conference on Urban Forestry was, however, an encouraging sign of a growing interest in the concept among existing staff. With the establishment of the Tree Council's new urban forestry initiative, specifically aimed at local authorities, this position should improve.

Of the relevant government agencies, the Forest Service, with EU support under various forestry related operational programmes, has played the most prominent role in the development of urban forestry. It initiated the Forest of Limerick project and, using this as a successful pilot project, developed the first grant aid scheme for urban woodland. Ministerial support for this work from an early stage was vital in ensuring its success. Grant aid schemes for urban woodland have provided an increasing number of local authorities with a much-needed financial incentive to pursue these initiatives. The Forest Service has also facilitated a number of once-off initiatives such as conferences and Urban Forester posts with ECO and the Tree Council that have increased the recognition of the concept throughout the Republic. While limited by its statutory remit, Coillte has also been very supportive from an early stage. The Department of the Environment and Local

Government, the government agency with overall responsibility for the Republic's urban environment, has, however, yet to embrace urban forestry or play any direct role in its development. This may be due to continuing misconceptions regarding the broad scope of urban forestry and a lack of awareness that it is primarily a local authority function.

The early involvement of some national voluntary organisations has been another crucial factor in the development of urban forestry. Crann has consistently played an important role from the outset and ECO's contribution has been even more significant as the first voluntary organisation to really embrace the concept and promote it nationally through its Urban Forestry Programme. Not only did ECO develop the beginnings of a national urban forestry network, it also did much to gain international recognition for developments in the Republic.

As the national 'umbrella' body for trees and forests, the Tree Council has consistently shown vision and leadership. In its role as a catalyst for action, it has been very successful in stimulating interest in urban forestry and in encouraging its member organisations to become involved. It has provided a vital link between the public, private and voluntary sectors, encouraging a wide range of practical projects and played a leading role in organising the first and second conferences. Its new urban forestry initiative, supported by the Forest Service and the EU, is one of the most significant developments in recent years and should lead to much greater local authority involvement. Since the Second National Conference in 1996, the beginnings of a national urban forestry movement has emerged in Ireland, led by the Tree Council and many of its member organisations.

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PUBLISHED REFERENCES

Alexander, J. 1988. The Way Forward. *In:* A Seed In Time. Proceedings of the 1st UK Conference on Urban Forestry, Wolverhampton Polytechnic, 29th-31st March. A Seed in Time Ltd.

Anon. 1986. 40 acres to learn about trees. *The Sunday Press*, 1st June:9.

Anon. 1987a. Virgin boss in Crann link. *Longford News*, 2nd July:3.

Anon. 1987b. Sponsor for trees. *Horticulture Week*, 30th October:8.

Anon. 1988. Tree planting scheme to start in Dublin. *Horticulture Week*, 203(2):5.

Anon. 1993. New National Forest Research Council formed. *Irish Timber and Forestry*, 2(5):4.

Anon. 1996. Autumn festival of trees branches out. *The Irish Times*, 2nd November:24.

Boylan, C. 1996. A Decade of Growth: History of the Tree Council of Ireland, 1985-1995. The Tree Council of Ireland, Royal Hospital, Kilmainham, Dublin 8. 46 pp.

COFORD. 1994. Pathway to Progress: A Programme for Forest Research and Development. National Council for Forest Research and Development, UCD, Belfield, Dublin 4. 132 pp.

COFORD. 1996. Directory of Forest Research in Ireland, 1996. National Council for Forest Research and Development, UCD, Belfield, Dublin 4. 177 pp.

Collins, K.D. 1995. A Strategy for Urban Forestry in Ireland: A Review and Case Study. Environmental Conservation Organisation, 26 Clare St., Dublin 2. 72 pp.

Collins, K.D. 1996c. ECO and urban forestry - ten years revisited. *ECO News*, 9(1):18-20.
Collins, K.D. 1996d. Creating urban woodlands - a practical perspective. *Irish Timber and Forestry*, 5(6):10-12.
Connelly, J. 1996. The Urban Woodland Scheme - A Nationwide Opportunity. *In:* Proceedings of the Second National Conference on Urban Forestry, Limerick City, 27th-29th March. Edited by Collins, K.D. The Tree Council of Ireland and ECO. The Tree Council of Ireland, Royal Hospital, Kilmainham, Dublin 8. 100 pp.
Crann. 1997. Trees in Urban Spaces: Community Involvement in Releafing our Cities and Towns. Proceedings of a seminar hosted by the Dublin Crann Group at the Dublin Writers' Museum, 24th April 1996. Edited by Gunning, D. Crann, Main St., Banagher, Co. Offaly. 108 pp.
DAFF. 1995a. Urban Woodland Scheme. Forest Service, Department of Agriculture, Food and Forestry, Leeson Lane, Dublin 2. 12 pp.
DAFF. 1995b. Amenity Woodland Scheme. Forest Service, Department of Agriculture, Food and Forestry, Leeson Lane, Dublin 2. 12 pp.
DAFF. 1996. Growing for the Future: A Strategic Plan for the Development of the Forestry Sector in Ireland. Government Publications Sales Office, Sun Alliance House, Molesworth St., Dublin 2. 98 pp.
ECO. 1995b. Community Forestry Resource Pack. Environmental Conservation Organisation, 26 Clare St., Dublin 2.
Finnegan, R. 1996. Finglas Community Tree Nursery: A Model for Community Involvement. *In:* Trees in Urban Spaces: Community Involvement in Releafing our Cities and Towns. Proceedings of a seminar hosted by the Dublin Crann Group at the Dublin Writers' Museum, 24th April 1996. Edited by Gunning, D. Crann, Main St., Banagher, Co. Offaly. 108 pp.
Hickey, A. 1988. English tree expert sees great future for Crann. *Leitrim Observer*, 9 January:4.
Johnston, M. 1991. The Forest of London: I. Planting an idea. *Arboricultural Journal*, 15:127-143.
Johnston, M. 1992. The Forest of London: II. A model for others. *Arboricultural Journal*, 16:145-154.
Johnston, M. 1995. The Forest of Belfast: Healing the environment and the community. *Arboricultural Journal*, 19:53-72.
Johnston, M. 1996a. Book Review. *Irish Forestry*, 53(1&2):88-90.
Johnston, M. 1996b. A brief history of urban forestry in the United States. *Arboricultural Journal*, 20:257-278.
Johnston, M. 1997. The early development of urban forestry in Britain: Part I. *Arboricultural Journal*, 21:107-126.
Larkin, E. 1996. Urban Forestry Comes of Age. *Irish Timber and Forestry*, 5(6):8-9.
Madden, J. 1996. Trees in the City: The Forest of Limerick. *In:* Proceedings of the Second National Conference on Urban Forestry, Limerick City, 27th-29th March. Edited by Collins, K.D. The Tree Council of Ireland and ECO. The Tree Council of Ireland, Royal Hospital, Kilmainham, Dublin 8. 100 pp.
McCullen, J. and Webb, R. 1982. A Manual on Urban Trees. An Foras Forbartha, Waterloo Rd., Dublin 4. 139 pp.
Molloy, R. 1991. Opening Address. *In:* Proceedings of the Urban Forestry Conference, UCD, Dublin, 7th June. The Tree Council of Ireland, Royal Hospital, Kilmainham, Dublin 8. 60 pp.
Mulloy, F. 1996. The Way Forward. *In:* Proceedings of the Second National Conference on Urban Forestry, Limerick City, 27th-29th March. Edited by Collins, K.D. The Tree Council of Ireland and ECO. The Tree Council of Ireland, Royal Hospital, Kilmainham, Dublin 8. 100 pp.
Neeson, E. 1991. A History of Irish Forestry. The Lilliput Press in association with the Department of Energy. 338 pp.
Pepper, M. 1993. County Council to plant a million trees. *Enniscorthy Guardian*, 18th February:5.
Powers, J. 1997. Romancing the forest. *The Irish Times* Weekend Supplement, 1st March:11.
RDS. 1990. The Right Trees in the Right Places. Proceedings of a Conference on Forestry and the Environment, Royal Dublin Society, Dublin, 17th-19th October. Edited by Mollan, C. and Maloney, M. Royal Dublin Society, Ballsbridge, Dublin 4. 143 pp.

Sweeney, M. 1991. Urban Forestry. Paper presented at a workshop on Social Integration and the Creation of New Urban Activities in the context of a European Conference, The Improvement of the Built Environment and Social Integration in Cities. Berlin, 9th-11th October. Sica Innovation Consultants, Dublin.

Tree Council. 1991. Proceedings of the Urban Forestry Conference, UCD, Dublin, 7th June. The Tree Council of Ireland, Royal Hospital, Kilmainham, Dublin 8. 60 pp.

Tree Council. 1996. Proceedings of the Second National Conference on Urban Forestry, Limerick City, 27th-29th March. Edited by Collins, K.D. The Tree Council of Ireland and ECO. The Tree Council of Ireland, Royal Hospital, Kilmainham, Dublin 8. 100 pp.

Trench, B. 1987. The Crann Crusade. *Magill*, December:24-25.

Walsh, B. 1991. Seeing the woods from the cities. *The Irish Times*, 10th June:4.

UNPUBLISHED REFERENCES

Boylan, C. 1996. Tape-recorded interview, 5th September.

Brogan, A. 1996. Written reply to questionnaire.

Cassells, P. 1990. Finglas Community Tree Nursery. Project proposal and work programme. Foras Áiseanna Saothair, 27-33 Upper Baggot St., Dublin 4.

Collins, K.D. 1994. Urban Forestry in the Republic of Ireland. A Review and Case Study. Thesis submitted to the Department of Crop Science, Horticulture and Forestry, University College Dublin, for the degree of Master in Agricultural Science (Forestry).

Collins, K.D. 1996a. Tape-recorded interview, 6th September.

Collins, K.D. 1996b. Written reply to questionnaire.

Collins, K.D. 1997. Tape-recorded interview, 24th May.

Crann. 1987. Project proposal for Crann sa Chathair. Crann, Main St., Banagher, Co. Offaly.

Crann. 1988. Minutes of a meeting held to discuss Crann sa Chathair at the Allied Irish Bank Centre between representatives of Crann, AIB and Dublin Corporation Parks Department, 23rd March. Crann, Main St., Banagher, Co. Offaly.

CVI. 1996. Job description for the post of Urban Woodland Officer. Conservation Volunteers Ireland, PO Box 3836, Ballsbridge, Dublin 4.

CVI. 1997. The Millennium Urban Forest Campaign. Launch information pack. Conservation Volunteers Ireland, PO Box 3836, Ballsbridge, Dublin 4.

Deenihan, J. 1995. Address by Jimmy Deenihan, Minister of State at the Department of Agriculture, Food and Forestry, at the launch of ECO's report entitled A Strategy for Urban Forestry in Ireland, ENFO, St. Andrew St., Dublin 2, 1st March. Environmental Conservation Organisation, 26 Clare St., Dublin 2.

Dick, W. 1996. Written reply to questionnaire.

ECO. 1992. Growing in the City: ECO's Urban Forestry Policy. Environmental Conservation Organisation, 26 Clare St., Dublin 2. 12 pp.

ECO. 1995a. ECO's Urban Forestry Programme. A report on ECO's activities in urban forestry from 1st September, 1994 to 31st August, 1995, compiled for the Forest Service, Department of Agriculture, Food and Forestry. Environmental Conservation Organisation, 26 Clare St., Dublin 2.

ECO. 1996. ECO's Urban Forestry Programme. A report on ECO's involvement in urban forestry from 1st September 1995 to 13th September 1996, presented to ECO's National Council. Environmental Conservation Organisation, Dublin.

Fearon, J. 1996. Tape-recorded interview, 6th September.

Finnegan, R. 1996. Tape-recorded interview, 5th September.

Forrest, M. 1996. Letter to Mark Johnston, 20th September.

Henderson, E. 1992. The Need to Strengthen Community Involvement in Tree Planting Projects: A Case Study in Ronanstown, Dublin. Thesis submitted to the School of Agriculture and Forest Sciences, University College of North Wales, for the degree of Bachelor of Sciences (Honours) in Agroforestry.

Larkin, E. 1996. Written reply to questionnaire.

Maddock, A. 1996. Tape-recorded interview, 6th December.

