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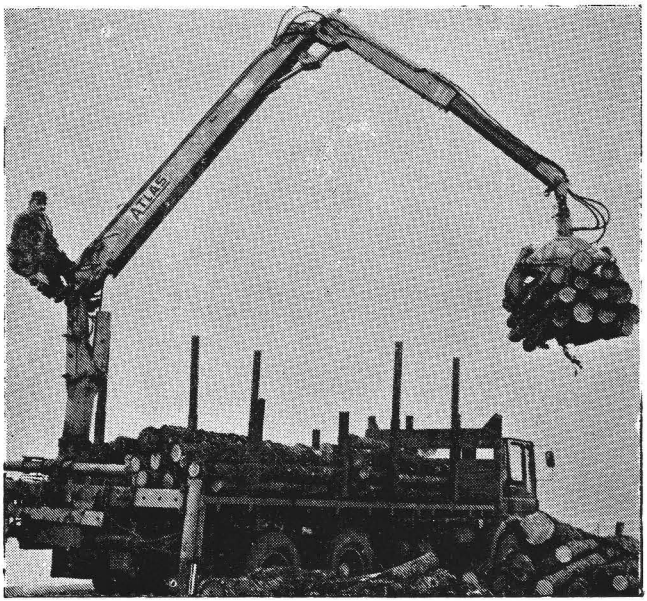

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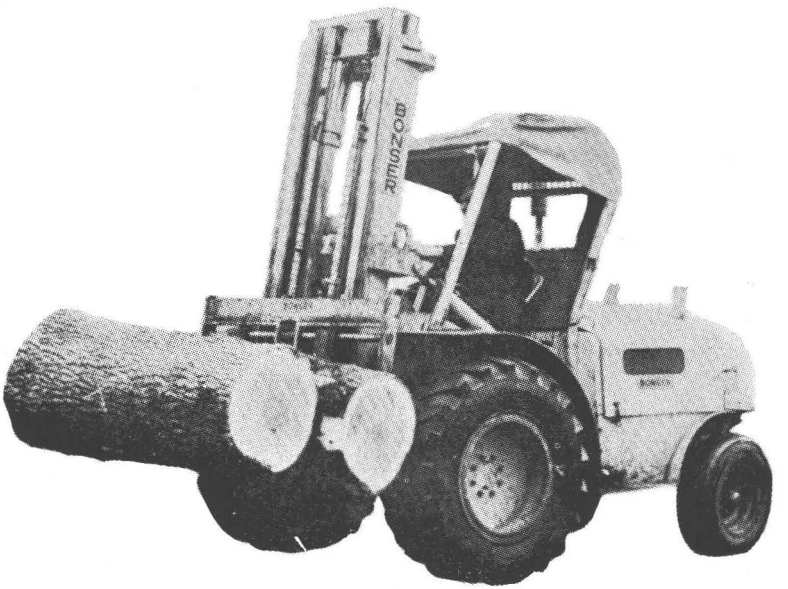

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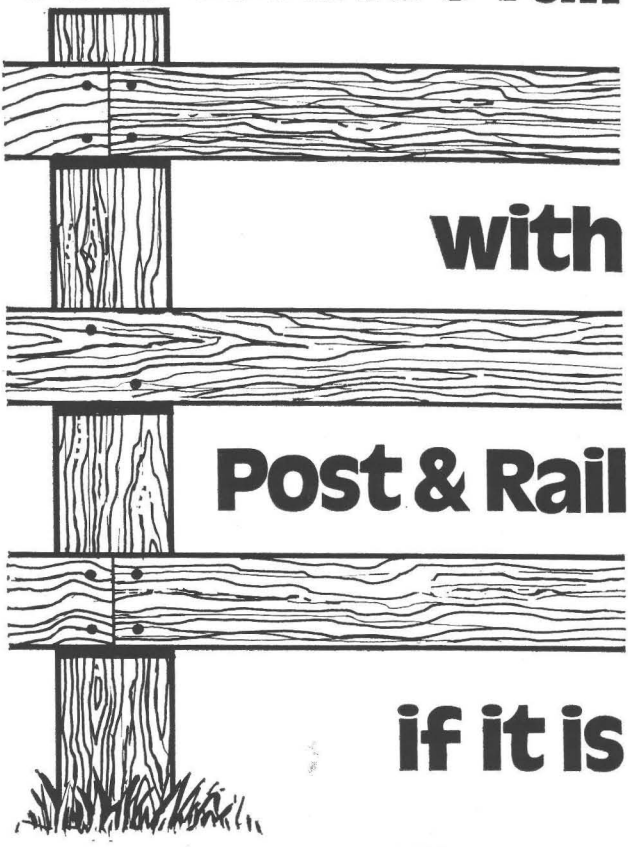

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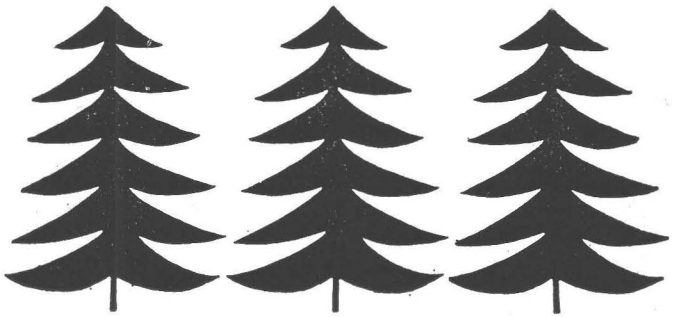

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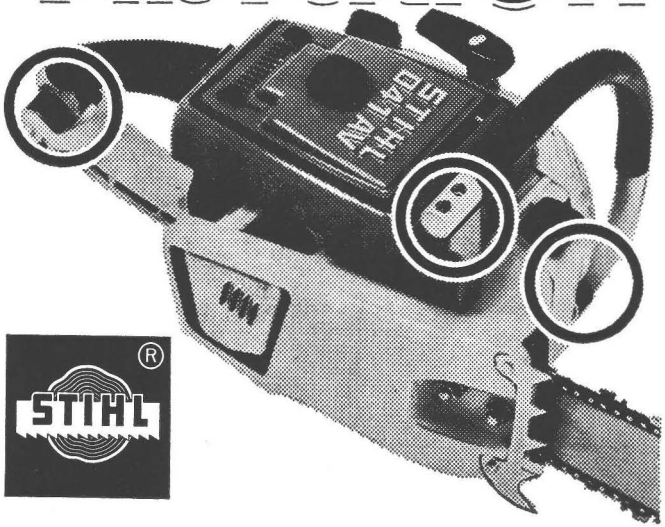

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COVER: Abandoned homesteads such as this are typically associated with an expansion of afforestation on sub-marginal agricultural land. (Photograph: Michael Bulfin).

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IRISH FORESTRY

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Have a good hard think about the Western Blanket Bogs

1970 was European Conservation Year, and about that time all the components of our environment were examined and sifted to find candidates for that apparently indefinable if not undefined process. Mostly they were considered in terms of specific associations: historical, ecological, scientific, even cultural.

One feature that may have got less than its fair share of attention is our landscape, considered purely as a visual entity. This landscape has certain notable aspects, but one of its most unusual features, one possibly unique in the world, is the appearance of the vast open stretches of rolling low-level peatland which constitute the blanket bog regions of the west.

We may be in danger of being biassed against these areas by a buried folk-memory which associates them with misery and starvation, arising out of historical events stretching from the plantations (of people, not trees) of the sixteenth and seventeenth centuries to the great famine of 1846-48. This may explain some of the "wet desert" strictures which are often heard.

As a tourist country we must be conscious of what we can offer which is not available elsewhere. There are many parts of the world where the traveller can drive for miles through uniform pine forests, or rolling farmland. But he will not easily find the like of our western blanket bog areas.

Going deeper, one can argue that bogs as such, are as much a part of our national culture as are our unique traditions of music, literature and language. This concept has been put somewhat crudely in the adage that, while it is easy to take the man out of the bog it is more difficult to get the bog out of the man.

For these reasons, we need to be quite clear about what we are doing before we change too many of those areas by the establishment of blocks of forest, any one of which may visually affect many square miles of landscape. We need to be sure not alone that it is what we want, but also what our children and grandchildren will want.

Because, once there, those plantations can never be obliterated.

Hybridisation among Deer and its implications for conservation

RORY HARRINGTON[1]

INTRODUCTION

The Red Deer (*Cervus elaphus scoticus* Lonnberg, 1906) is generally considered to be the only native hoofed animal that has lived contemporaniously with man in Ireland (Charlesworth, 1963 and O'Rourke, 1970). Ecologically, the red deer appears to be an animal of the transition zone between forest and steppe (Dzieciolowski, 1969) and it was widely distributed in Ireland up to the mid-eighteenth century (Pococke, 1752; Moryson, 1735 and Scouler, 1833). The present distribution of the species in the wild is however confined to three of the thirty two counties of Ireland and only in County Kerry are the deer considered to be indigenous. The other two counties, Wicklow and Donegal, have stock of mainly alien origin.

There is a general recognition of the threat that an alien red deer stock could present to the genetic integrity of the Irish race of red deer in county Kerry if these two red deer stocks were brought into contact. However, until recently few people realized that, in areas where red deer and the exotic Japanese sika deer (*Cervus nippon* Temminck) are living sympatrically (within the same geographical area) as in County Kerry, there is any threat of the two species hybridising.

A current ecological study of red deer and sika deer in County Wicklow has produced evidence that clearly supports the early reports made by Powerscourt (1884), Brooke (1898) and F. W. B. (1902) that red deer and sika deer can hybridise freely. The evidence also indicates that hybridisation between these species is an insidious phenomonen which can result in an apparent total amalgamation of a red deer population during a relatively short period of time.

The objective of this paper is to relate the past history and present status of the hybridisation between sika deer and red

1. Research Branch, Forest and Wildlife Service, Dublin.

deer in the County of Wicklow with a view to alerting all concerned with the conservation of these and other species of the genus *Cervus* to the implications of hybridisation.

ORIGINS OF HYBRIDISATION

It appears that the racial integrity of the red deer in County Wicklow began diminishing as early as 1244 when the Norman barons introduced alien red deer to their deer forest at Glencree (Le Fanu, 1893). There appears also to be little doubt that additional introductions were made up to the mid-nineteenth century. In 1858-1859 Viscount Powerscourt experimented with the introduction and acclimatization of various animals which he thought might be ". . . . ornamental as well as useful in Deer-parks in the United Kingdom," at his estate at Enniskerry, County Wicklow. In his report of the experiments in 1884 he wrote that he initially introduced three species of deer; several colour varieties of red deer, (*Cervus elephus hippelaphus* Erxleben), sambur deer (*Cervus unicolor*), axis deer (*Axis axis*) and several colour varieties of red deer (*Cervus elephus* L.) including the sub-species wapiti deer (*Cervus elaphus canadensis* Erxleben). After finding his 100 acre deer enclosure too small, he transferred all the deer to a newly built deerpark on his estate. Then in ". . . . about the year 1860 . . . ." he introduced for the first time, to either Britain or Ireland, Japanese sika deer (*Cervus nippon* Temminck). These deer, one stag and three hinds, were also placed in the deerpark where no attempt was made to separate the varous species.

Powerscourt also reported that several red x sambur deer hybrids were born and that the sika deer, ". . . have undoubtedly interbred with the Red Deer; there are three of four Deer in the Park here which are certainly hybrids, the Red hind in each case being the dam." F.W.B. (1902) also reported seeing red x sika deer hybrids in the Powerscourt deer park. The sika deer were very successful and in 1884 report, Powerscourt wrote that he had ". . . . upwards of 100 of them, besides having shot two or three yearly, and also having given away a great many and sold others." This included the introduction of some sika deer to Colebrooke, county Fermanagh and Brooke wrote in 1898 that he observed at least one instance of red deer and sika deer hybridising there. Red deer and sika deer hybridisation has also been reported in at least four separate areas of Britain (Whitehead, 1964; Delap, 1967; MacNally, 1969 and Blair, 1972).

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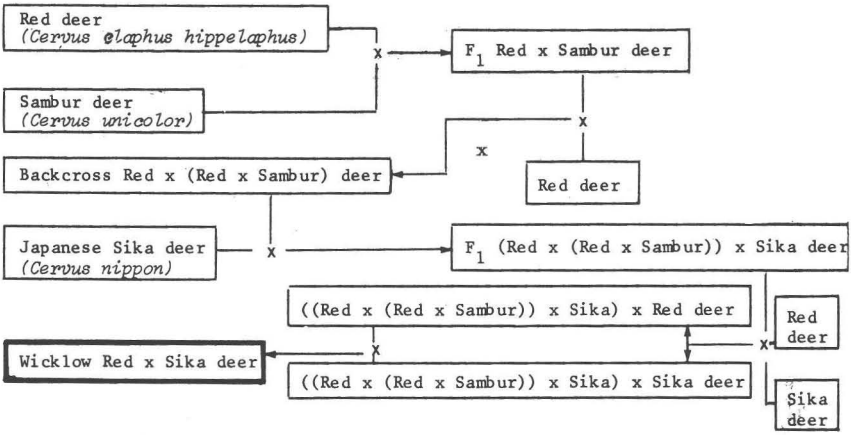

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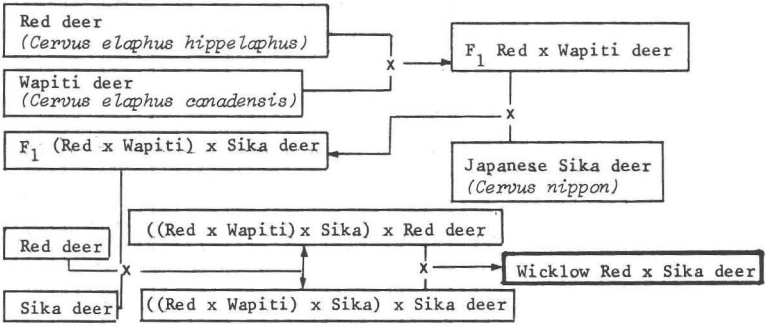

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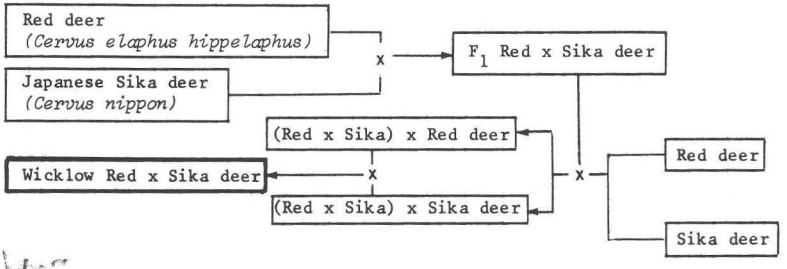

Figure I

Three possible combinations of Red deer *(Cervus elaphus hippelaphus)* Sambur deer *(Cervus unicolor)* and Japanese Sika deer *(Cervus nippon)* that may have initiated the present Wicklow Red x Sika deer hybrid population.