McConville, J. 1996. Written reply to questionnaire.
Mulloy, F. 1996. Tape-recorded interview, 5th September.
RDS. 1996. The RDS Irish Forestry Award 1996. Promotional leaflet issued by the Royal Dublin Society, Ballsbridge, Dublin 4.
RDS. 1997. The RDS Irish Forestry Award 1997. Promotional leaflet issued by the Royal Dublin Society, Ballsbridge, Dublin 4.
Tree Council. 1987a. Leaflet promoting a public lecture on the Forest of London Project by Mark Johnston, ILAC Centre, Dublin, 22nd June. The Tree Council of Ireland, Royal Hospital, Kilmainham, Dublin 8.
Tree Council. 1987b. Minutes of the 25th Meeting of the Tree Council, 6th October. The Tree Council of Ireland, Royal Hospital, Kilmainham, Dublin 8.
Tree Council. 1997. ReLeaf Our Towns. Press release to promote National Tree Week 1997. The Tree Council of Ireland, Royal Hospital, Kilmainham, Dublin 8.
Webb, R. 1996. Written reply to questionnaire.

Forestry and the environment – a sustainable prospect[1]

Fergal Mulloy[2]

Of old the world by dreaming fed
Grey truth is now her painted toy

W.B. Yeats

Part 1: The new agenda

Sustainable development – an emerging concept

Sustaining the world's resources has become a new priority for world leaders. Whether it ever becomes a 'painted toy' remains to be seen. When, in 1987, Dr Gro Harlem Brundtland, former Prime Minister of Norway, published *Our Common Future*, the report of the World Commission on Environment and Development, a fundamental shift in perceptions of the global environment commenced. Two years before its publication, one of the world's most horrific environmental disasters took place in Bhopal. The following year, the nuclear catastrophe at Chernobyl occurred. In addition to these momentous events, tropical deforestation was taking place at an alarming rate. The Brundtland report concluded that the burden of indebtedness was forcing many countries in the developing world to use their forest resource to meet debt repayments. Debt servicing and the human demands for land resources were impacting on forests faster than they could be regenerated.

From the Brundtland report, the concept of sustainable development emerged as a political issue. (Although the World Conservation Strategy of 1980 took the first step in popularising the concept of sustainability, the Brundtland report promoted it onto the world's political agenda.) The concept is encapsulated in *Our Common Future* as meeting the needs of the present without compromising the ability of future generations to meet their own needs. The report laid the foundation for UN General Assembly Resolution 44/228, which convened the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro, 1992. Among the issues that were to be tackled at the conference was the protection of land resources by, *inter alia*, combating deforestation (Humphreys, 1996).

The tropical forest issue

Meanwhile, during the 1980s, awareness was emerging among donor countries, non-governmental organisations (NGOs) and the tropical countries of the need to develop a plan for tropical forests. The Tropical Forest Action Plan, later to be known as the Tropical Forest Action Programme (TFAP), was subsequently formulated by the UN Food and Agriculture Organisation (FAO). It incorporated five action programme areas. These, however, had very limited impact on deforestation. In fact, when the plan was reviewed in 1990, many felt that it had not only totally failed to arrest deforestation, but had, in some

[1] Paper presented at the Annual Symposium of the Society of Irish Foresters, April 1997.

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curious way, exacerbated the problem. Strangely, or perhaps not so strangely, the main criticism came from those countries which had not paid their annual subscriptions to FAO!

Seventy-six of the 120 countries and regions that have tropical forests developed National Forestry Action Plans under the TFAP (Humphreys, 1996). These national plans were agreed between the donor countries and the country concerned. However, while slowing the destruction of the tropical forest resource, many of the implications of a process driven by countries in the northern hemisphere proved both politically and economically unacceptable for those countries whose dependence on wood was high.

Definitions of sustainability

By the time of UNCED, the world's forests were firmly established on the international agenda. All levels of political clout were being brought to bear on forestry issues, including the G7, the Council of the European Union and individual forestry ministers. Sustainable development and more specifically, sustainable forest management, had suddenly become the illusive target, as reflected by shifting definitions of its objectives. For example, in 1991, the International Tropical Timber Organisation (ITTO) defined sustainable forest management as follows:

> Sustainable forest management is the process of managing permanent forest land to achieve one or more clearly specified objectives of management with regard to the production of a continuous flow of desired forest products and services without undue reduction of its inherent values and future productivity and without undue undesirable effects on the physical and social environment.

In 1992, meanwhile, the FAO formulated a definition of how sustainable development applied to forests:

> Sustainable development is the management and conservation of the natural resource base and the orientation of technological and institutional change in such a manner as to ensure the attainment and continued satisfaction of human needs for the present and future generations. Such sustainable development (in the agricultural, forestry and fisheries sectors) conserves land, water, plant and animal genetic resources, is environmentally non-degrading, technically appropriate, economically viable and socially acceptable.

A series of four preparatory conferences took place prior to the Rio conference. At these, a definition of sustainable development was a major issue. At Rio itself, it was decided not to define sustainable forest management but to include a strong reference to it in one of the statements of principles.

During the process, a fundamental difference in philosophies emerged between the more developed countries of the northern hemisphere and the developing countries of the south. Essentially, the north regarded deforestation as a global problem where the forests played an essential role in the world's carbon cycle and global warming. Meanwhile, the south regarded the issue as regional and within their own competence to manage, given moral and financial support from the north. The south also expressed the view that the north consumes too much and that the global economic system is exploitative and is a driving force behind environmental degradation.

North and south positions still prevail, as witnessed by a recent statement by Nelson

Wong (1997) of the Malaysian Timber Council, "Deforestation in Malaysia began under the British colonial rule. Vast areas of virgin forest were cleared for rubber plantations. Rubber latex was supplied to Great Britain for tyre manufacturing for the British motor car industry. It is strange for developing countries to witness the plundering of their forest over the past few centuries and watched the empires of these developed countries grow richer and more powerful. Stranger still when they have sucked the third world dry, to turn around and tell the third world that they must keep their forests while we in the developing countries understand the importance of our forests. I don't think we are in the business of keeping western environmentalists happy."

Protection of Europe's forests

In Europe, meanwhile, a ministerial conference in Strasbourg in 1991 passed six resolutions to protect Europe's forests. Many research and forest protection initiatives within Europe are a direct result of this conference. For example:

- the monitoring of forest health was incorporated in Resolution 1;
- the present COST[3] Action on forest physiology resulted from Resolution 4;
- EU-funded concerted action European Forest Ecosystem Research Network (EFERN) resulted from Resolution 6.

A second ministerial conference on the protection of forests in Europe took place in Helsinki in 1993. This conference, which led to the Helsinki Process, passed four resolutions dealing with sustainable forest management and biodiversity. A third ministerial conference is scheduled for Lisbon in 1998.

The UNCED definition of sustainability

A non-legally binding authoritative statement of principle for a global consensus on the management and sustainable development of all types of forest was agreed at UNCED in Rio. To some extent, this was a compromise between the aspirations of the north and the economic needs of the south. According to Humphreys (1996), the statement represents "a mean position of the lowest common denominator between North and South". Principle 2(b) of the statement states:

> Forest resources and forest lands should be sustainably managed to meet the social, economic, ecological, cultural and spiritual human needs of present and future generations. These needs are for forest products and services, such as wood and wood products, water, food, fodder, medicine, fuel, shelter, employment, recreation, habitats for wildlife, landscape diversity, carbon sinks and reservoirs, and for other forest products. Appropriate measures should be taken to protect forests against harmful effects of pollution, including airborne pollution, fires, pests and diseases, in order to maintain their full multiple value.

The statement of principles thus became the basis for subsequent action. Several initiatives emerged as a result of the Rio conference. As far as Ireland is concerned, these fall into two main areas: sustainable forest management and certification. Initiatives relating

[3] COST – Co-operation in Science and Technology, an EU initiative to foster networking and information exchange in science and technology.

to sustainable forest management include the UN's InterGovernmental Panel on Forests (IPF), the Helsinki process and the International Standards Organisation's (ISO) 14000 series, while those relating to certification include the Forest Stewardship Council (FSC). These initiatives are already influencing, or will soon influence, operations within the Irish forest industry, and will undoubtedly impact upon the course of future forest management in Ireland.

The InterGovernmental Panel on Forests

The first occasion that forests were discussed within the UN after the Rio conference was during the 1995 session of the Commission on Sustainable Development. At this high level meeting, the IPF was established, with a mandate to pursue consensus and to formulate options for further action to combat desertification and forest degradation. It would also promote management, conservation and sustainable development of all forest types. Its main task was to promote multi-disciplinary actions at the international level consistent with the UNCED Declaration and Agenda 21. (Agenda 21 is intended to be an action agenda for governments, aid agencies and other players in environmental issues up to the end of the century.)

The fourth and final session of the panel was held in New York in early 1997. Much of the debate centred around whether or not countries should enter into formal negotiations that would ultimately lead to the creation of a legally binding International Forest Convention. Some countries expressed support for such a convention, while others were strongly opposed to it. Disagreement existed even among strong political allies such as Canada and USA. The sudden about-face of most NGOs, who now state that they are against an International Forest Convention even though they initially advocated such a move, has also added much confusion (Moore, 1997).

Sovereignty, financial and trade related issues still stand between the international community and any consensus on forests. Agreement has yet to be reached regarding what sustainable forest management means in concrete terms, or how to balance commodity and economic values of forests with ecological and socio-cultural values.

The next stage in the process that will consider international forest policy will be the Commission on Sustainable Development and the UN General Assembly (Anon., 1997). Ireland supports the concept of a legally binding convention as the process moves towards the next UNCED event.

The Helsinki Process

Discussions surrounding the introduction of mechanisms of putting the Helsinki conference resolutions into practice began in 1994. A follow-up expert group approved a list of six pan-European criteria and 20 suitable qualitative indicators which will be the tool for gathering and assessing information on how the signatory states have succeeded in implementing the general guidelines for sustainable forest management, as described in Resolutions 1 and 2 of the Helsinki conference (Anon., 1994). These criteria are as follows (from Humphreys, 1996):

- maintenance and appropriate enhancement of forest resources and their contribution to global carbon cycles (three indicators);
- maintenance of forest ecosystem health and vitality (four indicators);
- maintenance and encouragement of the productive function of forests (wood and non-wood) (three indicators);

- maintenance, conservation and appropriate enhancement of biological diversity (five indicators);
- maintenance and appropriate enhancement of protective functions in forest management (notably soil and water) (two indicators);
- maintenance of other socio-economic functions and conditions (three indicators).

The Forest Service represents Irish interests both at the IPF and in the Helsinki Process.

ISO 14000 series

The ISO is an international body for the development of standards. The ISO 14000 series deals with environmental management systems (EMS), certification and labelling. For example, ISO 14001 deals with EMS's, while 14004 outlines a procedure for drafting environmental quality systems. The ISO 14000 series is not specific to forest management, nor does it specify performance levels. An ISO working group is, however, now actively engaged in drafting a reference document for the use of ISO 14001 by forestry organisations. Ireland is represented at ISO meetings by the National Standards Authority of Ireland.

The Forest Stewardship Council

The formal establishment of the FSC initiative in October 1993 by the World Wildlife Fund for Nature (WWF) was essentially a reaction to the failure of the ITTO to introduce a labelling programme for forest products. Given its governmental representative nature, the ITTO could not, or was not prepared to, introduce a labelling system, as such a move could have been regarded as being illegal under GATT (Humphreys, 1996).

There is much debate about principles, criteria and more specifically, the indicators, used by the FSC. The cost of certification and who bears that cost, are also major issues. At issue too is the certification process itself. The FSC accredits certifiers who assess whether a forest is 'well managed' according to predetermined indicators. Products from certified forests can then be traced through the system to the final consumer. This certification process applies to wood products from tropical, temperate and boreal forest, both planned and natural. Irish Woodworkers for Africa represents the interests of the FSC in Ireland.

Part 2: Sustaining the Irish forest resource

A national forest

There are fundamental aspects concerning Irish forests which are unique to this island and which must be considered if we are to be consistent with the Helsinki resolutions and the aspirations in the Government's strategy document *Growing for the Future* (Department of Agriculture, Food and Forestry, 1996).

One essential for applying sustainable forest management to Irish forestry practice is to decide whether our forests represent a series of individual wood lots, where sustainability is measured within the boundaries of the wood lot, or a national forest, where the sustainability of that resource is enshrined in national policy and supported by law. There is a strong argument that our national forest is a single unit of management. The overwhelming need in Ireland, which experienced a dramatic drop in forest cover to under 2% by the second decade of this century, was, and still is, the restoration of the national forest. While the sustainable management of this national forest is an important issue, it must take account of the sustainability of individual sites.

Establishing the forest resource

The first task of Irish foresters was to develop, or more correctly, to re-establish, this forest and associated ecosystems. This process was begun in Ireland almost a century ago. Since then, foresters have been rebuilding a forest resource principally on land regarded as being marginal for agriculture. The focus during this period has been to generate an economic production unit within which the main product is wood. This focus is likely to continue in our nationally owned forest, given the encapsulation of a commercial ethos in law in the form of the 1988 Forestry Act. It is the intention that it should also happen in private woodlands. In fact, wood production is the very *raison d'être* for the re-creation of Irish forests. The aim of *Growing for the Future* is to build on the achievements of the past so that forestry can realise its full potential contribution to Ireland's economic and social well-being.

The new forest resource

Since the establishment of the forest plots at Avondale almost 95 years ago, the species signpost has firmly pointed down the conifer route. Initially, this signpost directed foresters towards a broad band of European coniferous species particularly suited for many old estates acquired during the 1930s. Although not described as such, diversity was the underlying result, having been so dictated by soil conditions and plant availability. The resultant plantations generated a mixed forest resource which has now been almost completely replanted with North American species, the wood value of which is considered the deciding issue.

A new political drive in the early 1950s resulting from the influence of Sean McBride in government coincided with the arrival of the Cuthbertson, and later, the Clark ploughs. These factors allowed for an afforestation push onto peatland, peaty gleys and poor mineral soils, the acquisition of which was conditioned by price. For three and a half decades, there existed a very close relationship between the price of a pair of shoes – unfashionable men's shoes at that – and the maximum price payable for an acre of land for afforestation. Acres planted became more important that their ability to grow wood economically and even less, their ability to accommodate a diverse range of species. It is on such land that approximately three quarters of our national forest resource exists.

Biodiversity in forests

The forest should be defined as an ecosystem within which a dynamic relationship and interdependence exists between flora and fauna and their environment. It is essentially a place where a relationship exists between all elements of the system. For this forest to be sustainable, the activities undertaken by man – be they wood harvesting, hunting, recreation or even bird watching – must not be to the detriment of the ability of the other elements of the ecosystem to respond, recover and continue the dynamic process of renewal and change. This ability encompasses the totality of relationships including carbon cycling, nutrient and water budgets and, most essential of all, the biological entities that drive the process. Whether these biological entities are complex, diverse, simple or narrow, depends on the ecosystem. Their function is to ensure that the cycle is capable of completion. Species numbers may not be as significant as species function.

Biodiversity must be seen in the context of resilience, response and recovery. Genetic resources associated with species, the habitat they require and their resilience in times of stress, lie behind the logic of conservation. "You take my life" says Shylock in *The Merchant of Venice*, "when you take the means by which I live". This same logic lies behind

the significance of habitats and the Habitat Directive that we are obliged to follow. Biodiversity should not be seen as an end in itself, but rather, as a means of supporting resilience and adaptability.

Resilience and adaptability

Any debate as to whether our peatland should ever have been planted is irrelevant at this stage. What is of more importance is whether or not, within the context of sustainable forest management, such areas should be reforested as the current forest cover is harvested.

Among the aspects to be considered in respect to the felling of mature peatland forests will include the impact of harvesting operations on the physical and chemical properties of water (in relation to both fish and human consumption), the peat itself and the landscape. The oxidation and buffering capacity of the growth medium will also require further consideration and should be supported by continued scientific investigation.

To assess such impacts, a total analysis of how harvesting and establishment operations are to be undertaken has yet to be tried and tested. Some Irish research is being undertaken that will help to chart the future course of events. Legally, of course, there is no such argument. The 1946 Forestry Act is quite specific in that it caters for the licensing for the felling of all trees in a forest context. As part of the licensing process, the licensee is obliged to replant the area felled or a similar area, by agreement with the Forest Service. Thus, the precept of sustaining forest cover is observed. If, however, research shows that the impacts are unacceptable in the context of the sustainability of the site itself and thus compromise our obligation to practise sustainable management, the legal obligations contained in the act will require modification. In the case of peatland forestry, oxidation following drainage and planting could be such that the peat itself is diminished. This could bring into question the long term sustainability of peatland forestry if the rate of carbon sequestration is less than the rate of oxidation.

On the credit side, however, a new ecosystem development process has commenced within these areas which will, without doubt, influence strict legal interpretations. Initial ground preparation has changed surface configuration, allowing new microclimates to develop with a consequential impact on species range. Shelter is contributing towards the broadening of both species range and function. Controlled by soil fertility and micro-organisms, the process is helped by natural regeneration and the build-up of forest litter. The process of species diversification has commenced which must surely balance many of the possible negative influences.

Life Cycle Analysis

Considerations regarding sustainability in forestry generally extend beyond felling and replanting. It also applies to all aspects of forest growth and harvesting and must, of necessity, cover the long and short term interests of all our citizens and the ability of future generations to meet their needs from this resource. They must therefore outweigh immediate economic considerations.

Minimum impact operations must be considered in the context of sustainability. The assessment of such impacts must be undertaken from an economic as well as an environmental viewpoint. Among the recognised methods of such assessment is Life Cycle Analysis (LCA), also known as Life Cycle Assessment. This method identifies and evaluates the inputs and outputs of processes in terms of environmental costs, if any. In an ideal situation, all material and energy inputs are traced back to their extraction from the

environment and all releases traced back to the environment. These are then registered in a life cycle inventory (Frühwald and Solberg, 1995). Research workers are currently assessing the flows of energy inputs from seed sowing to final harvesting. Under the current methods of assessment, wood and wood products emerge high among all primary production systems in regard to energy and carbon cycling. In this context, forests and the use of wood products contribute to the fight against greenhouse gases in three ways:

1. carbon sequestration by harnessing CO_2 during tree growth;
2. substitution with wood of high fossil energy products such as plastic, steel and aluminium;
3. reuse of wood products for energy, thus avoiding the use of fossil fuels.

Forest and wood products emerge as highly positive. Indeed, it only remains a matter of time before their value in the context of overall impact on the environment becomes manifest to all. It will thus help to counteract public perception that it is environmentally detrimental to fell a tree.

LCA is a new discipline which can be of enormous help to forestry and wood production, assuming, of course, that the same criteria are used in the assessment of other production processes.

Building the ecological reserve

In Ireland, approximately 5,000 ha of forest cover is being felled annually, and approximately 22,000 ha planted – a ratio of over four to one. The move onto better quality land has resulted in an improvement in wood production capacity, biodiversity and multi-functionality. The generation of a series of national forest ecosystems is therefore in an upward spiral. These areas are now new ecological assets in that they are workshops for ecosystem development and change, with the continual cycle of felling and regrowth providing homes for plants with varying requirements (Rackham, 1995). The afforestation process currently taking place on better land is therefore not only laying the foundation for wood production, but is also generating an ecological resource, thus adding to Ireland's natural heritage.

Applying sustainable forest management to new forests

The norms which governed the establishment of our existing forests no longer apply today. Gone is the government dictate that forests can only be established on land unsuitable for agriculture - a factor which limited species diversity given altitude and fertility constraints. Afforestation, assisted by grant availability, is now competing with conventional agriculture for the use of our lowlands. On such land, species diversity will undoubtedly increase, given its inclusion as a new condition for grant aid and the fact that fertility is no longer a limiting factor in species selection. Fertilisation is also not normally required, while herbicide usage, if considered necessary at all, is minimal and confined to the initial half decade. These factors will prove positive in the LCA process. In addition, landscape impacts are not as critical on lowland as they can be at higher elevations, where visibility is over a very much greater area. Meanwhile, association and integration with lowland farming present an opportunity to introduce or increase the woodland component in the landscape, thereby promoting biodiversity by providing a greater boundary:area ratio.

Conclusion

Sustainable forest management is not limited to the silvicultural aspects of forestry. Instead, it encompasses the entire forest environment, including socio-economic aspects and its impact upon rural development. Irish forests are multi-functional in nature, where people are, and must remain, the prime beneficiaries. While wood is harvested for economic benefit, this benefit must be seen within the context of rural communities and environmental impact. LCA will be a way of measuring the broad sweep of sustainability issues and will pinpoint the operations and practices which cause the highest cost to the environment.

In regard to rural development, distant economic benefit is not conducive to rural harmony. Similarly, distant control alienates communities and leads to local disenchantment. Sustainable forest management requires diplomacy as well as technical skill. It helps to replace monologue with dialogue, and affirms local involvement. Although perhaps not listed among criteria for success, sustainable forest management in the Irish context must include acknowledgement of the environmental benefits of forests, be they carbon sequestration, habitat creation, soil protection or the provision of opportunities for recreation. It must also include the appreciation of wood use as an environmental plus, and the recognition of wood, whether it be for fuel, construction or paper, as the world's ultimate renewable resource.

Irish laws and government encouragement for forest development are ensuring a net increase in forest cover and wood grown in Ireland, an increase which is projected to continue for at least the next 30 years. Our skills as foresters must match the challenges that confront us all. We must not be found wanting.

ACKNOWLEDGEMENTS

The author would like to thank Gerhardt Gallagher (Forest Service), Eugene Hendrick (COFORD) and Eilish Kennedy (Forest Service) for their suggestions and help in the preparation of this paper.

REFERENCES

Anon. 1994. Ministerial Conference on the Protection of Forests in Europe. Press release, 24th June.

Anon. 1997. IPF-4 press summary, 1st April.

Department of Agriculture, Food and Forestry. 1996. Growing for the Future: A Strategic Plan for the Development of the Forestry Sector in Ireland. Government Publications Sales Office, Sun Alliance House, Molesworth St., Dublin 2. 98 pp.

Frühwald, A. and Solberg, B. 1995. Life cycle analysis - a challenge for forestry and the forest industries. European Forest Institute Proceeding No. 8. 278 pp.

Humphreys, D. 1996. Forest Politics. Earthscan Publications, London. 224 pp.

Moore, P. 1997. Greenspirit Vancouver, Canada. Internet message, February.

Rackham, O. 1995. Trees and Woodland in the British Landscape. Weidenfield & Nicolson, London. 234 pp.

Wong, N. 1997. Malaysian Timber Council. Posting to Forest List, Internet listgroup, April.

Poster abstracts presented at the Annual Symposium of the Society of Irish Foresters, April 1997

The following is a series of abstracts from a poster exhibition presented at the Annual Symposium of the Society of Irish Foresters, 18th April 1997, included to offer the readership of *Irish Forestry* a snapshot of some of the ongoing forest research in Ireland.

Deciding when to lift and plant forest nursery stock

Charles Harper, Conor O'Reilly and Nick McCarthy

Department of Crop Science, Horticulture and Forestry, University College Dublin.

The physiological development of Douglas fir (*Pseudotsuga menziesii* (Mirb.) Franco) transplants was followed from September/October to April each year from 1991-1995, to develop physiological predictors of planting stock performance. The seasonal course of cold hardiness development, shoot and root mitotic index and root growth potential was monitored at 2-4 week intervals. Transplants were dispatched to a field trial at 4-5 week intervals to assess field performance. The influence of cold storage was assessed following placement of plants in a cold store for up to 7 months beginning between November and March. The transplants were less cold hardy in 1994/95 than in other years. The roots of seedlings were mitotically active throughout the winter of some years but not others. The period of high stress resistance is from November to early February, but the best time to plant freshly lifted stock is from November to December, when root growth potential is good and soils are relatively warm. Vitality of the stock in June following cold storage was good for those lifted to storage from December to February.

Research at the Radiological Protection Institute of Ireland into radioactivity in forest ecosystems

B. Rafferty, D. Dawson, H. Synnott and E. Burchill

Radiological Protection Institute of Ireland, 3 Clonskeagh Square, Clonskeagh Road, Dublin 14.

The Chernobyl accident in 1986 resulted in the contamination of vast areas of Europe, mainly with caesium-137 (a biologically important, long-lived radionuclide). In parts of eastern Europe, the contamination was severe. Chernobyl fallout in Ireland was low and patchy in distribution. Research has shown that in contaminated forests, the caesium-137 has been transferred from the canopy to the forest floor and has become incorporated into forest nutrient cycles. Caesium-137 in the forest floor is relatively bio-available to plants and fungi so it is likely that it will persist in the ecosystem for many years to come. In eastern Europe, where contamination is severe, this persistence represents a serious problem for the forest industry and for other users of the forest environment. Research at the Radiological Protection Institute of Ireland (RPII) is aimed at developing strategies for managing severely contaminated forests. The dynamics of caesium-137 cycling in forests have been studied, enabling the development of models to predict the future behavior of

the contamination. Research into mechanisms which control the behavior of caesium-137 in forests indicate ways in which management may attempt to augment the natural decontamination processes.