Red deer and sika deer differ considerably in size and to a lesser extent in mating behaviour. The question of how these two species first hybridised is unfortunately not easy to answer. It appears that there has never been any controlled mating of these species. However, Brooke (1898) wrote: "In July, 1896, a tame red deer hind dropped a hind calf to a Japanese deer stag." As this sika deer stag came originally from the Powerscourt deerpark after hybridisation had already occurred, the genetic constitution of the sika deer stag can be suspected of having some red deer genes. Knowledge of the circumstances which led to the initial hybridisation of sika deer and red deer at the Powerscourt deer

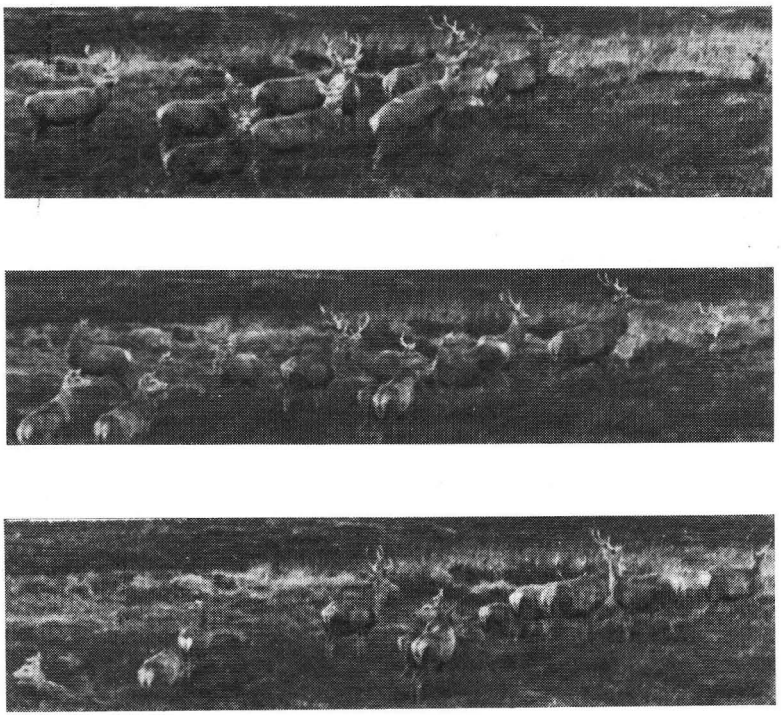

Figure 2

Three views of a group of red x sika deer hybrid stags in May 1973. They are typical of the deer in the non-forested areas of Wicklow which show a wide variety of red deer and sika deer characters.

park seems impossible to obtain as there were three species of the genus *Cervus* together in the park; red deer (including wapiti deer) sambur deer and sika deer. Although Powerscourt claimed to have removed the wapiti deer, and that the sambur and red x sambur deer hybrids had died out, it was still quite possible that some sambur deer or wapiti deer genes remained among the red deer. Thus it was equally possible that the initial hybridisation was between a red x sambur deer hybrid or a red x wapiti deer hybrid and a sika deer, as it was between a pure red deer and a sika deer (Fig. 1).

Red x sika deer hybrids have not been observed in County Kerry where some 200 red deer and more than 1000 sika deer are living on the same range (Larner, 1972). The question of why hybridisation occurred at the Powerscourt deerpark and not in County Kerry arises. However, an examination of two major differences that exist between the two situations may provide the answer. Firstly, as the county Kerry red deer are most likely of native stock they have evolved in greater geographical isolation from the central European red deer than those from the Powerscourt deerpark. Therefore with less mixing genetically the county Kerry red deer may be less compatable, reproductively, with sika deer.

Secondly, the forced confinement of the red deer and sika deer in the Powerscourt deer park was important in increasing the opportunities for hybridisation. However, this may not be a primary factor as hybridisation has been reported to occur in the wild in Scotland (MacNally, 1969) and natural hybridisation has been reported to occur between sika deer and the Asiatic red deer in areas where they are living sympatrically. (Corbet, 1966; Mirolyubov and Ryashchenko, 1948). Thus it is likely that the origins of hybridisation between red deer and sika deer are due to a number of factors rather than any single one and the reason for the apparent delay in its occurring in county Kerry is because the required combination of factors has not yet presented itself.

THE COUNTY WICKLOW HYBRID DEER POPULATION

It appears that the present Wicklow deer population originated mainly from stock that escaped from the Powerscourt deerpark during the troubled period around 1922 (Whitehead, 1964). Both

the red deer and sika deer (including red x sika deer hybrids) established themselves successfully in the Wicklow region. Little effort was made until recently to study these deer although various reports of their distribution and members were made during the intervening years by Delap, 1936; Lang, 1970 and Mulloy, 1970.

The current ecological study of the red deer and sika deer in Wicklow was initiated early in 1972 in response to forest requirements relating to management, recreation and conservation. Field work for this recent study commenced in June 1973. The initial work consisted of accurately censusing the deer inhabiting the non-forest areas and mapping the distribution of all deer in county Wicklow and adjacent counties. During the initial observation of the deer in Wicklow it became apparent that morphological and colour characteristics of the deer under observation in non-forested areas were in no way specific for either red deer or sika deer. Hybridisation between the two species was obviously occurring.

At present there are about 250 red x sika deer hybrids inhabiting the non-forested area of the mountains and a subjective estim-

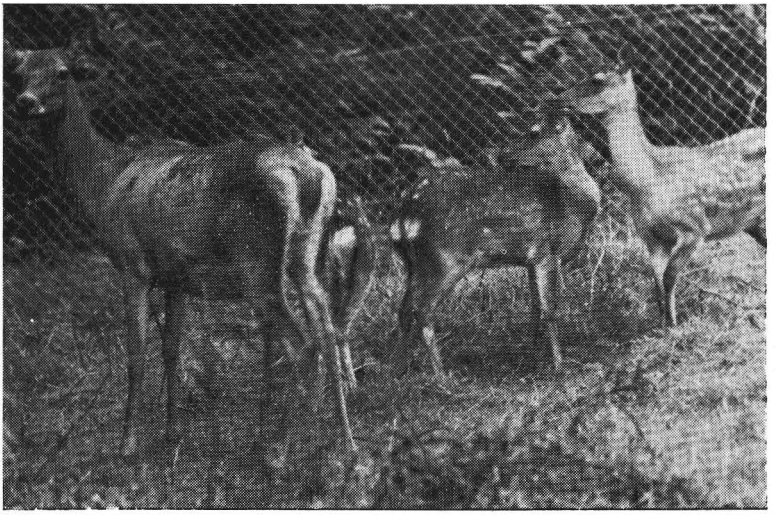

Figure 3

Left; female red deer (**Cervus elephus**), right; female sika deer (**C. nippon**) both showing the diagnostic characters summarised in Table 1.

ate of the sika-deer-like population inhabiting the forested areas, based upon distribution, sightings and carrying capacity, is about 3,000 deer.

Just over 200 deer have been observed closely in non-forested areas of Wicklow. They have been described on the basis of characteristics specific to red deer or sika deer (Table 1). Preliminary analysis of these observations show that approximately 50-60% of the deer were obvious red x sika deer hybrids (example, Fig. 2), 10% were mostly red-deer-like and 30 % were very sika-deer-like. Generally, the specific morphological and colour characteristics of red deer and sika deer tend to coalesce and combine in the Wicklow hybrid deer population. This has resulted in the production of individuals varying widely in both colour and form. This suggests that the introgression of the red deer and sika deer was complete many years ago and that no red deer are now present in the Wicklow region.

None of the Wicklow deer observed so far during the present study has shown only red deer characteristics. However some sika-deer-like animals have proved very difficult to distinguish from sika deer. Indeed the extent of hybridisation occurring within the Wicklow sika deer population remains unknown. This investigation may require the use of biochemical techniques. However, it appears that the problem of determining whether deer are hybrids or not can be solved in Wicklow if observations are made on the following morphological and colour characteristics.

(1) There always appears to be some evidence of the sika-deer-like metatarsal gland, even though there may be only a small clump of white hairs.

(2) In hybrids the rump patch does not extend forwards as far as in red deer. (See Table 1).

(3) The facial profile of red-deer-like hybrids is shorter than that of pure red deer.

Although these three features appear useful in determining red and sika deer hybrids in Wicklow, red-deer-like hybrids may be possible to identify in the field areas where introgression is complete. In these situations the dilution of sika deer genes may be so great that only biochemical techniques may determine whether red-deer-like animals are pure or not.

Although behavioural data on the red sika deer hybrids are as yet exiguous some general patterns of behaviour are nevertheless apparent. Principally, there appears to be a clinal variation in behaviour within the hybrid population that ranges from almost

TABLE 1

MORPHOLOGICAL AND COLOUR CHARACTERISTIC DIFFERENCES BETWEEN ADULT RED DEER AND JAPANESE SIKA DEER*

(See also fig. 3)

Character	*Red deer*	*Japanese Sika deer*
Shoulder height	Stag 42-50 inches Hind 40-46 inches	Stag 32-36 inches Hind 30-32 inches
Winter coat	Greybrown or dark brown	Stag, dark grey to black Hind, grey to dark grey Both sexes may show faint spotting.
Summer coat	Light reddish brown to dark brown—occasionally a row of white spots on either side of dorsal stripe	Light reddish brown to dark brown with numerous white spots running in roughly aligned rows along flank.
Rump patch	Off-white to light brown heart shaped patch extending to top of pelvis	White, not extending above base of tail, bounded by black expands to large conspicuous patch when alerted.
Tail	Short, usually same colour as rump or slightly darker	Long white, with black dorsal stripe, helps to conceal white rump patch when unalerted.
Ear	Long, dense white hair inside, surrounded by dark margin	Rounded, fine white hairs inside on pink flesh with black thumb print on lower edge. Hairs very short in Summer
Metatarsal gland	Small, 1 inch diam., light to dark brown or same colour as surrounding hair and almost as long	Large 1×2 inches, white and odoriferous and hair almost twice as long as surrounding hair.
Profile	Long tapering snout	Short tapering snout.
Antlers	Up to 12 or more points, angle of brow tine to main beam usually greater than 90° and branching out from top of coronet, first top points usually pointing to front and rear of animal	Usually up to 8 points, angle of brow tine to main beam less than 90° and branching out 1-1½ inches from top of coronet, first top points pointing to sides of animal.
Velvet	Dense covering of fine dark brown or black hairs, also silver hair on pink flesh	Dense covering of very fine and short black hairs, wax like appearance, pink flesh showing in places.

*From: Kiddie, 1962; Whitehead, 1964 and author's measurements.

typical red deer behaviour in non-forested areas to behaviour typical of sika deer in forested areas. It is also clear that the sika deer population is rapidly expanding its already wide distributtion (Fig. 4).[1]

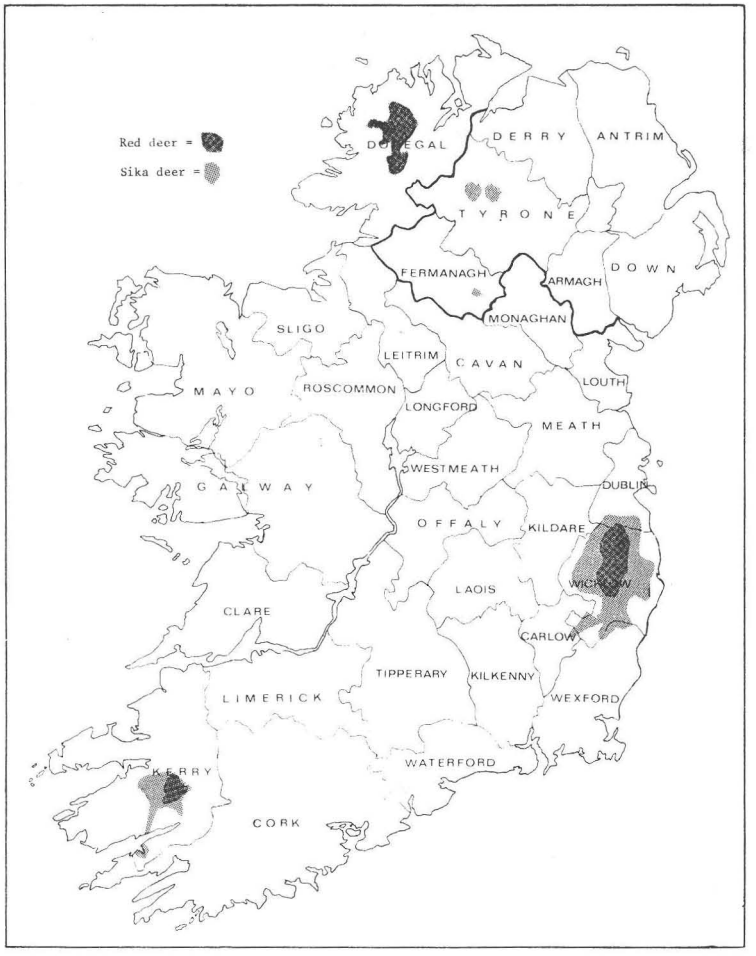

Figure 4

Distribution of red (**Cervus elephus**) and sika deer (**C. nippon**) in Ireland.

1. The Donegal red deer have recently extented their range into County Fermanagh and are now sympatric with the sika deer in the vicinity Brookeborough, Co. Fermanagh.

Recent information from the Great Glen area in Scotland indicates that the sika deer population there is also expanding and rapidly colonising new areas (MacNally, 1973). This dispersal behaviour is in marked contrast to that of the sika deer in Co. Kerry, Wareham (Dorset) (Horwood 1972), and in other areas where hybridisation has not yet been recorded or at least only recently. As red deer are known to be good colonists (Wodzicki, 1961), it is likely that it is the influence of red deer genes within the sika-deer-like population that causes them to disperse more rapidly in areas where hybridisation occurs. This theory is supported by the numerous reports that continue to be received by the Wicklow deer research team, of sika-deer-like hybrids being seen in the most recently colonised areas and at the edge of the sika deer's distribution there. The presence of these sika-deer-like hybrids in these newly colonised and boundary areas has been confirmed by close examination of shot animals. These observations are also a further indication of how insidious is hybridisation between red deer and sika deer.

CONTROLLED CROSS BREEDING AND HYBRIDISATION

As stated earlier the exact origins of the hybridisation between European red deer and Japanese sika deer are unknown and as there appears to be no record of the controlled crossbreeding of the two species, the characteristics of the F1 hybrid are unknown. Hence, a series of controlled cross breeding experiments between red deer, sika deer and red x sika deer hybrids was started in September, 1972. It is hoped that the results from these experiments will provide vital clues to the factors which led to the initial hybridisation of the two species. It is also expected that the resulting offspring of known parentage will act as a reference of morphological and colour characteristics that can be used in recognising the relative proportions of red deer and sika deer genes present in the Wicklow deer population. This reference would also aid the identification of red x sika deer hybrids in areas where the control of red deer x sika deer hybridisation might be attempted.

Table 2

Cross-breeding e experiments between Red deer (**Cervus elaphus hippelaphus**), Sika deer (**Cervus nippon**) and red x sika deer hybrids.

1 Red deer stag x 4 Sika deer hinds 3 Sika deer stags x 4 Red deer hinds	Started in March, 19723.
1 Red x sika deer x hybrid stag	3 Red deer hinds—started in November, 1972. one male calf born 1 Sept., 1973. 3 Sika deer hinds—Started in 1973

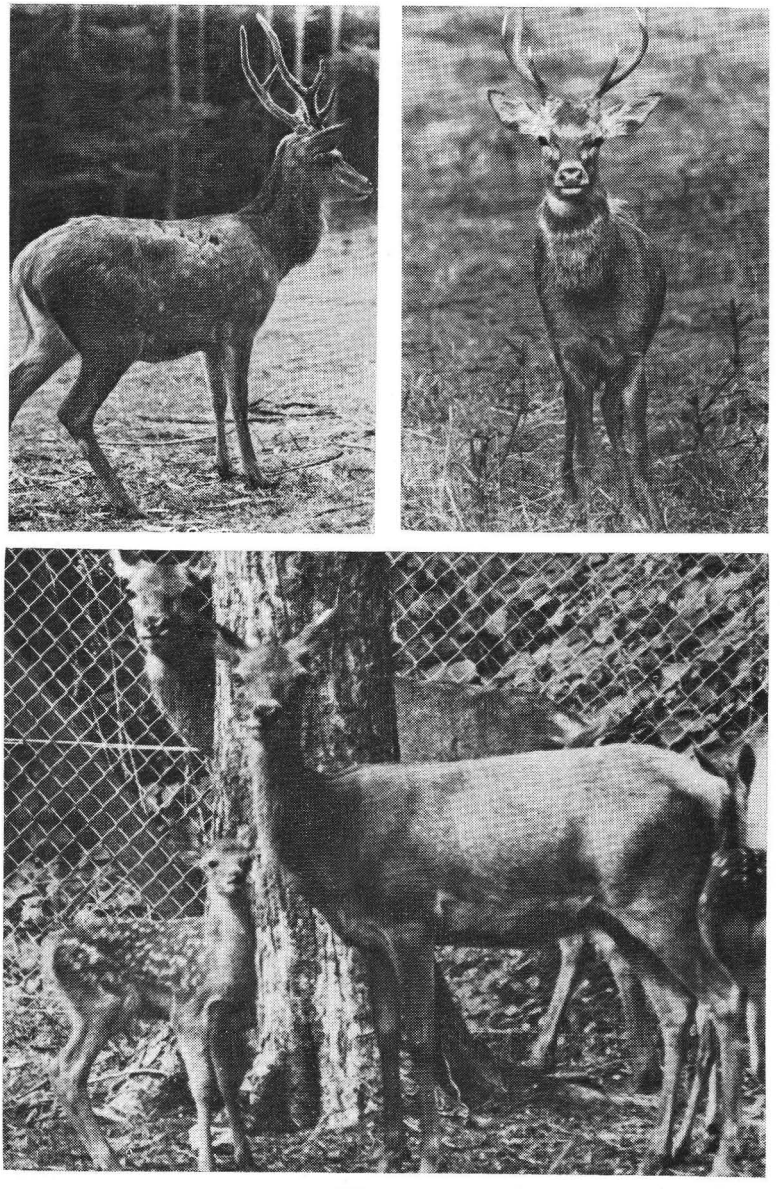

Figure 5

Photographs of hybrid stag (top left and right) red deer hinds, sika deer hinds, and the (red x sika) x red deer calf born on 1st September 1973 (bottom).

Initially four hybridisation crosses are being made, as outlined in Table 2. On 1st September, 1973 the first calf was born (Fig. 5). This was the result of a cross between a red deer hind (seven years old 1972/73) and a red x sika deer hybrid stag (two years old 1972/73). This calf shows only faint hybrid characteristics, principally, a low rump patch and a light coloured metatarsal gland, some of the hairs of which are white. The white spots that dapple the flanks of this calf are not in the obvious horizontal alignment that is usual for red x sika deer calf hybrids and sika deer calves in the Wicklow region, neither are the ears in any way sika-deer-like. However, as this is only a calf, the mature characteristics may be more obviously hybrid. Nevertheless, it is interesting that the red deer characteristics appear so dominant over that of the paternal hybrid characteristics. Should this be a rather consistent trend it is very likely that once red x sika deer hybrid genes are introduced into a red deer population their detection is almost impossible by visual means.

In the early literature on red deer and sika deer hybridisation it was generally stated that the crossing occurred between a red deer hind and a sika deer stag (Powerscourt, 1887 and Brooke, 1898). However, the sika stag (standing about 34 inches at the shoulder) is often considered too small to physically mate a red deer hind (standing about 42 inches at the shoulder). Indeed it would seem quite impossible when these two species are seen together. Nevertheless, the height difference is overcome by the ability of the red deer hind to accommodate herself to the shorter stag by bending her rear legs. While there seems no physical impediment for union between a sika deer hind and a red stag there appears to be mating behavioural differences between the two. It is hoped that the controlled breeding experiments will indicate that combinations are behavourally compatable.

HYBRIDISATION; ITS THREAT TO GENE POOL CONVERSATION

Information on the hybridisation of red deer and sika deer is limited by the scarcity of observational and experimental work, and by the relatively short period the ecological study of the deer in Wicklow has been in progress. Evidence that these two species hybridise, based on their morphological and colour characteristics is conclusive. It is also evident that red deer x sika deer hybridisation is an insidious and extensive phenonomen which leads to the complete destruction of the genetic integrity of at least the red deer population and, possibly, that of the sika deer population. The hybridisation of these two species in Wicklow is not an

isolated phenomonen but has also occurred widely in Britain, in nearly all areas where red deer and sika deer are living sympatrically (Blair, 1972; MacNally, 1969; Whitehead, 1964 and Delap, 1968).

Genetic and ecological research has shown that the genetic integrity of species, subspecies and genetically distinct gene pools of plants and animals are worthy of conservation (Frank *et al*, 1970 and Des Vos, 1956).

However, the conservation of genetically distinct populations requires that they may be protected not only from extermination but also from amalgamation between closely related and reproductively compatible groups. This latter threat may be the greater of the two in present times.

Although natural amalgamations can occur when geographical barriers are eliminated between closely related but allopatric (occupying geographically separated areas) populations resulting in a clinal variation between the two original parent populations (Sinnott *et al*, 1952 and Mayr, 1966), man has induced many artificial amalgamations by his direct and indirect actions. In the past many different exotic and indigenous gene pools of red deer and sika deer were amalgamated to promote larger antlers and to maintain novel varieties (Lowe, 1961 and Kiddie, 1962). These introductions and amalgamations were widespread in Britain and Ireland and have led to the almost complete destruction of the genetic integrity of red deer in Britain and Ireland (Lowe, 1961). It is now believed that the only native stocks of red deer persisting in Britain and Ireland are in county Kerry, Scotland and northwest England. (Lowe and Gardiner in preparation).

However, in these regions the threat of hybridisation with sika deer is present. Red x Sika deer hybrids have been identified and shot in the north Lancashire area and an effort is being made to segregate the red deer and hybrid deer in areas of sympatry. However, although red and sika deer hybrids have not yet been observed in county Kerry, there is no room for complacency, for even if the county Kerry red deer are reproductively isolated by physiological or behavioural factors from the sika deer, with whom they share the range, hybridisation could easily commence if, for instance, a red x sika deer hybrid were introduced from Wicklow. It has already been reported to this author that Wicklow hybrid calves have been transported to other areas in Ireland and it is quite possible that one could find its way to county Kerry and hence remove the apparent barrier that has, as yet, inhibited the hybridisation of red deer and sika deer.

In areas where red deer are a taxonomic entity and worthy of conservation, it is logical to consider the removal of all sika deer and all red x sika deer hybrids. Many may consider this an inordinately difficult task in county Kerry. In that case, the author believes that the minimum compromise would be the removal of some county Kerry red deer to a sanctuary area which would be free from any threat of genetic contamination with other members of the genus *Cervus*.

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The effect of 19th Century Stone Drains on the growth of Sitka Spruce

By M. J. CONRY[1]

SUMMARY

In Rossmore Forest, Co. Laois, poor tree growth occurred on blanket peat planted in 1952 while there was excellent tree growth on the poorly drained gley soils of the Castlecomer Series. Within the poor stand parallel lines of relatively good tree growth occurred above stone drains installed in 1880. As a result of man's influence the depth of peat is considerably reduced in the immediate vicinity of the drains and roots pentrate to the base of the drains. Concentric ochreous mottles (neoferrans) have developed around these root channels. The drains are largely ineffective as a drainage system although the individual drains are still running.

INTRODUCTION

Rossmore Forest, Co. Laois, surrounding the "new" colliery (Fig. 1) was planted in 1952. Preliminary examination in 1970 indicated a wide variation in the growth rate of Sitka Spruce *(Picea sitchensis)*. An excellent stand of spruce had resulted on the poorly drained Castlecomer Series (around Profile 3) but in one area (around Profiles 1 and 2) growth was particularly poor. Further examination revealed that within this poor area there were parallel lines of fairly good spruce trees. Three profile pits were opened: Profile 1 one one of the "ridges" of better growth in the poor area, Profile 2 approximately midway between two "ridges" and Profile 3 in the high yielding stand. These investigations showed that: (1) The fast-growing stand was planted on the poorly drained Castlecomer Series (Surface-water Gley). (2) The poor stand of spruce was planted on a 50 cm. layer of blanket peat. (3) The fairly good parallel rows of trees within the latter area were situated above old stone drains placed in the underlying dense, tenaceous glacial till and the height of tree tapered away quickly on both sides of the drain (Fig. 5). (4) The stone drains were still carrying water.

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1. An Foras Taluntais, Oak Park, Carlow.

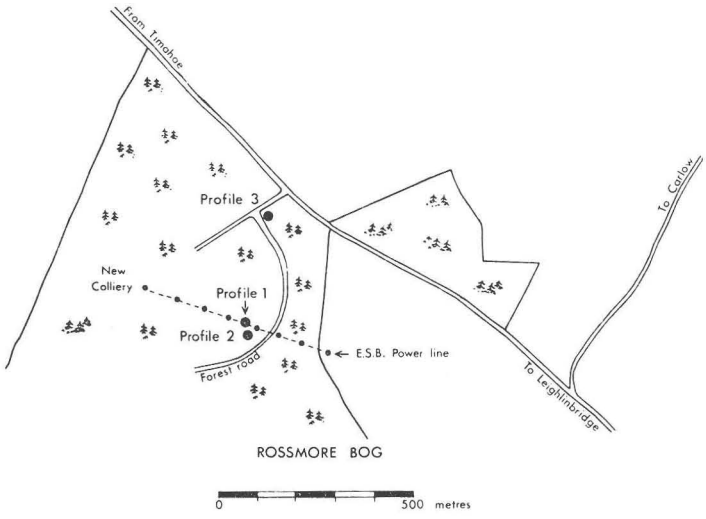

Figure 1

Location of soil profiles.

TABLE I — PROFILE ANALYSIS

Profile	Horizon	Clay	Silt	Fine Sand	Coarse Sand	pH	T.E.B.°	C.E.C.°	"Free" Iron %	C %	N %
1	021	—	—	—	—	4.0	7.4	84.8	0.2	27.4	1.2
	022	—	—	—	—	3.8	6.2	81.6	0.1	22.0	1.2
	A2g	16	44	24	16	4.3	1.7	23.4	0.1	3.2	0.19
	Btg	31	45	15	9	4.8	6.9	19.4	0.7	1.0	0.10
	Cg	31	48	12	9	7.5	9.2	7.9	1.6	0.4	—
2	021	—	—	—	—	3.7	11.5	87.2	0.1	28.0	1.4
	022	—	—	—	—	3.8	7.5	60.0	0.1	21.4	1.5
	A2g	15	45	25	15	4.2	1.2	20.8	0.1	2.4	0.14
	Btg	29	43	17	11	4.8	6.8	10.8	0.5	1.0	0.10
	Cg	28	49	14	9	5.8	4.8	15.3	0.7	0.5	—
3	A1	—	—	—	—	4.9	14.4	55.6	3.7	11.0	0.8
	A2g	29	44	18	9	6.9	15.1	16.0	1.0	1.1	0.14
	B2tg	28	43	18	11	6.9	15.4	16.8	3.6	0.5	—
	Cg	30	44	15	11	7.7	17.5	13.0	2.0	0.5	—

°T.E.B. = Total exchangeable bases (Meq/100g.)
°C.E.C. = Cation exchange capacity (Meq/100g.)

Three profiles were described, sampled and analysed (Fig. 1). Profile 1 and 2 occur in an area covered by blanket peat; Profile 1 exposed a stone drain (Fig. 2), and was situated on a band of fairly good trees while Profile 2 (Fig. 3) was sited midway between the stone drains. Profile 3 is typical of the Castlecomer Series. Profiles are described in the Appendix and analyses for the three profiles are given in Table 1. Thin sections of the mineral horizons were prepared following Laruelle's (1965) method.

The purpose of the present paper is to: (i) record the soil changes directly attributable to artificial drainage and (ii) to measure the effect of the drains on tree growth and their effectiveness for drainage purposes. During the course of the investigation the date of installation of the stone drains was also established.

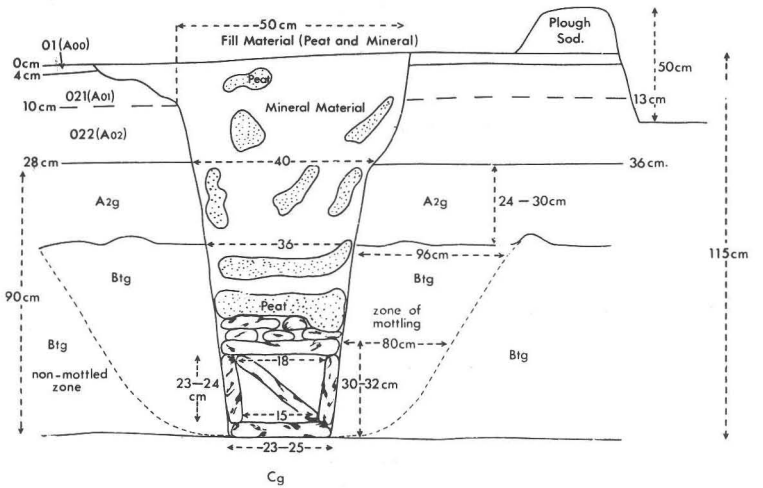

Figure 2

Diagrammatic representation of profile 1 showing field drain.

MATERIALS AND METHODS

Rossmore Forest occurs on the highest portions (up to 325 m) of the Castlecomer Plateau and has an annual rainfall of approximately 1,000 mm. The basic rock formations consist of Carboniferous shales, flagstones and sandstones with some coal-bearing seams. The region was glaciated during the Saale glaciation, but was not covered by the more recent Weichsel glaciation.

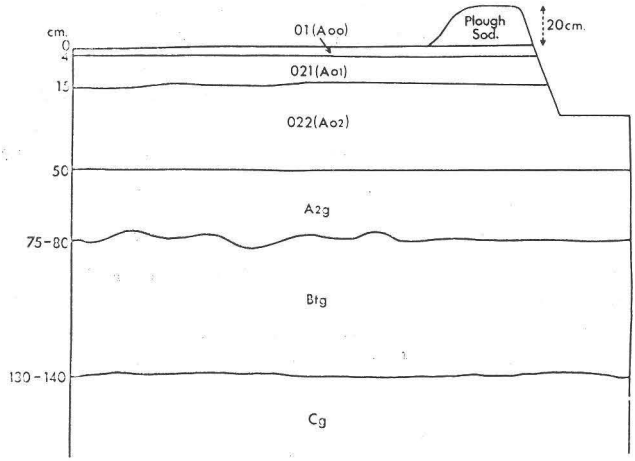

Figure 3

Diagrammatic representation of profile 2.

However, during this period solifluction phenomena denuded the steep slopes of their glacial deposits. For this reason poorly drained and very poorly drained surface-water Gleys, derived from dense, tenaceous glacial till composed mainly of shales, sandstone and flagstones are found mainly in depressional areas and on weak slopes. Extensive areas of blanket peat occur mainly in the depressions and on the gently undulating slopes.

DISCUSSION

Effectiveness of the drainage system

Although water flows freely through the drains, their effectiveness as a drainage system is extremely limited. Improved tree growth only occurs for about 1 to 2 metres on each side of the drain. Tree growth drops rapidly from the centre of the drain (Fig. 4). Dr. N. O'Carroll (Private Communication) calculated in 1971 that the tree growth over the drains had a General Yield Class of 10 (Equivalent to Yield Class 140/160 Hoppus). This compares rather unfavourably with the General Yield Class of 18 (Yield Class 200 Hoppus) on the Castlecomer Series at Profile 3 (Fig. 1). The tree growth between the stone drains was too low to be given a yield class rating.

It is obvious that the drainage scheme is only partially effective. The major defect is that the drains are too widely spaced. It is extremely doubtful if any drainage could be economically feasible on this particular situation. Apart from the excessive moisture regime in the soil, nutrition is probably the important limiting factor on the blanket peat. Ground rock phosphate application

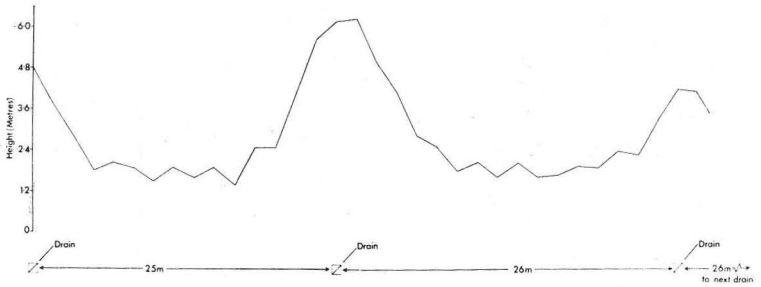

Figure 4

Mean tree height (based on 10 trees per line) in 1971, showing bands of relatively good growth in poorly growing Sitka spruce on blanket peat (Rossmore Forest).

in 1970 shows considerable growth improvement even on the poor stands between the drains where drainage is ineffective. Best results on this blanket peat can therefore be attained by ploughing to a depth of 30-40 cm. and the addition of fertilisers.