The effects of sixteenth century deforestation on soil development

D.A. Cunningham[1], E.P. Farrell[1] and J.F. Collins[2]

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Large scale clearance of oakwoods occurred in Ireland in the sixteenth and seventeenth centuries, chiefly for export as timber and for charcoal production. Uragh Wood, situated in the Clonee Valley 16 km southwest of Kenmare, is believed to be a surviving remnant of the original wooded landscape. There is good historical evidence supported by ^{14}C dating to suggest that the remainder of the wood was cleared approximately 400 years ago. A study of the soils within and immediately outside the wood was undertaken to examine the effects of deforestation.

The topography of the site comprises a series of steep ridges and corresponding troughs, many of which carry streams. Rock outcrops and large boulders are very common. The parent material is Devonian Sandstone. Mean annual rainfall is 1,900-2,000 mm.

Twelve soil profiles were studied, six from the cleared area and six from corresponding topographical positions within the relatively undisturbed portion of the wood. Differences in soil profile morphology were evident between the wooded and cleared areas. Surface accumulation of organic matter was greater on the cleared area. The ash content of the organic matter was higher inside the wood. Pan formation did not occur under the oakwood canopy but was observed in profiles from the cleared area. The eluvial (E) horizons of the latter had fragipan-like character, except where very wet.

Oakwood clearance appears to have resulted in increased water fluxes, changes in ground flora and soil morphology and an increased tendency towards peat development.

Modelling climate data to predict potential forest productivity in Ireland

Christine L. Goodale[1], Julian J. Aherne[2], John D. Aber[1] and Edward P. Farrell[2]

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- Traditional predictions of forest productivity in Ireland have been based on empirically-derived models of forest growth developed in the UK.
- A physiologically-based, climatically-derived model, PnET, is being adapted to Irish conditions to provide complimentary predictions of potential forest growth.
- The PnET model's input parameters and validation are described.

- For regional predictions, PnET requires spatial data for five variables, *viz.* soil water holding capacity and monthly summaries of precipitation, maximum and minimum daily temperature, and solar radiation.
- A water holding capacity has been assigned to each of the 44 soil types digitised from the General Soil Map of Ireland.
- Polynomial regression equations are used to describe the spatial variation of the climate variables with latitude, longitude and elevation.
- Work is in progress to parameterise PnET for Sitka spruce (*Picea sitchensis* (Bong.) Carr.) to run the model for all of Ireland.

Monitoring of forest ecosystems in Ireland

Gillian M. Boyle, Edward P. Farrell and Thomas Cummins

Department of Environmental Resource Management, University College Dublin.

Forest decline is not, as yet, a serious problem in Ireland. Thus, researchers are in the enviable position of being able to monitor the health status of Irish forest ecosystems in a relatively unpolluted environment, and to collect baseline data and conditions in relatively healthy forests. In 1988, the Forest Ecosystem Research Group (FERG) of the Department of Environmental Resource Management, University College Dublin established a monitoring plot at Ballyhooly, Co. Cork. In 1991, monitoring was extended to a further three forest plots at Brackloon, Cloosh and Roundwood in Co. Mayo, Co. Galway and Co. Wicklow respectively.

Precipitation throughout Ireland has a strong marine influence. Inputs of both sodium and chloride are high, particularly in the west of the country. Proton and nitrate inputs are highest at the Roundwood site, while there is a net consumption of protons and nitrogen at the two western sites, Brackloon and Cloosh. Concentrations of nitrate in the soil water are extremely low at Brackloon and Cloosh. Ammonium inputs at Ballyhooly are significant.

Sulphate inputs are similar at all four plots and the concentrations are significantly augmented in throughfall and stemflow. A much higher proportion of the sulphate at the Roundwood site is of non-seasalt origin.

Forest health results indicate a generally low level of discoloration and defoliation at the four forest plots.

Critical load mapping and the development of a sustainable forest resource

E.P Farrell and Julian Aherne

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In its simplest form, the principle of sustainable development imposes on us the responsibility to take care of the earth so that future generations may derive from it the same

benefits as we do today. The sustained yield concept, practised by foresters for generations, offers a perfectly valid view of sustainability, but it is relatively narrow. Modern ideas of sustainability suggest that 'sustained yield' should be replaced by the broader concept of 'sustainable forest management'.

The selection of sites for afforestation is increasingly being subjected to the planning process. Tools such as indicative forest strategies are being developed to assist in this process. The critical load concept has a potential application in planning forestry development.

Nitrogen dynamics in a forest ecosystem influenced by drought

Miriam G. Ryan, P. O'Toole and E.P. Farrell

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Increased rates of acidification and nitrification in some forest soils and waters, due possibly to changes in atmospheric inputs of ammonium and sulphates, are causing concern. Within the soil itself, however, acidification processes also occur. The nitrification process acidifies the soil and the rate and extent of this biological process is dependent upon substrate concentration, moisture, temperature and pH. In this study, the hypothesis is that periodic drought and rewetting of soil lead to a pulse of mineralisation of organic N followed by nitrification and acidification. The effects of drought and subsequent rewetting on nitrogen dynamics in forest soils and waters were studied as part of the European Union-funded EXMAN (EXperimental MANipulation of forest ecosystems) project. This involved six countries representing a climatic and pollution input gradient across Europe. The Irish site at Ballyhooly, Co. Cork has been monitored since 1989. It is situated 30 km from the sea and was planted in 1939 with Norway spruce (*Picea abies* (L.) Karst.) on an Orthic podzol over a sandstone colluvium till. The organic (O) horizon is between 6-10 cm deep and its average pH ranges from 3.6-3.8. The site is relatively remote from sources of industrial pollution, although ammonium deposition resulting from intensive animal production does occur. Annual precipitation of 1,000 mm deposits 12 kg of nitrogen/ha/yr, as ammonium and nitrate.

A summer drought was imposed at Ballyhooly for three successive years by installing a removable 10 m x 10 m transparent PVC roof below the forest canopy on the drought treatment plot. The roof was erected to coincide with bud-burst, and was removed when the soil water potential at 50 cm deep in the mineral soil reached -800 hPa. Once the roof was removed, the soil was allowed to rewet naturally when rain fell.

It was observed that levels of ammonium-nitrogen and pH values increased in the humus water of the drought treatment plot after rewetting at the end of drought treatment. A similar increase in ammonium-nitrogen and pH was not observed in the control plot. A nitrification pulse was not observed at these times. It can be concluded that, under prevailing Irish conditions, drought and subsequent rewetting can induce mineralisation but that significant nitrate production and consequent acidification do not occur.

Modelled and measured water fluxes in a forest ecosystem EXMAN project

J. Aherne, T. Cummins and E.P. Farrell

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The Forest Ecosystem Research Group (FERG) controls a series of intensive forest monitoring plots with the aim of quantifying the effects of atmospheric deposition on forest ecosystems. A knowledge of water fluxes through the ecosystem can contribute greatly to the understanding of biogeochemical processes and acidification. While precipitation and throughfall can be measured directly, fluxes such as soil water and evapotranspiration cannot. Computer simulation models can be used to estimate these fluxes. The initial study describes four years of measured and simulated water fluxes for Ballyhooly, Co. Cork.

The effect of harvesting on the pore size distribution of blanket peat

M. Doyle and E.P. Farrell

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Large areas of forested blanket peatland are currently being clearfelled. The majority of these felling operations are fully mechanised. Extensive compaction damage has been reported following such operations on mineral soils and situations have resulted where the aeration level of the soil has been reduced below that necessary for crop root development.

Defining the water retention capacity of compacted soils provides a picture of the distribution of different pore size categories and how they are affected following machine passage.

Blanket peat is highly porous, with most of the pores being of small diameter. A small percentage are macropores, which provide the basis for soil aeration and gas exchange. Compaction reduces the proportion of macropores and this has serious implications for the level of aeration present following operations.

Preliminary results show that some compaction occurs following traffic. It appears, however, that certain properties of the peat, i.e. its fibrous nature, enable it to resist compaction to some degree.

Gaseous SO_2 measurements with passive samplers at forest sites

Y. de Kluizenaar, R. van de Beuken and E.P. Farrell

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Although the mean concentration level of sulphur dioxide (SO_2) has decreased in recent years, it is still the most significant pollutant in relation to acid deposition in many parts of Ireland. Using advanced techniques, SO_2 has been intensively measured in areas where concentrations are generally high, such as those close to emission sources (e.g. power

plants). Continuous monitoring systems are costly and require electrical power. The id monitoring device for forest sites should be portable, self-contained, accurate, reliable a low in cost. For use on sites in Ireland, the device should also be capable of measuring l ambient concentration levels of SO_2 (1 mg/m^3). In this research, the 'Willems-badge' p sive sampler, developed at the Department of Air Quality, Agricultural Univers Wageningen, Netherlands, is evaluated for measuring monthly average SO_2 concentrat levels at forest sites in Ireland. The effect of different exposure times is investigatec field comparison studies. The final goal is to incorporate the passive sampler into ongoing forest ecosystem monitoring programme.

Estimation of evapotranspiration in small forested peatland catchments usi the water balance method and its comparison with potential evapotranspi tion values by Penman-Monteith equation

Remi Chandran[1], James F. Collins[1] and Thomas Cummins[2]

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Evapotranspiration is important as a term in the hydrological cycle, e.g. in soil water a ground water balances and in salinisation studies and predictions. There are a numbe mathematical methods which give an approximate value of evapotranspiration by using matic data such as radiation, humidity, wind speed, etc. The most commonly-used equat is the Penman-Monteith equation. In this study, the Penman-Monteith equation method be compared with the water balance equation method (ETa=P+∂SW±RO-D, wh ETa=actual evapotranspiration, P=precipitation, ∂SW=change in storage water, RO=run water and D=drainage). This equation is modified taking into consideration the reductio precipitation (P) due to interception (Ic). Interception is the amount of water intercepted the plant canopy, which prevents the water from reaching the ground. The amount of w that can adhere to the surface of the leaves depends on factors such as rainfall intens amount and distribution of precipitation, evaporation flux, and leaf shape, size and nat The amount of water intercepted can be measured indirectly by measuring the precipitati throughfall and stem flow. Interception values for a fully developed canopy of a Sitka spr (*Picea sitchensis* (Bong.) Carr.) forest in western Ireland vary from 25-45% of P. Field ues for the water balance equation will be collected at small forested peatland catchment Cloosh Valley, Connemara. The parameters in the water balance method will be measu (P, R) or estimated (Ic, ∂SW) and evapotranspiration (ET) will be calculated as ET (Ic+RO+D). Due to a continually high water table, ∂SW is regarded as negligible. potential evapotranspiration (ETp) value obtained will then be compared with the val obtained from the Penman-Monteith equation using measured data from the nearest Met rological Service synoptic station. The difference in the ETp values may provide a modi term for the application of the Penman-Monteith equation to such sites.

Interception of seasalt by coniferous and broadleaved woodland in a maritime environment in western Ireland

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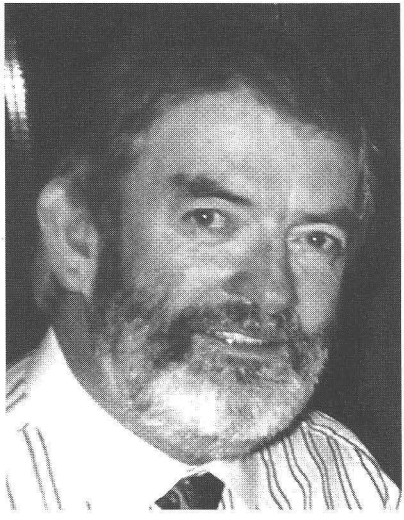
Atmospheric deposition in maritime regions is dominated by seasalt. High inputs of seasalt can induce short-term acidification in surface waters by the displacement of hydrogen and aluminium from the soil exchange complex. Measurement of sodium fluxes in two forest stands (one coniferous and one broadleaved) in a maritime region of western Ireland resulted in almost equal deposition at the two stands. This is remarkable given that the broadleaved forest has a low interception of water. Weekly throughfall data emphasise the enormous fluctuation in seasalt deposition. In both stands, deposition is highest in winter.

An Appreciation
Michael Donnelly
1940-1997



On an unseasonably cool July day, we – family, friends, colleagues and acquaintances – with heavy heart and leaden step made our way from Gloire na Geata cemetery towards Dingle town. We had laid to rest the mortal remains of Michael Donnelly in a place he longed to be – his native Kerry overlooking the broad sweep of Dingle Bay.