Profile changes

As a result of the installation of artificial drains in the 19th century a number of morphological changes have occurred in the soil profile. Firstly, comparison of profiles 1 and 2 shows that the depth of peat has decreased to almost half its original depth. Secondly, rooting depth has increased; in the undrained soil (profile 2) root development is largely confined to the surface peat and A2g horizon. On the other hand, tree and other roots penetrate down to the bottom of the stone drain in profile 1. Thirdly, concentric ochre (7.5 YR $\frac{5}{8}$) mottles have developed around these root channels in the gleyed (textural) B (Btg) horizon. These ochre mottles are typical neoferrans (Brewer, 1964) and occur in the mottled zone shown in figure 2. They have developed since 1880, as a result of the improved air/moisture ratio in that part of the soil.

Date of installation

It proved difficult to establish exactly when the stone drains were installed. The record of the Forest and Wildlife Service, Department of Lands, stated that the land was drained by the former landlord Adair. It was then established through the records of the Valuation Office that John George Adair owned the lands between 1864 and 1886. Further work eventually established (Conry, 1973) that the drains were installed as a Famine Relief Scheme by the Office of Public Works for Mr. Adair in 1880.

Identical drainage schemes were carried out at that same time on similar coal measure soils by the Office of Public Works, on many farms around Abbeyfeale (J. O'Connor, private communication). It seems, therefore, that a rather uniform type of stone drainage system was installed throughout Ireland at least on these heavy wet coal measure shale soils (Soil 13; Soil Map of Ireland, 1969) to relieve the distress caused by the 1879 famine (Doyle, 1971).

Figure 5

Relatively good tree growth over drain and poor tree growth between drains.

ACKNOWLEDGEMENTS

Sincere thanks to all the people who helped in obtaining the date of the drainage scheme; to Miss O. Shudall and Mr. T. Shanley for preparing the figures and providing analysis respectively; to Dr. G. Stoops for preparing thin-sections; and to the numerous people in the Forest and Wildlife Service who helped in various ways in the preparation of this paper.

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Appendix

Profile 1

Location: Rossmore Forest, Co. Laois; 37/1 T14-15

Topography: Undulating plateau
Slope: 3°
Altitude: 325 m.
Precipitation: 1,000 mm.
Drainage Class: Very poorly drained (now artificially drained)
Parent Material: Dense, tenaceous, non-calcareous glacial till (Saale Age) composed of Carboniferous shale, sandstone and flagstone.
Vegetation: Sitka spruce (*Picea sitchensis*) and occasional *Contorta pine*, with ground vegetation of mosses, *Calluna* and *Vaccinium*.
Classification: Blanket peat

Horizon	*Depth (cm)*	*Thickness (cm)*	*Description*
01 (Aoo)	0-2½/4	2½-4	Partly decomposed plant remains
021 (Aol)	2½-20/13	7.5-10	Dark reddish brown (5YR3/2) peat; clear boundary to:
022	10-28/36	18-23	Black to dark reddish brown (5YR2/1-2/2) peat; more humified than 021; abrupt boundary to:

A2g	28-50/66	24-30	Loam to silt loam; greyish brown (10YR5/2) with abundant blackish streaks of decomposed roots; structure-less; moist/wet plastic; gradual boundary to:
Btg	50-120/130	55-65	Clay loam to silty clay loam; bluish grey (7.5YR5/0 nearest) with faint olive brown mottles; abundant prominent strong brown mottles (neoferrans) (7.5YR5/8) along old root channels; structureless; wet plastic; gradual boundary to:
Cg	120+	—	Stony clay loam similar to above horizon except that strong brown mottles along old root channels are absent.

Profile 2

Rossmore

Location: Forest, Co. Laois; 37/1 T14-15

Topography: Undulating plateau
Slope: 2-3°
Altitude: 325 m.
Precipitation: 1,000 mm.
Drainage Class: Very poorly drained
Parent Material: Similar to profile 1
Vegetation: Similar to profile 1
Classification: Blanket peat

Horizon	*Depth (cm)*	*Thickness (cm)*	*Description*
01 (Aoo)	0-2½/4	2½-4	Partly decomposed plant remains
021 (Ao1)	2½-15	12½	Dark reddish brown wet peat (5YR3/2); clear boundary to:
022	15-50	36	Black to dark reddish brown (5YR2/1-2/2) wet peat; more humified than 021; abrupt boundary to:
A2g	50-75/80	23-30	Similar to A2g of profile 1
Btg	75-130/140	55-60	Similar to Btg of profile 1 except that strong brown mottles (7.5YR5/8) along root channels do not occur.
Cg	130+		Similar to Cg of profile 1

Profile 3

Location: Rossmore Forest, Co. Laois; 37/1 R14-15

Topography. Undulating plateau
Slope: 2-4°
Altitude: 320 m.
Precipitation: 1,000 mm.
Drainage Class: Poorly drained
Parent Material: Similar to profile 1
Vegetation: Dense stand of Sitka spruce
Classification: Surface-water Gley (Castlecomer Series)

Horizon	*Depth (cm)*	*Thickness (cm)*	*Description*
01	0-1/2½	1-2½	Pine needles, abrupt boundary to:
A1	1-14/15	13-14	Clay loam; dark greyish brown (10YR4/2); moderate fine to medium granular structure friable when dry and sticky when wet; root concentration in this horizon; clear smooth boundary to:
A2g	14-28/30	14-16	Clay loam; olive grey (5Y5/2) with many fine distinct mottles (10YR5/6) particularly around root channels; coarse prismatic structure, wet plastic; sparse roots; gradual smooth boundary to:
B2tg	28-85	57	Clay loam; speckled grey (5Y5/1) and yellowish brown (10YR5/6); coarse prismatic to structureless; wet plastic; sparse roots; gradual boundary to:
Cg	85+	—	Stony clay loam; grey (7.5YR5/0) with abundant distinct yellowish brown (10YR5/4) mottles; structureless; wet plastic; no roots; weakly calcareous.

Potassium supplied by precipitation and its possible role in forest nutrition

N. O'CARROLL AND R. McCARTHY[1]

SUMMARY

Published data on potassium content of precipitation for eight Irish meteorological stations over a period of seven years were processed to give the quantities supplied. The overall distribution is concave, with lowest values in the central area and the highest on the west and northwest coasts. The average quantity supplied ranged from 1.6 to 11.7 kg K/ha per annum. It is suggested that this supply may be important in soils of low K supplying power.

Introduction

Severe growth check due to potassium deficiency has been observed in forest crops on certain peat sites in the Irish midlands (O'Carroll 1966, 1972a, 1972b). Mild to moderately severe foliar deficiency symptoms have been observed on western and north western blanket bog peats, but no cases of severe growth check which could be ascribed to potassium deficiency have so far come to light.

Procedures

The Meteorological Service of the Department of Transport & Power has since 1962 recorded and published (in the Irish Monthly Weather Report) data on various inorganic constituents, including potassium content, of precipitation at 8 stations (Fig 1). Details of analytical methods are given by Tierney (1967). Data on potassium for the years 1965—1971 have been processed to give the quantities of potassium supplied by precipitation at each of the eight stations. The annual quantities are shown in Table 1 and have been tentatively converted to isopleths (lines of equal quantity) (Fig. 1) although these must be treated with reserve in view of the small number of stations involved.

1. Research Branch, Forest and Wildlife Service, Department of Lands, Dublin.

Data for two stations, Belmullet and Birr, representing areas of high and low potassium supply have been given in greater detail. Fig. 2 shows the monthly averages for the seven years studied. Fig. 3 shows the average precipitation and the average potassium concentration over the same period for the same two stations.

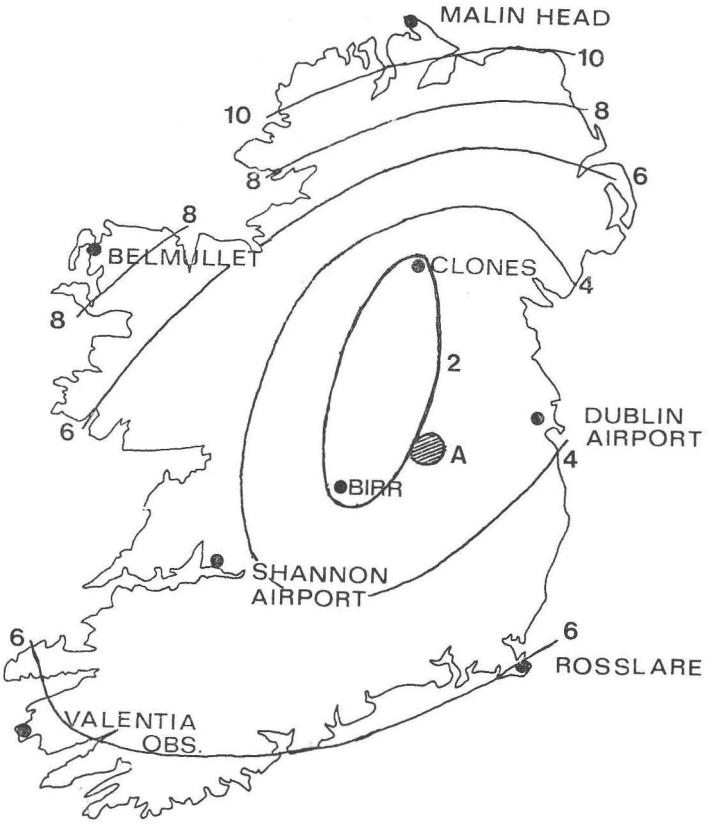

Figure 1

Location of meteorological stations and isopleths of potassium supplied in precipitation (kg/ha).
A—Area of known severe potassium deficiency.

Discussion

The general pattern of potassium supply as seen in Fig. 1 appears to be concave, with lowest values in the central part or

the country. Quantities supplied increase rapidly towards the north west, and more slowly towards the coast in the other directions.

No detailed survey of the occurrence of potassium deficiency in Irish forests has been carried out, but one area where severe deficiencies do occur is that marked A in Fig. 1. Severe deficiencies have not been observed in blanket bog areas in the west and north west where studies in forest nutrition have been in progress for about 15 years.

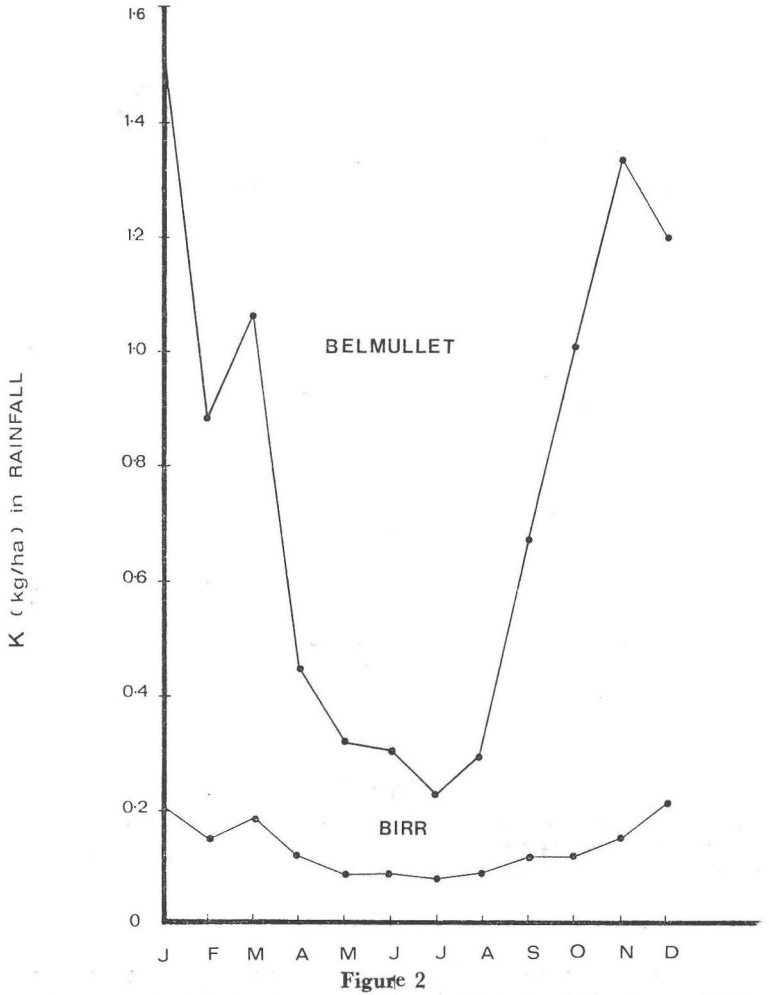

Figure 2

Average monthly supply of potassium in rainfall for Belmullet and Birr (1965—1971).

The practical significance of a supply of potassium varying from 1.6 or less to nearly 12 kg/ha per annum in terms of forest nutrition cannot be determined in the absence of information on both the potassium requirements of our crops and the potassium supplying power of our forest soils. Data assembled by Switzer and Nelson (1972) on young loblolly pine may give some

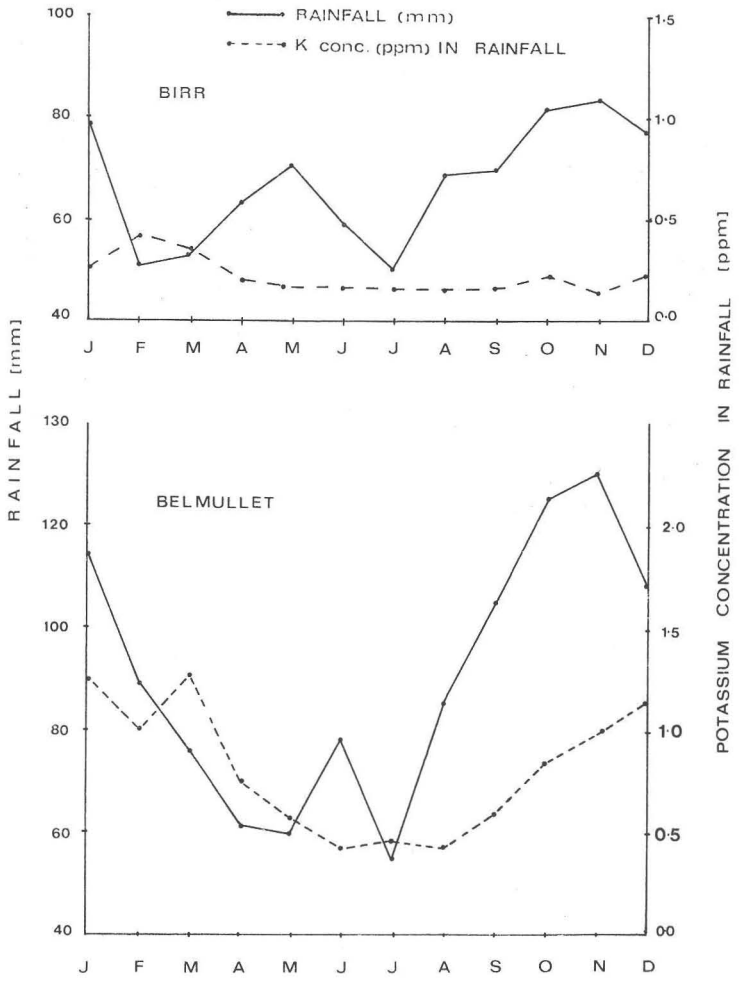

Figure 3

Average monthly rainfall and its potassium concentration for Belmullet and Birr (1965—1971).

indication of the order of quantities involved. They report that between the ages of 5 and 20 years, the annual incorporation of potassium into the above-ground (including litter) fractions of the plantation ecosystem varied from 4 to 7 kg/ha. The highest rate of incorporation occurred between 5 and 10 years, with a drop of nearly 50% in the 15 to 20 year period. It is clear that for such a crop on a soil deficient in available potassium, a variation of from 2 to 12 kg/ha of potassium supplied in precipitation could be critical. Unlike soil potassium, that derived from precipitation is entirely available although some may be lost in runoff.

These indications are supported by data of Ovington (1965) who reported average annual accumulations of 4 to 7 kg/ha of potassium in 47 year old crops of Douglas fir, Scots pine, Norway spruce and pedunculate oak in England. The same author gives data for a 55 year old Scots pine stand where the maximum annual accumulation of potassium in trees, ground flora and litter was 17 kg/ha, the average for the whole 55 year period being 6 kg/ha per annum.

Monthly variations for two stations are shown in Figs. 2 and 3. A seasonal contrast exists in supply in Belmullet with its maximum of 1.5 kg/ha in January, and its minimum of 0.23 kg/ha in July.

In Birr, on the other hand, the values are uniformly low, less than 0.20 kg/ha, throughout the year.

The seasonal contrast at Belmullet may be due to the higher winter rainfall at that station, allied to the close relationship between potassium concentration and the amount of rainfall. (Fig. 3). No such relationship holds for Birr, the potassium concentration staying relatively constant (.1—.2 ppm) irrespective of the amount of rainfall.

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TABLE 1

ANNUAL SUPPLY OF POTASSIUM IN RAINFALL (Kg/ha)

Station	Year							
	65	66	67	68	69	70	71	Mean
Birr	2.34	1.89	1.62	1.67	1.05	1.69	1.09	1.62
Clones	2.51	2.77*	1.72	1.34	1.54	1.73	1.43	1.89
Dublin Airport ...	4.11	3.98	3.42	4.93	2.40	2.47	2.01*	3.37
Shannon Airport	5.52	6.30	4.59	3.63	3.14	3.86	4.22	4.47
Rosslare	8.92	8.84	6.19	4.56	4.91	4.63	3.86	5.99
Valentia	9.26	7.39	8.08	5.17	4.31	5.19	4.32	6.25
Belmullet ...	10.63	9.70	10.88	8.50	7.61	9.58	8.31	9.32
Malin Head ...	13.62	15.96	14.37	8.57	10.41	11.18	7.92	11.72

*Data not available for Clones, May 1966 and Dublin Airport, March 1971.

Formica Lugubris
A new County record

L. P. O'FLANAGAN AND J. M. MOLONEY[1]

This is a short note to record the occurrence of *Formica lugubris* Zett (formerly included in *F. rufa*) in South East Limerick.

F. lugubris, the large wood ant, is actively encouraged in some continental European forests because of its role in the control of certain insect pests. Its distribution in Ireland is very restricted, probably due to the rapid deforestation over the past three or four centuries. It may now be on the increase as a result of recent progress in reforestation.

Two active nests have been located in Compartments 25776-e and 25778-R Galtee Forest, near the Tipperary border. (National grid reference R88 18). The first nest was located in November 1972 and the second discovered by forest workmen in March 1973. These two nests are 80 metres apart. It is quite probable that more nests may exist in this locality which is mainly pole and thicket stage conifer plantations with open replanted areas.

Stelfox (1927) quotes records of its occurrence in SK,[2] NK, WA, SG, WI, and AR (possibly introduced). O'Rourke (1950) notes the following locations: SK, NK, WA, WX, SG, WI (extinct), AR (doubtful), NT and ST. Collingwood 1958 records the following locations; ST and SG, he was unsuccessful in finding any nests in SK, though they have recently been found there. (Breen).

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1. Forest and Wildlife Service; respectively District Inspector, Cahir, Co. Tipperary, and Forester in Charge, Galtee State Forest.
2. The letter symbols used are those agreed upon by a committee of the British Association 1912 as follows :

SK	South Kerry	WI	Wicklow
NK	North Kerry	AR	Armagh
WA	Waterford	NT	North Tipperary
WX	Wexford	ST	South Tipperary
SG	South Galway		

Abstract

Aspects of Tree Nutrition on Peat

The relationship was discussed between the mineral nutrition and growth of Sitka Spruce planted on deep oligotrophic blanket peat in Northern Ireland. Oligotrophic peat was defined as that group of peats supporting vegetation the main species of which are *Calluna, Erica tetralix, Trichophorum caespitosum, Narthecium ossifragum* and *Sphagnum ssp.* This type comprises some 48 per cent of the total area of peat in forests in the North. Peat of all types represents almost 50 per cent of the present forest area. A recent inventory survey has shown that the present average growth rate of Sitka on oligotrophic peat corresponds to only Yield Class 9 (metric).

One way of increasing this rather meagre production is by fertilizer application. With the old treatment of applying a handful of basic slag in the planting hole, growth, although promising for a few years, soon slowed down until the extensive areas planted in this way were well and truly in 'check'. Application of rock phosphate at rates of 500-1000 Kg/ha greatly increased growth and for a year or two this seemed to be a solution to the problem. However although this treatment increased growth and both phosphorus and nitrogen uptake by the trees, growth was limited about six years later by nitrogen deficiency. Treatment of the often vigorous *Calluna* with either paraquat or 2,4-D substantially increased nitrogen uptake and growth but without further fertilizing growth returned to its pre-treatment level after only three growing seasons. Where both herbicide and fertilizers were applied growth increased for five years after treatment before decreasing to the pre-treatment rate in a further two years. In both cases growth was again eventually limited by nitrogen deficiency.

Even where high rates of phosphate were applied at time of planting nitrogen deficiency started to limit growth seven years later, despite the fact that phosphorus and potassium levels in peat and trees were still high. Growth could be increased only by the addition of fertilizer nitrogen. However, within three years of applying urea at 250 kg/ha nitrogen uptake by the trees was

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1. By D. A. Dickson, Agricultural and Food Chemistry Research Division, Ministry of Agriculture, Belfast. Paper delivered to Society of Irish Foresters Annual General Meeting, Dublin, 10th March 1973. Full text will be published in **Forestry.**

again critical and growth rate decreased. At ten years of age plantations (especially in the west) grew at a rate corresponding to Yield Class 24 (metric). However, all present evidence suggests that satisfactory growth beyond this age can be maintained only by the rather frequent addition of fertilizer nitrogen.

Limestone at up to 22 t/ha at time of planting reduced growth over the following six years. Soil pH was increased to over 6.5 and faunal activity greatly enhanced but the uptake of nitrogen, phosphorus and potassium all decreased. Trees planted seven years after liming at lower rates, however, grew remarkably well once the lime-induced potassium deficiency was overcome. Nitrogen availability was greater than in unlimed peat.

Unless a treatment such as liming can increase the availability of the nitrogen in peat over an extended period it seems that it will be necessary to apply fertilizer nitrogen regularly if the growth of Sitka Spruce on oligotrophic peat is to be maintained at a reasonable level. This will be an expensive operation.

Trees, Woods and Literature—9

BEECH TREE

I planted in February
A bronze-leaved beech,
In the chill brown soil
I spread out its silken fibres.

Protected it from the goats
With wire netting
And fixed it firm against
The worrying wind.

Now it is safe, I said,
April must stir
My precious baby
To greenful loveliness.

It is August now, I have hoped
But I hope no more —
My beech tree will never hide sparrows
From hungry hawks.

TO A LATE POPLAR

Not yet half-drest
O tardy bride!
And the priest
And the bridegroom and the guests
Have been waiting a full hour.

The meadow choir
Is playing the wedding march
Two fields away,
And squirrels are already leaping in ecstasy
Among leafy branches.

From *Collected Poems* by Patrick Kavanagh, published by Martin, Brian and O'Keeffe, Ltd., reprinted by kind permission of Mrs. Katherine Kavanagh.

Patrick Kavanagh was born in Inniskeen, Co. Monaghan, in 1905, of small farming stock. He has described his childhood as "the usual barbaric life of the Irish country poor." He came to Dublin ("the worst mistake of my life") in 1939 and remained there until his death, of pneumonia, in 1967.

His early writings, *Ploughman and Other Poems* (1936), the epic poem *The Great Hunger* (1942) and the novel *Tarry Flynn* (1948) are concerned with his early experiences, arising out of a life-style some of whose worst aspects are disappearing with houses such as that on our cover. Some of his later sonnets, in *Come Dance With Kitty Stobling* (1960), may be compared in their intensity and universality with the late string quartets of Beethoven.

His lines "O stony grey soil of Monaghan/You burgled my bank of youth" express the dispair of Drumlin belt farmers unaware of the potential of their "stony grey soil" under Sitka spruce.

Of the two poems printed here the first is obviously written of a personal experience, and the second suggests the presence of a specimen of X *Populus canadensis* Moench. var. *serotina* (Hartig) Rehd. in the neighbourhood.

JOURNAL WANTED

The Editor is anxious to obtain a copy of **Irish Forestry,** Vol. 23, No. 1, Spring 1966, and would like to hear from anybody having a copy to dispose of.

Notes and News

MINISTER'S SPEECH

The Minister for Lands, Mr. Tom Fitzpatrick, T.D., spoke as follows at a Press Reception given by the Society in Dublin on 5th. October 1973 to introduce the 1973 series of Guided Forest Walks:—

It was with pleasure that I accepted the invitation to say a few words here this afternoon. Dedication is a rare enough commodity nowadays when self-interest tends to dominate much modern thinking and when the Society of Irish Foresters invited me as Minister for Lands to launch their 1973 Programme of forest walks, I was very happy to take up that invitation. In our country where afforestation necessarily has, to a great extent, been left to the Government rather than to the individual and where, for that reason, there might be a dividing gulf as it were between the ordinary man and the State undertaking, it is very rewarding to find a dedicated group such as the Society of Irish Foresters forming a bridge in communications.

This, I think, is the fourth year in which the Society have sponsored these guided walks which, I am aware, have grown tremendously in popularity even in that very short time. This year's programme of walks covers the length and breadth of the country and, as always with the Society of Irish Foresters, it is happily true to say that the programme embraces north and south. Thankfully in these troubled days when bridges between men are liable to be burned as quickly as they are built the Society recognize no boundaries in their dedication to the profession that they are proud to follow.

I am very happy that as always there has been full co-operation between the Society and the Forest and Wildlife Service of my Department in this initiative and I can give an assurance that such co-operation will continue to be forthcoming. It would be my wish that as many people as possible should take part in the scheduled walks during the coming week-end so that they may not alone enjoy an aftenoon in the woodlands but can acquire, as the Society's leaflet says "a deeper understanding of the role our forests play in the economic and aesthetic development of the country."

There is little more for me to say, ladies and gentlemen. Actions speak louder than words and the work of the Society of Irish Foresters in giving of their time and expertise in this initiative is something that merits the highest commendation.

In concluding, I would wish to convey my personal thanks to them and to express the wish that this year's programme will be, as I expect it to be, an even greater success than those that have gone before.

CONTINUING DAMAGE TO SITKA SPRUCE

Mr. O. V. Mooney (Forest and Wildlife Service, Dublin) has supplied the following note.

Severe damage to Sitka spruce and to a lesser extent to contorta pine was noticed in many places from May onwards in 1973. The general impression is that the most severe damage was experienced approximately north of a line from Galway to Dublin but particularly in the north western counties, and even in situations near the sea. Where damage was severe all live needles and almost all buds even on trees up to 5 m or so on Sitka spruce appeared to be killed, while with contorta pine the few centimetres of spring shoot growth had been rendered flaccid in some places.

The date suspected for this frost is the 29th April, 1973 when there were a number of records of temperatures below -10°C (grass min.). For instance, temperatures of -13°C at Glenties, -14°C at Lullymore, -12.8°C at Ballinamore and -10°C at Birr were recorded for that date.

Sitka spruce has been subject to severe punishment in recent times. It was damaged in the same northern and western regions by an extraordinary frost in September 1972* and there has been continual and exceptional infestation of *Elatobium abietinum* in the last three years or so, all of which one feels must combine to result in substantial loss of increment.

*See Irish Forestry Vol. 30, No. 1, pp. 21-24.

RACISM IN DEER — AN ETHICAL DISTINCTION

The article in this issue by Rory Harrington may cause some readers to feel uneasy about its purpose. They should not. We must draw a clear distinction between the aim to preserve genetical integrity in plants and animals, and the idea of racial purity among human groups which has been advocated, and indeed put into practice from time to time. The preservation of genetical integrity in animal and plant species and races is a perfectly legitimate exercise, being little more than an attempt to slow down the approach of that overall randomness which will be the ultimate victory of time (with a little help from the thoughtlessness of mankind). A similar attempt with the human species is now generally

agreed to be completely wrong, although further discussion of this would be outside the scope of this journal.

LONG-SERVING AUDITOR

All members will wish to join in an expression of gratitude to Mr. D. M. Craig who resigned as Honorary Auditor at the end of 1972. Mr. Craig has held the office of Honorary Auditor since the foundation of the Society in 1942. The auditor's work is not immediately obvious to the general membership, but a succession of treasurers have paid tribute to Mr. Craig's professional skill and patience in his annual sorting out and putting into order of the Society's accounts.

THE CASE FOR FORESTS AS CROPS

An attempt to educate one of the better-informed sections of British public opinion as to what foresters are really trying to do, and why, was made in a detailed article entitled "Forests Are Crops" by Edward Hyams in the weekly *New Statesman* in September. Mr. Hyams is a well-known serious writer on a wide range of subjects, his books including a sumptuous volume on Irish gardens. In this article he is particularly harsh on the "haters of change." He admits some sympathy for what he terms the "aristocratic" attitude which "puts money returns where they belong . . . in third place after aesthetic and social considerations" but claims there is a long way between that and "objection to planting over-grazed and exhausted upland because you happen to like a particular kind of view." He points out the various subsidiary effects of forestry, well known to foresters, and draws attention to the situation where the forester can never be right. Having planted an against all opposition he then comes back at the end of rotation to clear-fell, to face a further uproar at his vandalism.

ENERGY GROWS IN TREES

Imagine this advertisement appearing on your television screen:

Man, no longer young, plump, balding, smug. Leans nonchalantly against tree in woodland setting. Speaks: "Invest your energy in trees and forests, and earn 600 per cent. Tax free."

Taps tree trunk twice with proprietorial air.

"Get with the right one."

If that advertisement did appear it could be more truthful than most.

Gordan F. Weetman and Stuart B. Hill, two Canadian forest research workers, have recently done some calculations on the rate of return, in terms of energy, from fertiliser use in forests. In a paper given at a forest fertilisation symposium New York State University, College of Environmental Science and Forestry in August 1972, they worked on the assumption that urea, spread at 400 pounds per acre on spruce forest growing at 40 cubic feet per acre per year (very low by Irish standards), would produce an increase in growth of about 30% per year over ten years. The extra timber produced would have an energy content of about 120 million B. t. u. or six times the combined amount in the raw material and energy source used to manufacture the fertiliser.

REPLACEMENT FOR OAK

Oak has been the traditional material for the manufacture of canal lock gates. But because of the severe conditions to which they are subjected they have to be replaced at regular intervals. In England in recent years it has become increasingly difficult to get home-grown oak in the large dimensions needed for lock gates, and a recent issue of *Timber Review* (No. 24) records the use of African Dahoma to build gates for the Wey and Godalming recreational waterway in Surrey. Tests on Dahoma indicate that it has qualities, including durability, similar to those of European oak.