Born in Dingle in 1940, the only son of the late Timothy and Mary, Michael was educated at the local primary and CBS secondary schools and later, at the Agricultural College, Pallaskenry. He graduated from Shelton Abbey Forestry College in 1962 and joined the then Forestry Division (Department of Lands) as an assistant forester. Then followed tours of duty at Collooney, Hollywood, Ballynahinch and Lough Talt Forests. He was appointed Forester-in-Charge at Ballyfarnon Forest in 1972. In the mid 1980s, he transferred to the chargeship of Killorglin Forest. With the inception of Coillte he took responsibility for New Business, including tree surgery, Co. Kerry, in which post he was extremely active and effective.

Michael was a dedicated public servant, a practical and innovative forester and an able silviculturist with good management skills and business acumen. He had a fine eye for the aesthetic, was a keen observer of nature and had a store of local knowledge and lore. He was above all, good company – a raconteur with a roguish sense of humour.

Alongside his professional life, he was an ardent angler – salmonoid and sea – and was interested in photography. He took a lively interest in the affairs of the Society of Irish Foresters, always ready and willing to lend a hand in the organisation and leading of forest walks and field days. Unknown to many, he was an occasional contributor on nature

and wildlife to *Kerry's Eye*.

Having known Michael since his student days, I was privileged to know him in his last illness. I cannot forget his immense dignity and courage, consideration towards his loving family and carers, and a spiritual resignation as he bowed to the inevitable.

We mourn his untimely passing and offer our sincere condolences to his wife Monica, children Charlene and David, mother and sisters on their grievous loss.

"Suaimhneas síoraí ar a anam"

J.A. Mannion

Report on Forestry Ireland, Kinnitty, Co. Offaly, 1997

Introduction

Forestry Ireland was a major outdoor forestry show organised by the Society of Irish Foresters and held at Kinnitty Castle, Kinnitty, Co. Offaly from Friday, 9th May to Sunday, 11th May 1997. The objectives of the show were (i) to highlight the growing importance of the forestry industry in Ireland, (ii) to act as a shop window for the forestry sector, and (iii) to successfully promote forestry and the forestry profession. Forestry Ireland was grant assisted by the Forest Service and the European Union, with major additional sponsorship provided by Coillte and a wide range of other forest related enterprises. Forestry Ireland was the fourth national forestry-based show to be organised by the Society in the last 10 years. Other shows included Forestry '88 at Emo, Co. Laois in 1988, and two Wood Ireland exhibitions held at University College Dublin in 1989 and 1992.

Management

Three separate committees were established to stage Forestry Ireland. These included a steering committee to oversee overall organisation, a coordinating committee to organise the show at a national level, and a site committee to deal with onsite logistics. In addition to the voluntary input of the members of all three committees, assistance was also employed at an administration level based in Dublin, and at a local level to manage the site. An administrator (Máiréad O'Donovan) and site manager (Kevin Donnellan) were employed for a period of six months, part of which on a full-time basis.

Marketing

The coordinating committee identified the promotion and marketing of Forestry Ireland to potential exhibitors, sponsors and visitors as being central to its success, particularly given that it was the first forestry show of such a scale to be held in Ireland. For this reason, the Society engaged the services of Donal Magner, a public relations consultant with specialist expertise and knowledge of the forestry sector. After a difficult ground-breaking drive, intensive promotion on local and national media both in the weeks leading up to the event and during the show itself, proved highly successful.

A show catalogue and trade directory was also published in conjunction with the *Irish Farmers Journal*. It contained lists of exhibitors, participants and sponsors and featured various articles on forestry in Ireland. The catalogue was included in the *Irish Farmers Journal* during the week of the show, reaching approximately 74,000 farming homes with an estimated readership of 300,000. It was also given to all visitors upon entry to the show.

Layout and services

Forestry Ireland was laid out over a 20 ha site centred around Kinnitty Castle. Four car parks were strategically positioned for ease of access, with the main exhibit area and exhibitors' car park positioned in front of the castle. The main exhibit area was supplemented by exhibitions within the immediate grounds of the castle and demonstrations of various forestry operations in adjacent forest areas. The marquee housing the Society's headquarters, from which the public announcement system was operated, provided a focal

point for the exhibitors and the public alike. The marquee contained a reception area and conference centre, and was used for various prize-giving events and for the Forestry Forum, a central feature of the show which attracted over-capacity crowds on occasion. Onsite facilities included telephones, toilets, a restaurant, catering marquee and bar.

Financial analysis

Forestry Ireland was funded through major sponsorship from the Forest Service, the European Union and Coillte, and through many other smaller sponsorships, exhibitor fees and gate receipts. Financial organisation for Forestry Ireland required a steady cash outlay throughout the year preceding the show, with a concentrated revenue collection period a month prior to, and during the week of, the event. Revenue from site fees and Forest Service/EU funding was used to defray administration and off-site activities up to the period immediately preceding the show.

From a financial perspective, Forestry Ireland broke even, with the cost of staging the event, including organisation, promotion and site planning, balanced by sponsorship and revenue generated from exhibitor fees and gate receipts. The total cost of staging the show was £178,000.

Forestry Ireland, Kinnitty, 1997.

Conclusion

Forestry Ireland attracted approximately 21,000 visitors over the three days, despite appalling weather conditions. The event also attracted 137 exhibitors representing forestry companies, contractors, chemical companies and a wide range of research, education and environmental groups. In general, feedback from visitors, exhibitors and sponsors has been very positive, with many complimenting its organisation, particularly in the adverse weather. The show organisers are also satisfied that the above objectives were successfully

fulfilled, in particular, the publicity and positive profile for forestry it generated. From a financial perspective, it was hoped that the show would generate profit revenue. However, given the adverse weather conditions and the first time nature of the show, the breakeven status achieved is regarded as a credible economic performance. The wealth of experience gleamed from the staging of Forestry Ireland, in terms of market knowledge and organisational acumen, will also prove invaluable for the organisation of future large scale events by the Society.

It would not be possible to name all the people who helped to make Forestry Ireland the success it was. Thanks are due to each and everyone, in particular, John O'Sullivan, Kevin Donnellan, Tim O'Regan, Richard Whelan and his events team, John Snell, Diarmuid O'Riordan and the Offaly forest workers team, Dr Gerhardt Gallagher, Len Gallagher, Ken Byrne, Máiréad O'Donovan, Donal Magner and Tom McDonald. Thanks are also due to the local people of Kinnitty, especially Joe Parlon and Ivan Shepherd.

John Brosnan
Chairperson
Forestry Ireland

Report on the Society of Irish Foresters Annual Study Tour to Poland, 1995

In 1995, the Society of Irish Foresters took their annual study tour to Poland. The tour concentrated on the east and south east, in particular, the Bialowieza National Park, the forests of the Roztocze Uplands, and the eastern Carpathians. The 48 tour participants represented all sectors of Irish forestry, from nurseries to sawmills.

The tour party arrived in Warsaw airport on Saturday, 9th September and quickly got a flavour of Polish life. Poland is a culture shock for most western visitors. As the tour bus made its way through the vast plain of Mazovia to the town of Hajnowka, men and women worked side-by-side in the fields digging potatoes, with horses, ploughs and carts outnumbering tractors and other farm machinery. For all that, Poland has none of the food shortages that other former Communist countries are experiencing, probably due to its refusal to adopt the Communist system of collective farms. Unlike other eastern block countries, over 80% of Polish farms remained in the hands of individual farmers throughout the Communist regime.

It is easy to be critical of Poland's lack of progress. It is, however, worth remembering that the country has had to endure much in the recent past, including the loss of six million lives during World War II and almost 50 years of Soviet control. Only five years ago Poland finally managed to shake off the stranglehold of Communism, which left the country with major problems including pollution, huge inflation and a $40 billion debt.

While the first impression is of a country caught in a 1940s time warp, the second – from a forestry perspective – is more positive. Poland has a huge forest resource by Irish standards (Table 1). Polish forests are well stocked and have a varied range of species. The common theme running throughout the tour was the priority placed on conservation.

Table 1: *Some comparisons between Polish and Irish forestry.*

	Poland	*Ireland*
Total area of forests (million ha)	8.7	0.5
Forest cover (%)	28	8
Average age of forests (years)	54	30
Total forestry employment	350,000	13,000
Ownership (%)		
State	83	80
Private	17	20
Annual harvesting (million m^3)	20.6	2.2
Average volume/ha harvested (m^3)	2.4	4.4
Annual average growth/ha (m^3)	3.4	16.0
Species distribution (%)		
Conifers	78	90
Broadleaves	22	10

In Bialowieza, all forest areas are protected, either fully or partially. In fully protected areas, no harvesting or replanting takes place. In partially protected areas, felling is only permitted in the case of damaged and windblown trees, and reforestation only where the objective is to shift the balance of species from conifers to broadleaves. Irish foresters might regard this treatment as being far too extreme, but Polish foresters and environmentalists are all too well aware of threats to their forests. These include insect pests and fungal damage, fire and pollution. For example, fire caused 37,000 ha of damage in 1992, while the nun moth (*Lymantria monacha*) affected over one-third of Poland's forests from 1978 to 1992. A more sinister threat is that posed by pollution. While a problem all over the country, the greatest threat is in the south western region known as the Black Triangle, where Poland, the Czech Republic and Germany meet. A quarter of Poland's forests are now classified as ecological hazard areas.

The Bialowieza has so far escaped the worst effects of pollution. The forest, impressive by any standards, comprises oak (*Quercus* spp.) (some more than 500 years old), birch (*Betula* spp.), hornbeam (*Carpinus betulus* L.), aspen (*Populus tremula* L.), Scots pine (*Pinus sylvestris* L.) and Norway spruce (*Picea abies* (L.) Karst.), which is capable of growing to over 50 m in height. A wildlife conservation programme is part of the overall conservation strategy. Over 120 species of birds are represented, while the list of mammals include elk, roe deer, wolf, wild boar, lynx and bison. Originally wiped out in 1916, the bison was reintroduced in 1926, and today there are over 240 in Bialowieza. The Poles experience the same problems with deer damage as we do in Ireland. They have tried using repellents to control roe deer, with little success. They also plant maple (*Acer* spp.) through oak to act as a distraction, with some success. Like Irish counterparts, however, Polish foresters have resorted to culling as the most effective way of dealing with the problem.

The biggest contrast with Irish forests is in species distribution. Unlike Ireland, only native species are planted. Conifers, including Scots pine, larch (*Larix* spp.), Norway spruce and fir (*Abies* spp.), comprise 78% of species, with the 22% broadleaf proportion including mainly oak, sycamore (*A. pseudoplatanus* L.), beech (*Fagus sylvatica* L.), birch, alder (*Alnus* spp.), hornbeam, aspen and lime (*Tilia* spp.). Large scale clearfells are opposed by both the public and the environmentalists. Instead, foresters lay a series of patch fellings, each less than a hectare in size. These are either restocked by natural regeneration or manual planting. A few years ago during the Society's study tour to Oregon, US foresters could not understand why Irish stocking levels at 2,500 trees/ha were so high, compared to their own figure of 1,000 plants/ha. Let's hope they never visit Poland, where initial stocking rates are as high as 17,000 plants/ha. The end result after 140 years is straight, self-pruning forest stands which greatly impressed the sawmillers in the tour group but which left the accompanying accountants in a state of near apoplexy! It was estimated that it would take one worker 12 weeks to plant a hectare, given the average planting rates of 270 plants/day.

Approximately 20% of Polish forests are privately owned. The group visited a private forest in Parczew where there is no harvesting control. The forest is overexploited in marked contrast to the adjoining State forest.

Probably the most interesting part of the tour took place in Bieszezady in the Eastern Carpathians. This area was populated up until relatively recently by two ethnic groups known as the Bojkowie and Lemkowie, both descendants of nomadic tribes. These groups were caught up in a civil war in the aftermath of World War II and all but 20,000 of the 300,000 population were deported within a few days. The area has an eerie feeling which

is compounded by the ruined farmhouses, wild meadow land and deserted wooded churches which dot the countryside. From our base in the village of Ustrzyki Gorne, we visited the Ukranian border and one of the many charcoal burners located throughout this region. Here the workers produce charcoal in near primitive conditions for a weekly wage of approximately £20.

The group saw no harvesting on the tour, mainly due to the fact that timber extraction is confined to winter months in many of Poland's forests, when the frozen underfoot conditions make for better extraction conditions and less site damage. In Bieszezady, many areas are not harvested, due to the difficult terrain. As a result, virgin stands of beech, sycamore and fir still remain.

Poles have a strong sense of history. Our guides spoke about World War II as if it was only yesterday, and about Stalinisation as if it still prevailed. Despite this preoccupation with the past, Poland has emerged as a politically stable country without any of the internal problems that have plagued many other former Communist Bloc countries. Its economic development is slow, but the Polish respect for its heritage is ensuring that the protection of its forest resource is in safe hands.

Donal Magner

Report on the Society of Irish Foresters Annual Study Tour to Northern Ireland, 1996

Tuesday, 4th June

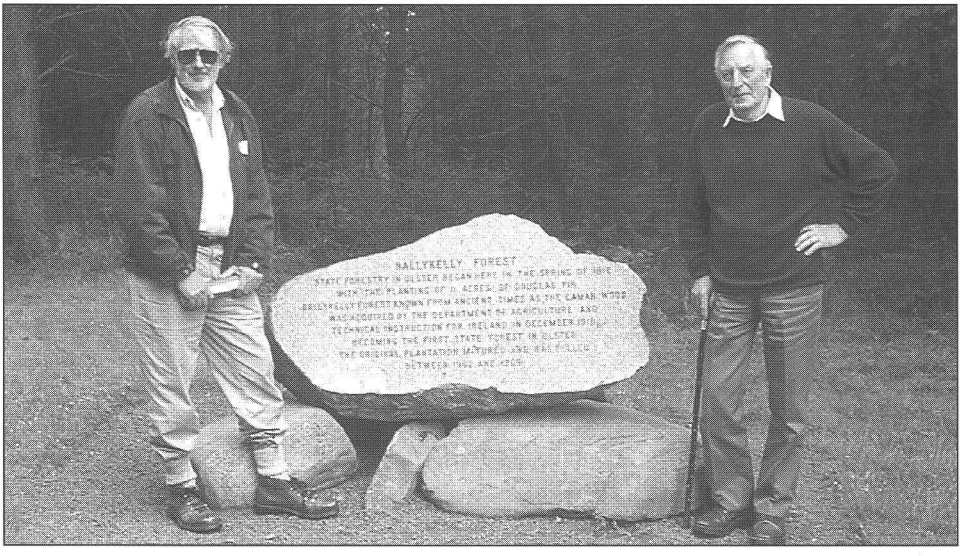
The group of 45 left Dublin that morning and travelled directly to Enniskillen. There we were met by our hosts for the afternoon, George Kidney, Brendan Friel and other members of staff from Balcas Ltd., before being treated to an excellent lunch at the Killyhevlin Hotel. Afterwards, we were taken to the Balcas plant in Enniskillen where we were given a comprehensive tour of the facility, from log intake and bark stripping to a variety of processing and drying procedures. After dinner that evening, Bill Wright, Chief Forest Officer with the Northern Ireland Forest Service, presented the group with an account of forestry in Northern Ireland, followed by a talk by Ian Wright-Turner on forestry in Co. Fermanagh.

Wednesday, 5th June

The morning's topics included short rotation coppice and its potential for energy production. Ground preparation and establishment techniques for Sitka spruce (*Picea sitchensis* (Bong.) Carr.) on gley soils were examined later that morning at Kesh Forest. The afternoon began with a visit to Coolavanagh Forest, to examine experimental plots of P1992 poplar clones grown for pulp and ready for harvesting after 15 years. At Baronscourt Forest, various respacing experiments were visited, where the discussion widened to emphasise the long term nature and importance of forest research. Baronscourt Estate, one of the largest private estate woodlands in Northern Ireland, was the final stop of the day. As well as forestry, the estate boasts a farm, a Christmas tree enterprise and a garden centre. Other features include a beautiful Victorian garden and the largest Scots pine (*Pinus sylvestris* L.) in Ireland, planted in 1830. Following dinner that evening, Cecil Kilpatrick, an Honorary Member of the Society, led the group on a historic tour of the walls of Derry.

Thursday 6th June

Ballykelly Forest, locally known as 'Caman Wood' in reference to its long tradition of supplying hurleys, was the first stop of the day. It is suspected that oak may have been taken from the wood and used in the construction of the Houses of Parliament. Harvesting and extraction were the main themes at Springwell Forest, where a 'no-thin' policy is observed due to the threat of windthrow. Felling in the 1980s presented an opportunity to restructure the forest and to enhance its natural features. The importance of 'conservation corridors' and public consultation and involvement were also stressed. Afterwards, a visit to Slieveanorra Forest included an examination of a number of issues including fertilisation of Sitka spruce stands on nutrient-poor sites, the effect of herbicides and fertilisation on height growth, the importance of drainage and the nutritional requirements of stands at different rates of growth. The group visited the beautiful North Antrim coast and the remarkable Giant's Causeway on its way to Belfast that evening.



Cecil Kilpatrick, former Chief of the Northern Ireland Forest Service,
Honorary Member and former President of the Society,
with Dr Gerhardt Gallagher, President, in Ballykelly Forest.

Friday, 7th June

Multi-use forest management in the Down/Armagh district was the theme for the day's activities. It involved visits to Gosford, Castlewellan and Tollymore Forest Parks, where our leaders described forest management in areas of high public recreation and amenity. These properties include extensive areas for recreation, camping and caravaning, in addition to other attractions such as the National Arboretum at Castlewellan. The annual tour dinner was held that evening.

Saturday, 8th June

The final morning of the tour dealt with urban and community forestry. The main objective of these forests is to create a woodland amenity for the benefit of the surrounding public, incorporating active community consultation and participation. The first visit of the day was made to the 80 acre Belvoir Park Forest, which caters for approximately 400,000 visitors annually. Facilities at Belvoir include a lecture room, forest trails, forest guides, displays and other educational facilities. The tour concluded with an interesting account of the Forest of Belfast project, a city-wide urban forestry initiative aimed at promoting tree planting by local communities and at improving the quality of urban tree management through the orchestrated involvement of a wide range of public and voluntary bodies. The visit concluded with a guided bus 'tree-tour' through the streets of Belfast, where the concerns and work of the Forest of Belfast could be observed at first hand.

Tom McDonald

Inchagoill revisited: Report on the Society of Irish Foresters Field Trip to Inchagoill Island, 18th October 1997

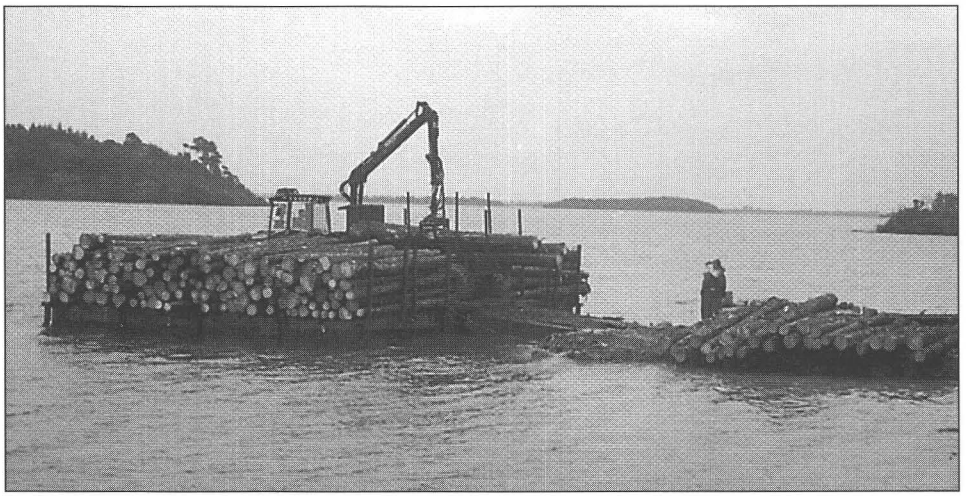
The Society of Irish Foresters visited Inchagoill Island, Lough Corrib, on 18th October 1997. Hosted by the Coillte Galway Region, the tour studied the progress achieved to date in the woodland restoration programme for the 40 ha island. The Society last visited the site in 1993, an account of which is contained in *Irish Forestry* 51(1&2). Inchagoill has a rich heritage and is regarded both locally and internationally as an important archaeological site. Apart from its scenic beauty, Lough Corrib provides excellent fishing for salmon, trout, pike and perch, and is particularly renowned for its mayfly trout. It is also one of the few lakes in Ireland containing char, a species now protected under an EU habitat directive. The woodland restoration project therefore had three dimensions, *viz.* silvicultural, archaeological and environmental.

Coillte avoided potential local and international controversy by adopting a proactive communications approach from the outset. Initially, the company began wide-ranging discussions with local and national groups to ensure that the company's woodland restoration objectives were clearly understood. The Galway Region staff, led by Vivian Ryan, Region Manager, developed a comprehensive plan after consultation with Coillte's own specialist staff and research scientists, the Forest Service, Galway County Council, the OPW and various fisheries and tourist groups in Galway.

Many local groups had concerns about the harvesting of 13.5 ha of mainly Sitka spruce (*Picea sitchensis* (Bong.) Carr.) on the island. Fears were expressed regarding possible damage to tourism, especially in relation to an archaeological site on the island and fishing on the lake. The Western Fisheries Board, who expressed concerns about the project, were involved in the preliminary planning stage and invited to inspect the operation at all stages of development. The company facilitated the Board in a number of ways. For example, Coillte co-operated in a monitoring programme which included unscheduled inspections of the harvesting and loading of timber. Kevin Rogers of the Western Fisheries Board told the tour group that they had received excellent co-operation from the company from the outset. He added that a number of unscheduled inspections had already taken place and Board officials had received no complaints.

In addition to seeking the views of outside groups, Coillte adopted their own stringent safety and environmental standards during timber removal. Anglers and tourists were facilitated by the rescheduling of timber felling and removal to October. When the group visited the site, work had been underway for about three weeks. Michael Cox, Environmental Officer, explained the consultative process which resulted in the construction of two loading piers on the island and one unloading pier in Cong. A further pier was built at Inishannagh Island where a small volume of timber was removed. Careful attention to detail during loading and unloading has resulted in no pollution from either oil spillages or siltation. In addition, felling and transport was planned well clear of pathways to the archaeological site, to ensure that access by tourists and interest groups was maintained.

The main challenges facing this project are (i) the removal of the existing crop and (ii) replanting with species which originally colonised the island. Vivian Ryan pointed out that the area was planted during 1960 and 1961. The crop was now vulnerable to windthrow. Indeed, the storms of 1961 and 1974 caused extensive damage to previous crops including Scots pine (*Pinus sylvestris* L.). The existing harvested area comprised 75% Sitka spruce along with Norway spruce (*P. abies* (L.) Karst.) and Douglas fir (*Pseudotsuga menziesii*



Loading timber onto a barge on Inchagoill Island.

(Mirb.) Franco). All species were highly productive, with yield classes as high as 28 for Sitka spruce, and standing volumes between 340 and 790 m^3/ha. Tom Grunnell, former Divisional Inspector in Galway, first visited the island in the mid 1940s and was involved in the original planting during the early 1960s. He provided the group with an interesting insight into how timber had been harvested and floated to Cong and how the workers came across by boat to replant the area.

As a result of careful planning, the harvesting and transport operations were being carried out efficiently. At the time of the group's visit, half of the total volume of 7,000 m^3 had already been felled and 2,300 m^3 had been removed from the island. Kieran McLoughlin, Production Manager, explained that the Valmet harvester was ideally suited to the reasonably level site. It caused no site damage and was capable of harvesting in excess of 200 m^3 per day. The lengths were segregated and loaded at the pier onto two customised barges, each with a capacity of 60 m^3. Timber was then towed to Cong where it was loaded directly onto lorries and transported to a number of mills throughout Ireland. Destinations for sawlog and boxwood included Murray Timber Products in Ballygar, the nearby ECC mill and the Coillte's sawmill at Cong. Pulpwood was dispatched to Claremorris railway station and transported by train to the Louisiana Pacific Coillte OSB mill in Waterford Harbour.