NATIONAL FORESTRY DAY, MOSCOW

In Moscow, according to Alan Brien writing in *The Sunday Times* last August, each industry is given a day to itself on television, to explain what it has done. Since there are four channels the programmes have to be good to hold their audiences. National Forestry Day apparently did not succeed in doing that. "But that was our fault," they told him. "If we had used a really creative approach, it should have been entertaining to all."

LAST ISSUE'S COVER

Due to an error the details of the cover picture on our last issue were omitted. The portrait was of Augustine Henry (1857-1930), plant collector, pioneer tree breeder and Professor of Forestry at the Royal College of Science, Dublin. The original, in the Henry Herbarium, National Botanic Gardens, Dublin, was painted by Celia Harrison and was reproduced by kind permission of Mr. Aidan Brady, Director.

Reviews

INVENTORY OF WOODLANDS OF THE FOREST AND WILDLIFE SERVICE. INVENTORY OF STATE FORESTS—1968. Liam P. O'Flanagan, Stationery Office, Dublin. pp. 94. Unpriced.

As the title indicates, this publication gives detailed descriptive lists of the characteristics of State woodlands in regard to areas, species and volume and also gives forecasts of production up to the beginning of the next century. Indeed, two-thirds of its pages are devoted to tables of forest statistics.

The stated prime objectives of the inventory were twofold:

1. To provide short and long term forecasts of timber production from State forests at national, county, district and forest levels.
2. To provide up-to-date forest maps with stand descriptions for use by forest managers.

The first objective is oriented toward planning at national and regional levels. The second is aimed largely at local management and relates to the first only in so far as some basis of forest area classification is required to forecast growth potential. A third possible objective, estimation and classification of the volume of growing stock was considered to be "not of such significence," although tabular estimates are provided.

The provision of stock maps involved visiting and mapping all sub-compartments in forests planted prior to 1958. Each compartment was described on a field form, using seventeen criteria. These data were then punched on cards for computer processing and listing. In all, a total of 90,000 inventory data cards were punched, validated and processed on an I.B.M. 360/20 computer. Details of the field procedures and criteria used are provided as well as an outline, complete with flow diagram, of the methods adopted for computer processing. Computer output is presented in the form of summary tables showing forest type by area, industrial timber volume and firewood at national and county level. (Tables A).

Field data for forecasting the growth potential were obtained concurrently with the mapping exercise. The yield classes of coniferous sub-compartments were estimated by "selecting subjectively a point in the sub-compartment where growth was deemed average and taking two top heights per species in a 1/20th acre circular plot." A field test to check the accuracy of this procedure "showed that the Assessors estimated the correct yield class eight times out of ten." This was considered sufficiently accurate for the

purposes of the inventory. In view of the fact that the field assessor had to visit each stand for mapping purposes it was deemed desirable to carry out a "complete inventory" rather than resort to a sampling procedure. In this way the objective to provide up-to-date maps determined the actual inventory method.

Forecasts of production relate only to conifer high forest, both pure and mixed. It is based on data from three sources: (a) the inventory of forests planted up to 1958 (b) a supplementary forecast for crops planted 1958 to 1968 inclusive (c) the projection of (b) to cover subsequent planting. In all cases the vehicle for forecasting is the Production Forecast Tables of the Forest Management Tables, which assume an annual thinning yield of 60% of the yield class during the thinning period. These tables were read into the computer, either in tabular or equation form, and used to forecast thinning yield on the basis of area and yield class of the various species as they entered the thinning stage. Clear felling yields were allocated to stands which had reached the age of maximum mean annual increment and these which were to be prematurely felled on a reducd rotation.

Forecasts of thinning, clear felling and total yields at national level are given for all conifers up to the year 2002, for Sitka and Norway spruce show yields at county level. Tables of weighted mean yield class, area and volume of main coniferous species both at national and county level complete the picture.

The publication is printed on good quality paper, with a generally acceptable presentation format. The practice of using the same alphabetical character to identify a whole series of tables may facilitate computer programming but it can be somewhat confusing to the reader. This is further aggravated by detaching tables A and B on pages 61 and 62 from their respective series. The dual titles, one on the cover and one on the fly-leaf, essentially convey much the same meaning, but why should not one of them suffice? Some misspellings, e.g. "forewood" for firewood, point to hasty proof reading and there is at least one error in the tabulated data. Apart from these criticisms the publication is very readable.

Sawmillers and those in the pulp and particle board industries who are concerned about the short term supply of material and the prospects for expansion will find the tables of forecasts extremely valuable. Planners of regional wood using industries will welcome the presentation of data on a county basis. Foresters and students of yield regulation will appreciate the existence of a reference manual on the vital statistics of our forests even though it is already some years out of date.

The author is to be commended for including the tables giving forest type by area and volume despite an earlier reference to the lack of significence of such data. Although they appear to be based on ocular assessments without estimates of their standard of accuracy they provide a picture of the national wealth in our older plantations. In these days of high inflation, soaring timber prices and scarcity of supplies, this provides a bulwark against an emergency, which would be none the less critical if it were economic rather than military.

What is the outlook for forestry? The mean yield classes of the main coniferous species at national level are very encouraging. With pure Norway spruce leading the field at 185 hoppus, followed by pure Sitka at 165, the data show an overall average yield class of 146 for pure conifers and 130 for mixed conifers.

Although these figures are somewhat optimistic in that they do not take into consideration 36,300 acres of "other conifers" which have not been given a yield class in the table, they still represent some of the best growth rates in the Northern Hemisphere.

With a 1 million-acre normal forest of yield class 140 (hoppus) managed on a sustained yield basis our average annual cut would represent 50 million cubic metres. Compare this with production in Norway, a country with a long established forest enterprise playing a major role in its economy. There the current average annual cut is 72 million cubic metres from 8 million hectares of forest.

From an overall planning and forecasting point of view this table of weighted mean yield class at national level (page 62) is one of the most important in the book. Regretably it has two defects; firstly the omission of a yield class for "other conifers" and secondly, a printing error which has robbed *Pinus contorta*, pure, of 5,000 acres. It should read 18,343 acres instead of 13,343. If the reader is so inclined he can use the table to do his own forecasting. Assuming that the present acreage of 600,000 acres (240,000 hectares) will all be in the thinning stage at the end of this century and that an average yield class of 130 obtains. The annual thinning yield (60% of the yield class) will then be 130 x 0.60 x 600.000 = 46.8 million hoppus feet (1.69 million cubic metres). A similar, but most accurate, result will be obtained by referring to the forecasts of coniferous production from State forests, 1971/72 to 2001/02 (page 29), showing the thinning yield, clear felling yield and total yield. In contrast to the previous table, however, this is rather disappointing. In view of the known excellent performance of crops planted prior to 1958 and the present

policy of acquiring land of similar yield class potential the slow increase in clear felling yield baffles this reviewer. Accepting that the constant clear felling yield from 1990 to 2002 is due to yield regulation one must ask why is there not a greater clear felling yield during this period. Does the answer lie in the application of the "reduced" rotation concept or in the acceptance of a rotation of maximum mean annual increment which is just around the corner? A projection of the table for another ten years would ascertain if the latter were the case.

The inventory spanned a three year period and cost approximately £95,000 of which some £21,000 is set against data processing. The total area covered in the inventory was 264,514 acres. This is possibly the last inventory of its kind. An inventory of stands over 10 years of age if undertaken in 1974 would add another 150,000 acres to the above total. In these conditions some form of continuous inventory or sampling procedure is indicated. Whatever inventory design is adopted it is essential to have a periodic assessment of the position for forecasting, regulating and controlling yield. Without these, forest management is non-existent.

P. M. Joyce.

OTHER PUBLICATIONS RECEIVED

Forestry Commission Publications

Leaflets:

No. 55. *Hydratongs* by F. B. W. Platt and P. Wood ... 10p
No. 56. *Grey Squirrel Control* by Judith J. Rowe ... 12p
No. 57. *Replacement of elm in the countryside* by A. F. Mitchell 4p

Research and Development Papers (unpriced)

No. 94. *Cablecrane design studies* by D. Biggs
No. 95. *Some aspects of recreation planning in the Forestry Commission* by A. J. Grayson, R. M. Sidaway and F. P. Thompson.
No. 96. *Construction and application of stand yield models* by G. J. Hamilton and J. M. Christie.
No. 97. *Report of a working party on lorry transport of roundwood* by P. C. Ormrod and R. C. Stern.

Society Activities

ANNUAL STUDY TOUR 1973—

Saturday, 19th May

Arriving at Brussels the party was met by Professor van Migroet and his assistant Dr. Lust. Professor van Migroet welcomed the party with a short speech and having sorted out our luggage we boarded the tour bus for our hotels in Brussels. The party split into two hotels on the Minovesteenweg not too far from the Grand Plas. Some difficulty was encountered in the Hotel Prins van Huik due to double booking but this was sorted out amid much emptying of wardrobes etc.

A visit to Waterloo was arranged for the afternoon, though one got the impression that Waterloo is like Gaelic coffee, strictly a tourist taste. Dinner was on one's own account and the myriad of restaurants beside the Grand Plas were well equipped to cater for empty stomachs. Even the most modest Brussels restaurant will rise above chicken and chips.

Sunday, 20th May

To-day we met Mr. Jan van Schyter, Professor van Migroet's indefatigable assistant and we travelled to the Forêt de Soignes or Zonien Bos in Flemish. Here we were welcomed by Mr. F. Jannssens and told something of the history of this forest. The forest, the 'Carbonaria Sylva' Julius Caesar referred to in his **De Bello Gallico** is now much reduced in size from 11,000 ha. it covered in 1815 to about 4,300 ha. In fact, most of the clear cutting was carried out between 1815 and 1843 when the Belgian State took possession of it.

The bare statistics are as follows :

3,442 ha. of broadleaved high forest, of which 85% is beech.
308 ha. of oak coppice with standards.
322 ha. of conifers mostly Scots pine.
261 ha. used for ancillary purposes.

The day was sunny and a pleasant walk through the forest was conducted by Mr. Janssens who explained the group regeneration system used and their ambition to achieve irregular, uneven aged mixed stands. To many of us it was a sharp contrast to the even rows of Sitka Spruce and **Pinus Contorta**, not to mention the scrubby hardwoods that pass for broadleaved forest in Ireland.

The average timber height of the beech is 15 to 20 metres and one noticed that there was quite a practical approach to natural regeneration. If it did not develop the group was planted from nursery stock. For the mercenary minded the beech was sold at £15 and the Scots Pine at £10 to £12 a cubic metre standing. Labour, when available, cost £30 per 40 hour week plus insurance. Geographically the Forêt de Soignes was on the outskirts of Brussels, now it is being surrounded by Brussels, so obviously the amenity value of the forest is important and will take precedence in its future management.

The State Forest Service picked up the bill for a pleasant lunch at a local inn. We gathered afterwards that this was the first time they had ever bought lunch for a visiting group. Obviously Professor van Migroet smilingly twisted an arm somewhere along the line.

After lunch the party visited the Geofrafisch Arboretum van Tervuren. This arboretum, administered by the Royal Fund covers 350 ha of which a 100 ha is devoted to groups of trees geographically located as standards and understorey. The arboretum was designed by Bouner and is about seventy years old. No straight lines here, the trees had the appearance of natural groups with wide grassy rides in between. However, some species, especially western North American ones were not too happy but the many groups of **Brusselois** (if that is the word) were cheerfully unconcerned by any botanical allergies to the local climate.

Dr. Jack, President, thanked our hosts for the day and we enbussed for Houthalen in the Province of Limburg where we were to stay for the next two nights.

Monday, 21st May

The province of Limburg has 36,170 ha of forest, about 15% of the land area, of this the ownership distribution is a follow :

State	1,866 ha
Province	269 ha
Township	12,532 ha
Public inst.	840 ha
Private	20,663 ha

To-day we visited the state forest of Pijnven. This forest was started in 1904 on poor sandy soil and now covers 774 ha. Professor van Migroet gave a brief history of forest in Limburg and dealt with the policy change from the original pure conifer stands, which led to many problems of disease and windblow, to the introduction of broad leaved trees whenever possible. We were introduced to the divisional and district officers, Ir.-hoofd van dienst J. Timmermans and Ir. F. Dufrane and the latter led the party to some of the more interesting stands. The main species were Scots and Corsican Pine—The Corsican producing better yields and quality up to the equivalent of our yield class 10. This may appear low to Irish readers but it must be emphasised that the very poor soil and skill needed to achieve these results made them quite impressive. Cultivation before planting was essential and heavy doses of urea and lime necessary.

Lunch was served in a very pleasant reception area in the middle of the forest, after which, amid showers, we visited the recreation areas of Kattenbos which covers 80 ha and is situated near the Lommel-Leopoldsburg state road.

The most attractive points were, and I quote from the very wide ranging tour guide, which was prepared by Professor van Migroet and his staff.

"1. The camping ground 'Blauwe Meer' (blue lake) 25 ha.
2. The youth camping ground : 9 ha; place for 1500 campers.
3. The German military cemetery with its 40,000 graves.
4. The promenade forest, consisting of 55 year old Pinus Silvestris and variegated by dunes, small lakes, picnic sites, couches and four walks of respectively 1100, 1100, 2000 and 4000 metres."

A very fine forest museum was attached to the recreation area and showed examples of birds, animals, reptiles and plant communities found in the locality, though some of the exhibits must be quite rare at present. Outside

a forest worker showed a horse complete with harness and trappings used to haul logs. The breed was, I think, a Brabant, somewhat similar in build to the Percheron, though heavier, with a docked tail.

The centre for Forest Research of Bokrijk was next on our itinerary. There we were met by the Director Ir. Huygh who explained that the Institute was founded in 1949 and had twenty staff members at present. The research programme covered.

1. Soil science — mainly root formation
2. Chemistry
3. Silviculture
4. Genetics
5. Entomology.

The party split up into groups which each toured different sections.

The forest portion of this day's tour now finished we went back to Houthalen where a quick change prepared us for dinner at the restaurant in the Domein Bokrijk as guests of the Governor of Limburg.

The Domein Bokrijk is a folk village, showing how the Flemish lived several centuries ago. The different village houses are set around a green and little imagination was required to visualize Brueghel's merry peasants carousing after a wedding.

A traditional meal was laid on for us in the restaurant attached to the village and, as it had been a long day, full justice was done to the smoked meats, back puddings etc. The Governor of Limburg was, unfortunately, unable to be present due to illness, never the less, we drank his health and Dr. Jack thanked him, through Professor van Migroet, for his hospitality.

Tuesday, 22nd May

Leaving Houthalen the party headed south, through mainly flat agricultural countryside, until we reached Liège and the heavily forested hills of the Ardennes, where we were to visit **Le Grand Bois** of Vielsalm.

Ing. J. F. Offergeld, the officer in charge of the area met us and told us the history of **Le Grand Bois.** During the French revolution this ancient forest was divided among a large number of difierent owners but from 1897 to 1937 the Belgian state, through various purchases, acquired 1606 ha. Originally a beech forest the area was converted to Norway spruce and Scots Pine, 66% and 34% respectively, by 1897. Conversion of the pure pine stands to beech and Silver fir started in 1908 and in 1930 the divisional officer of the time, Mr. M. J. Turner, began to consider the pure spruce stands a definite problem and decided to convert them to mixed beech and spruce by the group method. Our first surprise was to be brought to a group of beech, growing at rather odd angles and be told that we were looking at an Anderson plot.

However, the Belgians considered the Anderson group system to be not as good in practice as in theory. In fact, they had evolved their own rather complex group regeneration system based on circular groups, 36 metres in diameter. The canopy of the pure spruce stands is opened when the trees are 50-65 years old at a rate of two groups per ha and beech introduced by planting.

Mr Offergeld showed us some of his better stands of Douglas, Norway, Scots, Silver Fir and beech which were compared in discussion to Irish production under similar conditions, which, of course, was better if one forgot that we were 475 metres above sea level.

Extraction was completely by horse but this system was given only another ten years. Norway Spruce fetched 900-1000 frs (£9-£10) per cubic metre standing, felling about 200 frs, extraction 70 frs and trans-

portation 100 frs, all per cubic metre. For the economists land could be bought for about 50,000 frs a ha and production at 8m³ per ha.