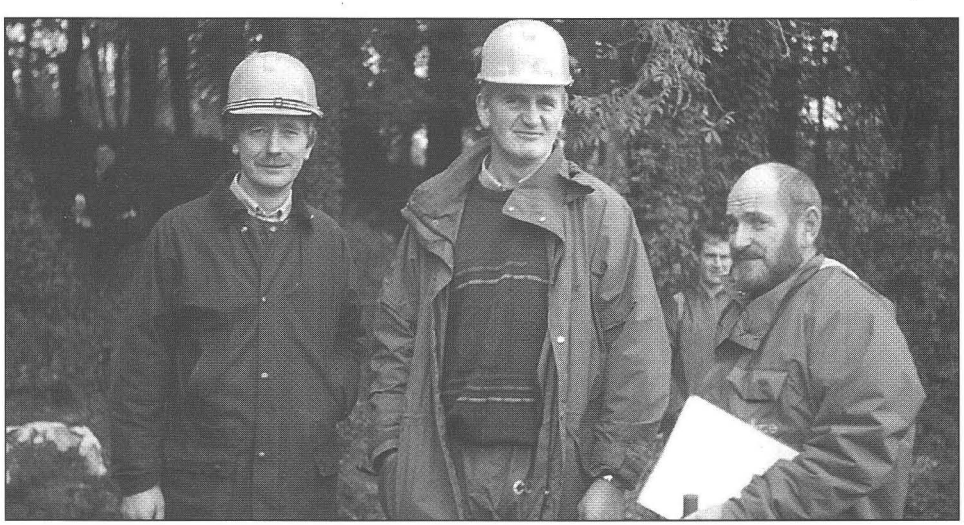
Vivian Ryan said that, even though the total operation was carried out efficiently, the objective was not to maximise financial return but to carry out the harvesting and transport in an environmentally sensitive way. (Maybe it was out of respect for the rich heritage of Inchagoill, but this was the first day tour this writer has ever attended where costs were not mentioned.) The same philosophy will apply during restocking, which will commence in early 1998 with native species, with particular emphasis on the island's original species, including oak (*Quercus* spp.), ash (*Fraxinus excelsior* L.) and Scots pine. In addition, some areas have been allowed to regenerate naturally and these are quickly returning to their original state, helped no doubt by the absence of browsing animals on the island. The group saw examples of excellent natural regeneration comprising 75% ash and 25% sycamore (*Acer pseudoplatanus* L.).

At the ecclesiastical enclosure and graveyard located a short distance from the clearfell area, Michael Cox provided the group with a fascinating insight into the rich heritage of the

island. It was first inhabited around 5,000 BC by nomadic hunters. In the early Christian period, monks founded a monastery here and the island appears to have received its name *Inis ha Ghaill* ('Island of the Devout Foreigner') from this later colonisation. Within the graveyard are the ruins of two churches of different styles and periods. Teampall an Naomh has an impressive example of Irish decorative art on its western gable doorway and probably predates the 12th century Norman invasion. Inside the church there is an etching of an ancient Greek or Byzantine cross which is part of the original building. The second church, Teampall Padhraig, is believed by Professor Etienne Rynne, University College Galway, to be approximately 1,000 years old. There is still a great deal of mystery attached to the Luaedon Pillar, an inscribed slender four-sided silurian stone widening at the base. This is due to the two-line inscription containing 23 old Latin characters: LIE LUGUAEDON MACCI MENUEH. It may have been the grave of Lugnaed, son of Mermuch who is believed to be a sister of St. Patrick. Michael Cox, who holds a degree in archaeology in addition to his forestry qualifications, believes that the stone inscriptions may date back to the 6th century and that it may have originally been part of an Ogham stone. The old Irish word for stone is *gall* and some believe that Inchagoill should be translated as 'The Island of the Stone'.

The visit to the forest and archaeological site illustrated the importance of a balanced approach in the restoration of Inchagoill. The management team has maintained the rich natural and historical continuity of the island. The restoration of Inchagoill is a unique project unlikely to be repeated again in Ireland. It has been an extremely worthwhile community and national exercise in proactive communications by Coillte and a demonstration of what a well-motivated workforce can achieve in managing a unique part of our heritage in accordance with best environmental and silvicultural practices. Despite persistent rain, the field trip was regarded as a tremendous success. Before boarding the *Lady Ardilaun* ferry for the two mile trip back to Ashford, the Society President, John Fennessy, thanked Vivian Ryan and his team for hosting the tour and for providing the group with a diverse and interesting view of forest management on an environmentally sensitive site.

Donal Magner



On Inchagoill Island: Coillte's Billy Carroll, Peter Raftery and Michael Cox.

Book Reviews

Wind and Trees

Edited by Coutts, M.P. and Grace, J. 1995. Cambridge University Press, The Edinburgh Building, Shaftesbury Road, Cambridge CB2 2RU, UK. ISBN 0 521 46037 9. 485 pages. Hardback. £65.00.

Reviewed by Erik Sundström, FoReCo, Consultant and Project Leader of TREEARCH-EU project (AIR3-CT93-1269) at Coillte Research and Development, Newtownmountkennedy, Co. Wicklow, Ireland.

Wind and Trees is a sample collection of papers presented at the conference on Wind and Wind-Related Damage to Trees, held at Heriot-Watt University, Edinburgh in July 1993. This IUFRO-conference, initiated by Chris Quine of the UK Forestry Commission, attracted approximately 100 delegates from 17 countries. The publication claims to be the first to combine the various disciplines of meteorology, mechanics and physiology in an attempt to understand how and why trees are damaged by wind. To say that *Wind and Trees* brings those topics together to provide a better understanding of the problem of wind damage to trees and forests, is, however, somewhat misleading. The above areas are certainly included, but only as separate papers, and no real effort is made to combine results from the various disciplines. The book includes 27 papers from 52 contributors from all over the world. The papers are divided into five different sections dealing with (i) airflow over topography and in forests, (ii) mechanics of trees under wind loading, (iii) tree physiological responses, (iv) impacts of wind on forests and ecology, and (v) risk assessment and management response.

The first section, which deals with airflow over open and forested areas, includes six papers discussing the influence of topography, roughness of the surface, edges, etc., on the turbulence and movements of wind. From a forester's perspective, the papers are technical in nature and understanding them requires both time and a reasonable knowledge of climatology and meteorology. Some points are, however, worth mentioning. Having studied the effects of coherent gusts on trees and stand canopies, Gardiner suggests that an irregular forest structure may have stability benefits over more uniform stands. Based on a wind tunnel experiment, Chen *et al.* identify three separate zones (quiet, wake and readjustment) at certain distances (in tree lengths) from the forest edge, and speculate what the effects of those zones would be on the overall seedling microclimate on a clear-cut. Inglis *et al.* test a linear airflow model called Flowstar against data from a complex terrain. According to the authors, the model requires further development in order to become robust enough for use in practicable forest planning operations. To predict wind speed, Hannah *et al.* have developed some multiple regression equations based on altitude, topex (exposure), roughness length, position and distance to the coast, which have shown encouraging results in independent tests.

The mechanics of trees when exposed to wind loading are dealt with in the publication's second section. In an overview chapter, Wood discusses the "adaptive growth hypothesis" which postulates that a tree will grow sufficiently strong to resist the forces exerted upon it, and that this optimisation of strength by nature is invariably more elegant than that achieved by the human design process. The author states, however, that this leaves the tree vulnerable to events unprecedented in its growth history (such as a storm blowing from a

non-prevalent direction) and even if the tree and roots grow adaptively, the soil itself does not adapt. This then leads to the overturning of trees rather than the snapping of stems, especially after a thinning operation. The now widely-accepted idea that thinning increases the risk of wind damage of trees is also described in a modelling experiment by Milne. Working with Sitka spruce (*Picea sitchensis* (Bong.) Carr.) in Ireland, Rodgers *et al.* found an increase in soil pore water pressure, when studying dynamic *in situ* loading of mature trees, and state that this led to hydraulic fracturing of the soil/root plate. They stress the importance of using site preparation methods which encourage deeper and more symmetrical root growth. Two separate papers deal with different modes/types of failure. Mattheck *et al.* describe criteria for failure after studying damaged trees, while Guitard and Castera attempt to understand and predict them with a tree sway mechanical model. The two concluding papers in the second section describe new instruments for measuring stress (Watson) and for assessing the wood quality of standing trees (Bethge and Mattheck).

In the third section of *Wind and Trees*, four papers discuss how trees react or respond when exposed to external stress and the resulting physiological processes of the trees. Telewski describes the influence of wind on tree growth and development, in terms of stress and strain relationships, and distinguishes between primary and secondary forms of stress. The primary stress is the force of the wind which leads to a number of viable and mechanical strains, with actual windthrow representing the ultimate phase. Secondary stresses, such as changes in atmospheric conditions around leaves and the influence of gravity due to displacement, also lead to physiological strain responses. Those strains can be seen as changes in transpiration and photosynthesis, reduced translocation, callose formation and more long term structural changes in canopy, leaf, stem and root morphology, in addition to modifications to the actual cell structure. Based on the results of two wind tunnel experiments, Stokes *et al.* describe how exposed seedlings have more roots and greater root cross sectional area on the windward side than on sides perpendicular to the wind. They suggest that this is an adaptive growth response, where trees allocate more assimilates to those roots necessary for anchorage. A similar finding, with more root biomass allocated on the leeward side of trees compared to those perpendicular to the wind, is reported by Nicholl *et al.*, based on studies into the breeding and selection of trees for improved wind stability. They also found differences in the allocation of biomass between above and below ground parts of the trees (root/shoot ratios) across different clones. They suggest that improved stability might be achieved by clonal selection, but state that more research is required.

Of the three papers in the publication's fourth section, which deals with impacts of wind on forest ecosystems, two describe the effect of more catastrophic events such as hurricanes in the Caribbean. Foster and Boose suggest that predictable pathways and characteristics could be found on regional and landscape levels, using models based on historical data after major storms. At stand level, they noticed the remarkable rates of recovery of the forest vegetation after major storms, which were mainly due to the very high rates of survival and resprouting. For better understanding and prediction, however, more studies of additional forest types are needed, particularly in the areas of hydrology, nutrient cycling and soil/organic dynamics. After reviewing papers reporting on 26 wind events in 27 different forests, Everham asks for a standard method for measuring damage to forests caused by storms. To facilitate comparisons, the author suggests that such a method should at least include both mortality and structural losses (described in terms of a decrease in basal area). When looking at the directions in which conifer trees blew over in a sub-alpine forest, Woolridge *et al.* found a distinct relationship between airflow and features of the local terrain.

Of the seven papers in the final section of *Wind and Trees*, two deal with the risk assessment for wind damage, while the remaining five are more oriented towards the management of the forest to avoid or prevent wind damage. In the introductory paper, Quine compares the British Windthrow Hazard Classification System with a new and more conceptual wind risk model, and suggests that a risk-based system, rather than a hazard-based system, is now required. Whatever the difference between risk and hazard, Quine suggests that the new model must be based on the interaction between variable wind climate and changing tree vulnerability. He concludes, however, that more understanding is urgently required, particularly in terms of the latter, where a change in management practice can significantly alter the vulnerability of the tree in different development stages. In the second paper dealing with risk assessment, Wollenweber and Wollenweber describe a method which includes a hierarchy of models in order to simulate the effect of the wind after a modification of the landscape. The authors claim that the method is both fast and efficient, and offers cost-effective assessments of environmental problems.

Nielsen offers a clear explanation as to why traditional thinning models with constant thinning intensities cause stability problems in Norway spruce (*Picea abies* (L.) Karst.) stands in Denmark. He suggests an alternative management practice for those stands, commencing with an initial wide spacing, followed by decreased thinning intensities and a no-thin regime during the final third of the rotation. Based on long term experiments with Norway spruce in the Czech Republic, Slodicak suggests a similar management approach, where the initial wide spacing also minimizes the risk of snow damage. As 4% of the annual allowable cut in British Columbia, Canada comprises windthrow damaged trees, Mitchell discusses topping and pruning as ways of reducing the risk of damage in partial cuttings. Finally, in two separate papers, Somerville and Studholme describe the problems with windthrow in Monterey pine (*Pinus radiata* D. Don) plantations in New Zealand. In some areas of the country, where windthrow can be as high as 90%, harvesting usually takes place after the trees have blown down. Site preparation is therefore deliberately avoided, as the resulting increased stability leads to broken, as opposed to fallen, trees!

Even if *Wind and Trees* does not give the full answers to many of the very costly problems that wind and storms can cause to trees and forests, it focuses on some important aspects. Anyone interested in this field should at least attempt to see a copy. As a proceedings publication from a scientific conference, it can certainly defend its place on the bookshelf as a useful reference to much of the most recent research.

Elements of Visual Design in the Landscape

By Simon Bell. 1993. E. &. F.N. Spon, London. ISBN 0 419 22020 8. Paperback edition 1996. Stg£19.99.

Reviewed by J.F. Durand.

As may be inferred from the title, *Elements of Visual Design in the Landscape* is not a book for light reading, though the text reads easily indeed. Rather, it is a serious essay to bring visual design principles more readily into the realms of land management.

In the few lines of the foreword, Dame Sylvia Crowe, Landscape Consultant to the Forestry Commission from 1963 to 1975 – alas, now deceased after an inspired life which has benefited so many practitioners and users of the landscape – describes the task of landscape architecture as one of reconciling man's activities with the welfare of the landscape.

The author is eminently qualified to play a leading role in such pursuits. Simon Bell is qualified as both forester and landscape architect and is Chief Landscape Architect of the British Forestry Commission. His work in that role has been acclaimed and has in turn led to many assignments abroad in the area of landscaping and designing for recreation. He pays generous and ready tribute to former colleagues in forest landscaping, Duncan Campbell and Oliver Lucas, both of whom had trodden path-making trails before him. All three individuals have brought insights and skills to landscaping from the perspective of the professional forester.

The most recent work by Bell, *Design for Outdoor Recreation*, was reviewed in *Irish Forestry* 54(1). This work, also published by Spon, covers the approach to, and practicalities of, the provision of outdoor recreation. With Oliver Lucas' earlier work, *The Design of Forest Landscapes* (published by the Oxford University Press in 1991), the forester has been given consummate source books for inspiration and practical guidance.

In the book under review, Bell engagingly and with many examples illustrated by drawings and photographs, starts from the very basics of design - point, line, plane and volume – and then explores applications and introduces the many variables. The author draws easily on his wide experience at home and abroad and in a manner easily read and understood.

The public is increasingly aware of our environment and is more articulate in landscape matters. *Elements of Visual Design in the Landscape* seeks consciously to provide a vocabulary of visual taste. Such a vocabulary can only be of good, and will prove valuable in discussions of matters of concern, which the public will ultimately have to debate and also bear the cost.

What makes the book specifically interesting and apt to the Irish reader is its inclusion of Powerscourt, Co. Wicklow as one of three case studies, and its use of a view south over the estate's Triton fountain as its front cover illustration. The other two studies deal with the flowing, sinuous form of a National Museum in Ottawa, Canada and the natural landscape of Strathyre, Scotland, where forest operations are the principal landuse. The author appraises each, analysing the compositions that have led by design to masterly solutions of international significance.

The forester in a distant past was the guardian of the forest for a potentate's power and pleasure. In the modern age, the forester has become creator, as well as guardian, in managing a resource for multi-functional use. Bell's work is one of leadership by both word and deed. In the volume, he provides the descriptive and analytical words and terms and makes them all easily understandable. There is no doubt that foresters have become more aware of their landscape responsibilities, but there is no reason for complacency. In the discussion of what is desirable and what is attainable, Bell's words and examples can play an invaluable part in allowing the debate to be founded on sound rationale. This book is both a working manual and inspiring reference.

This reviewer was specially interested to read the author's appraisal of the alignment of the main garden axis at Powerscourt. He writes that placing the axis to the centre of the peak of the Sugarloaf, which dominates the setting, would have been too obvious a device. Perhaps the house front, which in turn was based on the fortress wall of centuries earlier, determined the axis for the redoubtable Daniel Robertson, the designer. We might think that Robertson, given half a chance, would have liked to have changed the alignment of the house or, indeed, move the Sugarloaf a few degrees to the east! The asymmetry of the hill itself is so well pronounced that it would have withstood any suggestions of being trite or twee.

Robertson could certainly echo the words quoted by Bell, that the ultimate objective in

any design is to balance unity with diversity and to respect the spirit of the place. The magnificence of Powerscourt is indeed a fitting case study for so splendid a book as this, which will richly repay real and intense study by all landuse managers and planners.

Experiments on Lodgepole Pine Seed Origins in Britain

By Roger Lines. 1996. Forestry Commission Technical Paper 10. Forestry Commission, Edinburgh. ISBN 0 85538 336 4. 141 pages.

Reviewed by David Thompson, Tree Improvement Research, Coillte.

Unlike many publications reviewed in *Irish Forestry*, which often cover rather general subjects such as the environment, forest policy or biographies of botanists and foresters, this is a highly specialised book. It discusses a single species, lodgepole pine (*Pinus contorta* Dougl.), and although the title suggests it concentrates only on seed origin of that species, this is not entirely true. Nevertheless, as lodgepole pine has been, and continues to be, an important commercial species on this island, the publication merits review.

Lodgepole pine covers over 26 million ha in its native range from Alaska to California and at elevations from sea level to 3,900 m. As a result, a very wide range of 'varieties' (coastal versus interior as well as north verses south) are available. This has led to some confusion as to which is the 'best' seed origin for use in this country. This is further complicated by the fact that the species grows on a wide range of sites. Although originally thought to serve mainly as a nurse species, in recent years it has also been grown as a pure crop.

Although now retired for several years, Dr Roger Lines was previously in charge of species and provenance research in the Forestry Commission. This publication represents the culmination of his work with the species, which began in the mid 1950s. He explains the reasons for this book, "Many mistakes have been made in European forestry (not least in Britain) due to a lack of knowledge of the inherent properties of the very varied seed origins that were commercially available. In addition, different origins of lodgepole pine have such different silvicultural properties that they can almost be considered as separate species. Each must be used in its correct role in silviculture, whether it is a fast-growing pioneer, or as a bushy tree in mixture with spruce. Incorrect choice of origin by the forest manager for its role, site type and climatic province can lead to heavy financial loss. He also needs to know which origins can be used as substitutes should the most desirable ones not be available." This publication provides a summary of the effect of seed source on the performance of lodgepole pine in Britain, based on results from over 90 field trials established between 1928 and 1973.

Although the title and introduction stress the importance of seed origin, this publication contains much more, indeed perhaps more than most readers may care to know about the species. Chapters cover such subjects as species distribution and variation, seed zones, introduction and use in Britain, seed origin experiments, seed characteristics, nursery performance, relationship of root/shoot ratios and instability, growth habit, field trial results, use in mixture with Sitka spruce (*Picea sitchensis* (Bong.) Carr.), susceptibility to wind and snow, morphology (stem form, crown form, bark and cone characteristics) and finally,

a discussion on the choice of seed origin including some conclusions and recommendations.

Experiments on Lodgepole Pine Seed Origins in Britain is therefore more like a complete monograph on the species than a simple recommendation as to which seed origins should be used. Indeed, the key question in most readers' minds regarding the best seed origin of lodgepole pine, is left to Chapter 18, which begins on page 123. Nevertheless, the results presented confirm the results of 'sister trials' of most of the same origins in this country. The answer to the 'best' origin question depends both in the role (nurse or pure crop) and the site (exposed infertile or sheltered mineral soil). For mixtures, Alaskan or Queen Charlotte origins are best. For pure crops on exposed infertile sites, Queen Charlotte or Vancouver Island origins are recommended. On less exposed mineral soils, the lower Skeena River origins are best. Detailed information on the performance of 13 different origins of lodgepole in Britain is presented on a 1-page summary table on page 125. Results from Irish trials confirm these recommendations but also provide several other options. Firstly, the inter-provenance hybrids (a hybrid to combine the vigour of the south coastal origins with the straight stem of the north coastal origins), which are mentioned only in the last two sentences of this publication, can be planted in pure crops on both exposed and sheltered sites. Additionally, genetically improved south coastal material produced in seed orchards can be used successfully in sheltered fertile sites. Therefore, there is no one single 'best' seed source of lodgepole pine, which perhaps explains why it has taken so long to get the answer.

Now having given away the main point of the book, why should you read it? This reviewer must admit that *Experiments on Lodgepole Pine Seed Origins in Britain* is not the type of book that will find its way onto the bookshelves of most practising foresters, except those few who have a strong interest in the species. Nor is it the type of publication that most people will read from cover to cover. It will, however, serve as a reference book both on the best seed origins and the species as a whole. If you have a question about lodgepole pine, look here first and you'll probably find the answer.

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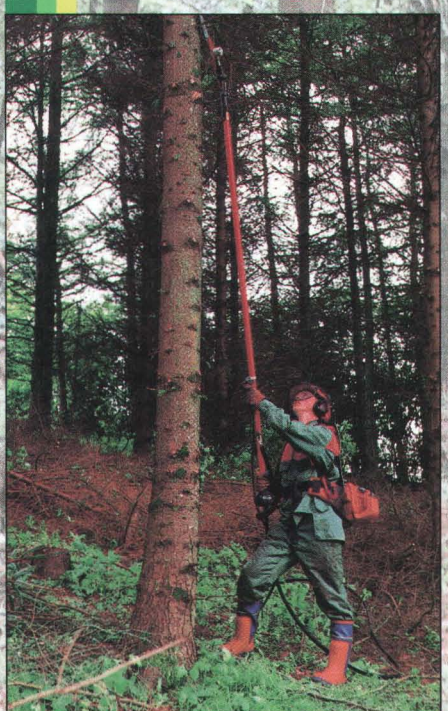

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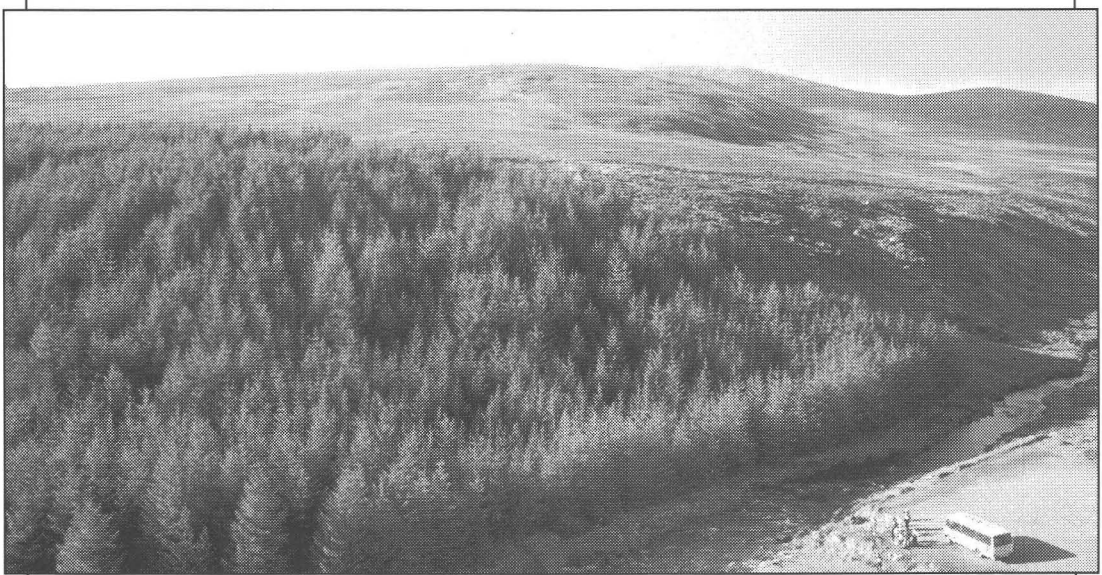

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Notes

Notes

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INCREASE IN GRANT AND PREMIUM RATES

With effect from the 15th October 1997, the following grants apply.

		Afforestation Grant £/ha	Maintenance Grant £/ha	Total Grant £/ha
Unenclosed Land		1,155	385	**1,540**
Enclosed/Improved Land				
	Diverse Species 20%	1,350	450	**1,800**
	Diverse Species	1,530	510	**2,040**
Broadleaf				
	Approved species other than oak/beech 100% stocking	2,250	750	**3,000**
Oak	75% - 100% stocking	2,775	925	**3,700**
Beech	75% - 100% stocking	3,000	1,000	**4,000**

The increase in premium levels will apply to payments due from January 1998 and will cover all applicants who plant under Reg. 2080/92 including those who have already planted.

Farmers

A supplement of £10/ha will be payable on sites greater than 6 hectares and £20/ha on sites greater than 12 hectares in respect of sites planted by farmers on enclosed land as from 15th October 1997.

Land Category	**Premium Rate £/ha**				
Unenclosed Land	**NEW RATE 145/ha**				
Enclosed/Improved land	**Conifers**			**Broadleaves**	
	Non-Diverse Species (1)	**20% Diverse Species**	**40% Diverse Species**	**Ash/syc.etc**	**Oak/Beech**
More Severely Handicapped	**£175**	**£210**	**£220**	**£250**	**£265**
Less Severely Handicapped	**£215**	**£240**	**£250**	**£285**	**£300**
Non - Disadvantaged	**£250**	**£270**	**£290**	**£315**	**£340**

Others - Non Farmers

*Unenclosed Land - **£90/ha** / Enclosed Conifers - **£115/ha** / Enclosed Broadleaves - **£135/ha***

(1) There will be no further planting under this category. The Premium rates will apply to land already under the category.

For further information contact: **FOREST SERVICE**, Department of the Marine and Natural Resources, Leeson Lane, Dublin 2. Tel (01) 6072000 Fax (01) 6611326 or your local Forestry Inspector or Teagasc office.

DEPARTMENT OF THE MARINE AND NATURAL RESOURCES

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