Lunch, as guests of Ghent university, was held **al fresco** in the amenity area where sausages, potatoes and bread were cooked over barbecues by rather fetching students from a nearby domestic science college and washed down with beer.

A pleasant drive eastwards to Monschau, a very pretty German village, with narrow twisting streets and steeply pitched slated roofs of the houses, passed the afternoon, and a substantial dinner and steins of German beer, the evening.

Wednesday, 23rd May

Our short stay in Germany over we crossed the border to the State Forest Hertogenwald where we were welcomed by Chef de Service Terwagne and Ing. F. Cronlin. Here we were shown Norway Spruce regeneration techniques at altitudes of up to 675 metres. Physical condition at 675 metres were akin to 350 metres in Ireland except that Norway spruce would not be the species. Mound planting techniques were used and a lively discussion on the merits and practicality of these sites ensued. At this level windblow accounts for 50% of the production, though this usually happens at the mature stage. There was no question of introducing broadleaved trees here as they just would not grow but the Norway did surprisingly well yielding a M.A.I. of 11m³/ha.

La chasse was important here and rents of 300 frs per ha per annum were obtainable. Regulations were strict, fines of up to 50,000 frs if a deer not in the right category is shot. We saw no deer or boar but a black cock did oblige us, certainly worth considering for introduction or reintroduction in Ireland. At lower elevations we were shown mixed beech and spruce forests and here the **Chef de Service** was obviously in his element explaining his coup system of natural regeneration. Inventories were deemed unnecessary as an aid to annual cut regulation as all foresters here were trained in ocular volume estimation and annual cut was thus regulated.

Our hosts were thanked and we repaired to our bus and lunch at a cafeteria at Eupen before the journey northwards to Louvain, where the Flemish Forestry Society represented by Prof. M. Geebelen, were our hosts at dinner.

Thursday, 24th May

We were welcomed to the State Forest of Meercaal by Prof. M. Geebelen, whom we had met the previous night. Professor Geebelen gave us a short history of the forest, explaining how it had come into state hands as a result of being sequested after World War I from the d'Arenberg family who were of German stock.

Prof. van Migroet, who had now rejoined the tour, explained the concept of the forest as a source of social stability. In a very civilized exposition he showed that mere timber production was not in itself important—more important is the healthy forest as a recreational outlet for the urban masses. There is a clash at present between the capitalistic elite and the cultural elite (biologists) : one in making money and causing industrial pollution, the other in preserving untouched nature reserves. The forester stands between as a pragmatic influence who can open his forests for all to use and enjoy. Van Migroet envisaged this as the most important function of the forester, otherwise an industrial urban society could become frustrated and violent. On a practical note he pointed out that four to ten veneer oak per ha can be as valuable as mass production of conifers.

Meercaal Forest covers about 1,300 ha of which 800 ha consists of oak

and beech stands with about 500 ha of conifers, mainly Scots pine. Professor Geebelen showed us good Corsican pine stands which were better producers than Scots pine on this site. Of interest in passing were a small number of **Pinus contorta** of poor quality but then they appeared to be of inland provenance. Flemish foresters held that the climate was not suitable for contorta though one wonders how the coastal variety would perform. A stand of **Thuya plicata** about yield class 14 was visited but the emphasis of the day was on hardwoods, preference is given to oak and beech and the swing is to natural regeneration in the classical group system. Red oak has been successfully introduced here and found very useful for conversion of stands. It yields 8 to 9m³/ha, about twice the increment of the indigenous oak.

In the afternoon we drove to Ghent where we were free to tour the city until evening when the well endowed Flemish Forestry Society were again our hosts at a very pleasant dinner in an out-of-town restaurant.

Friday, 25th May

Much of the Belgian coast has a dune belt of variable breadth. At both ends, De Panne and Het Zoute, it is two to three km in breadth while the central part between Ostend and Wenduine is 500 to 900 metres wide. Total dune area is about 4000 ha and the forests were cleared about 200 years ago. This naturally led to breakdown of the dunes and parts were reafforested in the 19th century, mainly unsuccessfully. To-day we drove to the Forest of Klemskerke where we were shown the present method of dune afforestation. Ir. S. de Groote welcomed us and during a tour of the forest showed us how pines were first established and hardwoods, mainly sycamore, introduced into the pole stage conifers. The quality or yield of timber was of little importance—this was protection forestry, and all that mattered was having a healthy tree cover. The minimum cost of dune afforestation was 60,000 frs a ha as against an average for Belgium of 20,000 to 30,000 frs. The problems of dune areas in a highly populated country hinge around people pollution, it is happening nearer home in Brittas Bay, and this is why dune afforestation is essential. The forest protects the dune sands from wind erosion and the undergrowth discourages trampling, paths were provided here, many of them concrete, allowing people the dual advantage of forest walks and proximity to the seashore.

Lunch was by courtesy of the City council of Bruges at the Beernem recreation area where we were joined by some members of the council.

The afternoon was spent in Bruges, perhaps the finest of the Flemish cities, the art galleries, especially, being worth visiting. Leaving Bruges the party visited the provincial **domein** of Lippensgoed Bulskampveld. This is an estate run by the provincial Government and we were met here by Mr. Mares and Mr. Rommel who showed us over the estate where we saw a number of fine stands before leaving for our hotels in Ghent.

Saturday, 26th May

Professor van Migroet led the party to poplar plantations in Flanders. Here we were in one of the three great poplar regions of Europe—the others being the Po valley in Italy and the Loire valley in France. Poplars are a farm crop, production is controlled by the end use — the match factory. Two match factories remain as a result of mergers and rationalization and these factories supply the plants, advice etc. free to the farmer who contracts to sell the produce at the prevailing market price when harvested.

The poplar used are mainly crosses between P. Nigra and American eastern poplars though new ones are continually being introduced. There is an annual cut of up to 500,000 m^3 of poplar in Belgium, 20% of total forest production. Increment runs at 20-30 m^3 per ha. as against 12-15 m^3 for pines on the best sites. A philosophical lecture by Professor van Migroet on consumption, democracy and control rounded off the morning. We drove to Antwerp where we were guests of the Irish Consul, Mr. de Roeck at a reception at the Zoological Gardens, where caviare and Irish whiskey were liberally dispensed. We returned to Ghent in a festive mood.

Sunday, 27th May

Our tour over we returned to Dublin. Our thanks are due to Professor van Migroet and his staff, who prepared the itinerary, and to our convener Dr. Jack Durand and Miss Lily Furlong who coped with all financial and other problems, and not least to our president Dr. Bill Jack, who was ever ready with a suitable summing up speech.

EPILOGUE

I should conclude by giving my own impressions of the current outlook of foresters in Belgium, especially in the Flemish region.

1. Production is no longer of particular importance. The important thing is a healthy forest with the emphasis on uneven aged mixed high forest—a return to the 'natural forest'.

2. No particular emphasis on mechanization. Foresters are quite content to use horse extraction and manual methods as long as the horses and men are available.

3. The realization that the Forester has a completely new role to play in providing recreational facilities for an increasingly mobile urban population and the importance of that role.

4. The relative unimportance of the cost factor in policy decisions. This can be seen in the replacement of conifer crops by broadleaved and the emphasis on protection forestry.

5. The hazards of industrial pollution in a small country. The drive from Ghent to Antwerp makes one realize that any advantage of petro-chemical complexes, in terms of investment or work content, is very short lived. Large areas of countryside are polluted and workers have to be imported from Southern Europe and North Africa to run the industries, thus creating new long-term problems.

6. The expansion of private forestry due to marginal upland farm-land being converted to forest, as the farming families move to industrial employment. The state is generally outbid by private interests for such land.

L. P. O'Flanagan.

ANNUAL GENERAL MEETING 1973

COUNCIL REPORT 1972

Council Meetings :

During 1972 seven Council Meetings were held.

Attendance was as follows .

Dr. Durand, Messrs. Mullov and Connelly	7 Meetings;
Miss Furlong, Messrs. O'Brien and Prior	6 Meetings;
Drs. Jack and O'Carroll and Mr. Sharkey	4 Meetings;
Mr. Joyce	5 Meetings;
Messrs. Hipwell and Sheridan	3 Meetings;
Mr. Walsh	1 Meeting.

Meetings :

A full quota of indoor and outdoor Meetings were held with attendances disappointing. It is to be hoped that in future, Members give more support to Society functions. The attendance at the Forest Walks held in September reflected the popularity of such Educational outings.

Annual General Meeting :

The Annual General Meeting was held in March. A very interesting paper entitled "Forestry in the European Economic Community' was read by M. X. Le Chatelier from Commission des Communautes Europeenes, Brussels.

Annual Study Tour :

The Annual Study Tour was held in Cork in June. The participating party based at Bantry enjoyed a very informative tour of contrasting Hardwood, Commercial, Conifer and Sand-dune plantations.

Our thanks are due to the Forest Officers in Cork who helped in the organisation of this tour.

Society Publication :

In 1972 two issues of the Journal were again published.

New Members :

The Council was pleased to record that during the year, thirty-two new members were elected to the Society.

Elections :

Elections were held for the positions of Councillor Technical (3 posts). The low poll, 40%, indicates the apathy which members have towards Council elections.

Finance :

Despite the growing increase in the running expenses of the Society during 1972, the Society attained a happy financial position which was due mainly to an increase in advertising revenue and a decrease in printing costs.

Signed : **J. P. Connelly.**

23/2/'73.

MINUTES OF THE 31st ANNUAL GENERAL MEETING, 10th MARCH, 1973, IN THE SHELBOURNE HOTEL, DUBLIN

The President, Dr. W. H. Jack, opened the proceedings and welcomed those present. The minutes of the 30th Annual General Meeting, having been published in **Irish Forstry,** were taken as read and were duly signed. The Council Report for 1972 was read, and its approval was proposed and seconded by Prof. T. Clear and Dr. J. F. Durand.

The Treasurer, presenting the Abstract of Accounts, commented on the happy state of the Society's finances and attributed this to the increase in membership during 1972. He also pointed out that in 1972 while the cost of producing the journal was £559, the Arvertising revenue totalled £672,

In a discussion which followed the Treasurer's report, Mr. J. O'Driscoll commented on the cost of sending out circulars and suggested that one yearly circular to cover all meetings might be sufficient. The President stated that it would be difficult to arrange meetings with such a long time interval, and Mr. O. V. Mooney suggested that the number of meetings be reduced, thereby reducing the number of circulars.

On the question of the Society's Book—**"The Forests of Ireland"**—Mr. T. McEvoy was interested in whether money had been set aside for its reprinting. It was stated that he book revenue had been used in the general running of the Society. The President suggested that now that the Society was in happier financial circumsances money should be set aside to reprint the book or bring out a new one. He also mentioned the possibility of a sponsored film on forestry. However it was the feeling of the meeting that the reprint of the book should take priority. It was proposed and seconded by Mr. T. McEvoy and Mr. J. O'Driscoll that the Statement of Accounts be adopted

The 1973 Council Elections were confirmed as follows :—

President : Dr. W. H. Jack.
Vice-President : Prof. T. Clear.
Secretary : Mr. P. Clinch.
Treasurer : Mr. F Mulloy.
Editor : Dr. N. O'Carroll.
Business Editor : Mr. M. Sharkey.

Councillors :

Technical : Mr. E. Joyce, Mr. J. Mackin, Mr. W. Dallas.
Associate : Mr. C. Tottenham. ...

The Motion that Messrs. D. Mangan, T. McEvoy, C. Kilpatrick and W Duggan be appointed sole Trustees of the Society with effect from March, 10th '73 having been proposed by Dr. J. F. Durand and seconded by Mr. J. Connolly was approved by the meeting.

Dr. J. F. Durand, Meetings Convener, outlined the meetings programme and stated that plans for the Annual Study Tour to be held in Belgium were complete, and that almost a full quota of bookings had been received. There was some discussion on the subject of meetings during which Dr. N. O'Carroll suggested that day meetings be discontinued if attendance should continue to be poor. It was also suggested that members be circularised to find out what type of meetings they required.

In bringing the Meeting to a close the President paid tribute to the work done by the council members during he past year and urged members to attend as many of the Society's functions as possible.

J. P. Connolly.

STATEMENT OF ACCOUNTS FOR YEAR ENDED 31st DECEMBER, 1972

RECEIPTS

1971						
104.49	To **Balance from last account**				107.91	
	„ **Subscriptions received :—**					
	316 Technical Grade 1	1972	784.20			
	26 „ „ „	1971	52.00			
	16 „ „ „ 2	„	24.00			
	92 Associate	1972	190.41			
	11 „	1971	18.50			
	7 Student	1972	7.00			
	— Other arrears		26.50			
762.22	— Advance payments		52.00			
					1154.61	
	Interest on Investment			6.50		
6.50	„ on Savings Account			7.68		
					14.18	
	Journal					
89.71	Sales			101.66		
343.45	Advertisements			672.64		
					774.30	107.91
5.50	**Examination Fees**					
53.93	**Book** "The Forests of Ireland" — Sales				21.41	
200.00	**Prize Bonds cashed**					
12.50	**Donations**				5.25	
£1578.30					£2077.66	£1578.30

PAYMENTS

1971				
183.44	By **Stationery and Printing**			260.63
1076.11	**Printing of Journal and Reprints** (inclusive of amounts due for previous years)			874.14
145.89	**Postages**			191.84
62.65	**Expenses re Meetings**			22.61
2.30	**Bank Charges and Cheque Books**			13.26
	Honoraria :			
	Secretary	12.50		
	Treasurer	12.50		
	Editor	12.50		
	Business Editor	12.50		
			50.00	
—	**Examination Expenses**			15.00
	Balance			
	In Bank on Current A/c.	142.50		
	„ „ „ Savings A/c.	507.68		
			650.10	
				£2077.66

I have examined the above account, have compared it with vouchers and certify it to be correct, the balance to credit being £650.18, which is on current account and savings account at the Ulster Bank Ltd. There is also a holding of Dublin Corporation 5% Redeemable Stock.

D. M. CRAIG,
Hon. Auditor.
85, Harcourt Street, Dublin 2.

23rd February, 1973.

LIST OF MEMBERS 31st AUGUST, 1973

Associate Members marked with asterisk
(Founder Members in heavy type)

Chief Forest Officer,	Ministry of Agriculture, Dundonald House, Upper Newtownards Road, Belfast, 4.
Archibald, T. G.	Lough Bradan Forest, Ally, Drumquin, Omagh, Co. Tyrone.
*Barry, T. A.	Town View, Dunmanway, Co. Cork.
Barry, T. A.	5 Great Connell Road, Droichead Nua, Co. Kildare.
Beirne, George	c/o Mr. C. Jeffers, Danorley, Stranorlar, Ballybofey, Co. Donegal.
Bell, William, L. B.	Nursery Officer, Forestry Division, Ministry of Agriculture, Dundonald House, Upper Newtownards Road, Belfast, 4.
*Berry, Alfred, J. F.	"Montford", Lough Eske, Barnesmore, Co. Donegal.
*Bishop, I. S. R.	Freeman's Cottage, Saley Common, Clifton-on-Ieme, Nr. Worcester, England.
*Boland, Matthew	185 Cashel Road, Crumlin, Dublin, 12.
Boyd, R. W.	Forestry Office, Crown Buildings, Omagh, Co. Tyrone.
Boyle, C. J.	Forestry Office, Collooney, Co. Sligo.
Brassil, D.	Mill Grange House, Greenore, Co. Louth.
Brennan, J.	11, Slip, Bantry, Co. Cork.
Breslin, W. J.	Lynn Road, Mullingar, Co. Westmeath.
de Brit, Gerard, J.	9 Glencarrig, Sutton, Co. Dublin.
*Broderick, Kevin	Kevin Broderick & Co. Ltd., 74 Clareville Road, Dublin, 6.
Browne, Richard	c/o Mrs. McNeery, Linenhall St., Castlebar, Co. Mayo.
Bruton, P. J.	Muckross, Killarney, Co. Kerry.
Bryan, W. J.	26 Knockgreenan Park, Omagh, Co. Tyrone.
Buckley, Arthur	Thomascourt, Mountrath, Laois.
*Buckley, John J.	Ladyswell, Cashel, Co. Tipperary.
Bulfin, Michael	10 Palmerston Road, Rathmines, Dublin 6.
Bunce, C.	Coach Road, Dunmanway, Co. Cork.
*Burke, James C.	Cahir House Garage, Cahir, Co. Tipperary.
Burke, Michael	c/o Meehans, The Square, Tubbercurry, Co. Sligo.
*Burkitt, Julian, F. H.	Glenveagh Estate, Letterkenny, Co. Donegal.
Butler, Peter J.	2 King Edward Road, Bray, Co. Wicklow.
*Cafferky, Liam	28 Oulton Road, Clontarf, Dublin, 3.
*Cahill, Sarah	12 Waterloo Road, Dublin, 4.
Caithness, James M.	14 Tardree Road, Ballymena, Co. Antrim.
Callaghan, Charles	Cnoc Mhuire, Kilbrittain, Co. Cork.
*Callanan, Patrick J.	41 St. Assam's Park, Raheny, Dublin, 5.
Campbell, John D.	47 Dunahellaght Road, Ballycastle, Co. Antrim.
Campbell, Sean	Lyndhurst, 9 Cypress Road, Mount Merrion, Co. Dublin.
*Cannon, George	Mill House, Crumlin, Monaghan.
Cantillon, John H.	Kilmacomb House, Dunmore East, Co. Waterford.

Carew Seamus A.	c/o Mr. J. Cronin, Mountbellew, Co. Galway.
Carey, Michael	Furze Lodge, Newcastle, Greystones, Co. Wicklow.
Carlin, Patrick J.	Ballintempo Forest, Tullan, Belcoo, Co. Fermanagh.
Carney, Sean	Turlough P.O., Castlebar, Co. Mayo.
Carrigy, John	Ballyraine, Letterkenny, Co. Donegal.
*Casey, D. B.	I.C.I. (Ireland) Ltd., 3 South Frederick St., Dublin, 2.
Casey Sean	Blessington, Co. Wicklow.
Cashman, John	"Coill Cais", Model Farm Road, Cork.
Cassidy, Matthew	Forestry Office, Model School, The Mall, Sligo.
Clear, Professor Thomas	2 Taney Crescent, Dundrum, Dublin, 14.
*Cleeve, Terence, V. A.	Arraghslea, Tipperary.
Clinch, Paul G.	Tahilla, Holmston Ave., Glenageary, Co. Dublin.
Coates, G. N.	1, Gilnahirk Rise, Belfast BT57DR.
*Collen, Lyall	Garrivham, Stepaside, Sandyford, Co. Dublin.
Collins, Brendan J.	27 Newpark, Portlaoise, Laois.
Collins, Maurice	5 St. John's Road, Moyle Park, Clondalkin, Co. Dublin.
Collins, W. F.	63 Knockenrahan, Arklow, Co. Wicklow.
*Colthurst, Sir Richard	Turret Farm, Blarney, Co. Cork.
Comer, Philip,	Knock, Milltown, Tuam, Co. Galway.
*Condon, Dr. K. C.	Montana, Crab Lane, Blackrock, Cork.
Condon, Liam	19 Glendine Heights, Kilkenny.
Conn, Hugh	The Rectory, Armaghbreague, Keady, Co. Armagh.
*Connelly, Mrs. Birgit	Old Court, Vevay Road, Bray, Co. Wicklow.
Connelly, John P.	Old Court, Vevay Road, Bray, Co. Wicklow.
Connolly, Aidan	"The Elms", Donegal.
Connolly, D. P.	Massinass, Creeslough, Co. Donegal.
Conway, Michael	Greenhill, Kilkenny.
*Copeland, Harry K.	44 Diamond Gardens, Belfast, BT10.
Corbett, Patrick J.	Lower Main St., Graiguenamanagh, Co. Kilkenny.
Corrigan, Fred	1, Forest Road, Garvagh Forest, Coleraine, Co. Derry.
*Cosgrave, Mrs. Maureen	22 Rockfield Road, Kells, Co. Meath.
Cosgrave, Myles	22 Rockfield Road, Kells, Co. Meath.
Costello, James	Foynes, Co. Limerick.
Costello, Michael	Glenhest Road, Newport, Co. Mayo.
Cotter, Dermot	"Padua", Springmount, Dungarvan, Co. Waterford.
Cotter, P. J.	1, St. Eunan's Terrace, Letterkenny, Co. Donegal.
Coyne, John F.	U.S. Forest Service, Box 2008 Evergreen Station, Gulf Point. Miss. U.S.A. 39501.
*Craig, Duncan M.	85 Harcourt Street, Dublin, 2.
Crawford, William J.	District Forest Office, 70 Barra Drive, Ballykeel, Ballymena, Co. Antrim.
Cremin, Kevin	22 Shandon Park, Kilkenny.
*Crichton, Mrs. Joan	Collinstown Park, Clondalkin, Co. Dublin.
Cronin, James J.	Mountbellew, Co. Galway.
Crowe, Peter	2 Boycetown, Kilcock, Co. Kildare.

Crowley, Charles C.	"Knockane", Rathonora, Sligo.
Crowley, James J.	34 Mountain View, Blessington, Co. Wicklow.
Crowley, Jerry C.	Tree Tops, Bailieboro, Co. Cavan.
Crowley, Patrick	Castlemorris, Hugginstown, Co. Kilkenny.
Crowley, Seamus	Duntahane Road, Fermoy, Co. Cork.
Cullinan, J. Noel	Boyle Road, Collooney, Co. Sligo.
Cunningham, Eamon	Aughera, Carrick, Co. Donegal.
Cunningham, Gerald	Castlecaldwell Forest, Leggis P.O., Enniskillen, Co. Fermanagh.
Cunningham, Padraic B.	Toomard Road, Ballinasloe, Co. Galway.
Curran, Cornelius	39 Port Road, Letterkenny, Co. Donegal.
*Cusack, Dr. Christopher A.	Clondalkin Paper Mills Ltd., Clondalkin, Co. Dublin.
Dallas, William G.	Tara Exploration Ltd., Railway Street, Navan, Co. Meath.
Dalton, James	24 Muskerry Estate, Ballincollig, Co. Cork.
*Daly, Edward	Padua, The Rise, Malahide, Co. Dublin.
Darcy, James	Kinnitty Castle, Birr, Offaly.
Darcy, John J.	Dooras, Caher, Co. Clare.
Darcy, Michael	Dun Mhuire, Killarney Road, Macroom, Co. Cork.
Davoren, Michael	c/o Mr. P. J. Kerrigan, Camolin, Co. Wexford.
Deasy, Joseph J.	21 Templeville Road, Templeogue, Dublin, 6.
Delahunty, Richard J.	Mullinaveigue, Roundwood, Co. Wicklow.
Dennehy, Noel	Fermoy Road, Kilorrery, Co. Cork.
Desmond, John	Forest & Wildlife Office, Main St., Ballinasloe, Co. Galway.
Devine, Michael J.	Ely Lodge Forest, Drumcose, Enniskillen, Co. Fermanagh.
Dickson, Dr. David	35 Knockfergus Park, Greenisland, Co. Antrim.
*Digby, The Lord	Clonad Sawmills, Killeigh, Offaly.
Dillon, James	451 Woodpark, Ballinteer, Dublin 14.
Dillon, Sean M.	9 Westfield Park, North Circular Road, Limerick.
Dinneen, Daniel	Mongfume, Murroe, Co. Limerick.
Dineen, Finbarr	Aughnamaddock, Stradbally, Co. Laois.
Donnelly, Michael	Abbeytown, Boyle, Co. Roscommon.
Donoghue, Thomas	Burrellspark, Thomastown, Co. Kilkenny.
*Donovan, Mrs. Maura	18 Willbrook Road, Rathfarnham, Dublin 14.
Donovan, Timothy	Cairbre, Sutton, Co. Dublin.
Dooley, James	"Woodview", Graiguenamanagh, Co. Kilkenny.
Dooley, Michael E.	Ardaghykill, Monaghan.
Doyle, Joseph M.	14 Western Bay, Dungarvan, Co. Waterford.
Doyle, Michael James	The Glebe, Stranorlar, Co. Donegal.
Duane, John P.	Mountain View, Mockmoyne, Boyle, Co. Roscommon.
Duffy, Andrew	Avondale, Rathdrum, Co. Wicklow.
Duggan, Martin	Avondale, Rathdrum, Co. Wicklow.
Duggan, Thomas	Follydale, Shannon Road, Mountrath, Co. Laois.
*Duggan, William	21 Warrenhouse Road, Baldoyle, Co. Dublin.

*Dunleavy, Dr. Jas.	I. I. R. S., Glasnevin, Dublin 9.
Durand, Dr. John F.	"Sequoia," 48, Arnold Park, Glenageary, Co. Dublin.
Dwyer, James	13 Beechwood Lawns, Rathcoole, Co. Dublin.
Eastwood, Donald	Baronscourt, Omagh, Co. Tyrone.
Egan, Declan	Aulane, Abbeydorney, Co. Kerry.
Egan, D. J.	Cappoquin, Co. Waterford.
*Ellis, Joseph, E. K.	Colin House, Donegal.
*Ellis, Richard	Russets, Rosbercon, New Ross, Co. Wexford.
*Ennis, A. W.	Ballyconnell, Co. Cavan.
Enright, James	Villa Maria, Railway Road, Belturbet, Co. Cavan.
Enright, Thomas	Convent Road, Enniscorthy, Co. Wexford.
Flanagan, Eamon S.	"Fuinseog", 12 Ballymany Park, Newbridge, Co. Kildare.
Flanagan, John	"Fuinseog", 12 Ballymany Park, Newbridge, Co. Kildare.
*Flannery, Michael	Forestry Office, Bellview Estate, Delvin Road, Mullingar, Co. Westmeath.
Fleming, Jerry	Rathbaun Road, Castlebar, Co. Mayo.
*Flood, Donal T.	Sharonra House, Donegal Road, Ballybofey, Co. Donegal.
Flynn, John	13 Lower Sunnyhill, Killarney, Co. Kerry.
Flynn, Patrick	High Street, Graiguenamanagh, Co. Kilkenny.
Fogarty, Michael	Leskey, Boho, Co. Fermanagh.
Forde, Michael	Glebe House, Crossmolina, Co. Mayo.
*Franklin, Sean	Soils Department, U.C.D., Glasnevn, Dublin 9.
Freeman, Joseph	Beach Road, Ballycastle, Co. Mayo.
Friel, Brendan	Dowra Road, Drumshambo, Co. Leitrim.
*Fuller, Thomas	41 Foyle Road, Fairview, Dublin, 3.
*Furlong, Lily	Tree Tops, Bailieboro, Co. Cavan.
Fahy, Finian	Pearse Road, Sligo.
*Fahy, Mrs. Margaret	Nuns Cross, Ashford, Co. Wicklow.
Fahy, Hugh	Tollymore Forest Park, 176 Tullygrannigan Road, Newcastle, Co. Down.
Fahy, Joseph	Greenhall, Carrigtwohill, Co. Cork.
Fahy, Philip	c/o Brennan's, Bunclody, Co. Wexford.
	Clonoola, Greystones, Co. Wicklow.
Fallon, Patrick J.	Rosslea Road, Clones, Co. Monaghan.
Fanning, James	97 Seafield Road, Clontarf, Dublin 3.
Farmer, Charles I.	17 Leahy's Terrace, Sandymount, Dublin, 4.
Farragher, Gerard	6 Westgate, Bishopstown, Cork.
Farrell, Dr. Edward	Woodford, Loughrea, Co. Galway.
	Dowra Doad, Drumshambo, Co. Leitrim.
Fee, Frank	Avonbeg, Shandangan, Pallasgreen, Co. Limerick.
Feeney, T. J.	Circular Road, Sligo.
Fennessy, John	c/o Mrs. Morris, Abbeystown, Boyle, Co. Roscommon.
Finnerty, A. M.	Grianan, Skibbereen, Co. Cork.
Finnerty, Patrick	"Silverne", 150 Clontarf Road, Clontarf, Dublin, 3.
FitzPatrick, H. M.	
FitzPatrick, J.	

Gaffey, Edward	14 Shamrock Hill, Clonmel, Co. Tipperary.
Gallagher, Dr. Gerhardt	53 Upper Beechwood Ave., Ranelagh, Dublin, 6.
Gallagher, Leonard W.	Glor na Mara, Greenfield Road Sutton, Co. Dublin.
Gallen, Thomas	Annagh Bay, Hazelwood, Sligo.
Gallinagh, Anthony	"Linden", Stranorlar, Co. Donegal.
*Galvin, James	Park Cottage, Wexford.
Galvin, Sean	Cahir, Co. Tipperary.
Gardiner, John J.	6 Woodlands Park, Dun Laoire, Co. Dublin.
Gault, John	24 Pond Park Crescent, Lisburn, Co. Antrim.
Gavigan, Hugh	c/o Mrs. Curtin, Henry Street, Kilrush, Co. Clare.
Gavigan, James	Ballymacarberry, Co. Waterford.
Giblin, Patrick	Main St., Loughrea, Co. Galway.
Gillespie, P. J.	Knockroe, Castlerea, Co. Roscommon.
Gilroy, Daniel	Streeda, Grange, Co. Sligo.
*Gladstone, J.	Capenoch Estate Office, Penport, Dumfrieshire, Scotland.
*Glennon, Patrick J.	Sawmills, Longford.
Glynn, Sean	Sheena, Drumkeeran, Co. Leitrim.
*Goodhue, Dr. Derek	Summerhill, Sandyford, Co. Dublin.
*Goulding, Sir Basil	Dargle Cottage, Bray, Co. Wicklow.
Grant, Oscar	Clonegal, Ferns, Co. Wexford.
Greehy, John C.	2 Thomas Street, Fermoy, Co. Cork.
Griffin, Richard	2 Beechwood Park, Mallow, Co. Cork.
de Gruineil, Tomas	Newport Road, Castlebar, Co. Mayo.
Guilfoyle, Thomas	St. Judes, Dun-na-Mara, Renmore, Galway.
Hackett, Patrick J.	20 New Road, Llandovery, Carms, Wales.
*Hall-Dare, Miss Clody E.	Newtownbarry House, Bunclody, Co. Wexford.
Halloran, Patrick	Inchigeelagh, Macroom, Co. Cork.
Halloran, Seamus	Woodford, Loughrea, Co. Galway.
Hanahoe, A. Joseph	16 Eyre Square, Galway.
Hand, Paul	Forestry Office, Milltown, Donegal, Co. Donegal.
Hanley, Christopher	Termon, Blacklion, Co. Cavan.
Hanley, John J.	Reelan, Cloghan, Lifford, Co. Donegal.
Hanly, John	Deerpark, Dundrum, Co. Tipperary.
Hanly, John J.	Lisrovan, Strokestown, Co. Roscommon.
Hanrahan, Patrick J.	Kinnitty Castle, Birr, Offaly.
Harbourne, Michael	10 Castle Grove, Clondalkin, Co. Dublin.
Harding, Frank	Cnoc Mhuire, Newtownmountkennedy, Co. Wicklow.
Harney, George V.	O'Growney St., Athboy, Co. Meath.
Harrington, Rory	20 Rock Lodge, Killiney, Co. Dublin.
*Harte, B. C.	5 Dundanion Court, Blackrock, Co. Cork.
Hayes, Denis	Castlecomer Road, Kilkenny.
Hayes, Geoffrey	c/o Post Office, Callan, Co. Kilkenny.
Hayes, Patrick J.	Scarteen Road, Newmarket, Co. Cork.
*Hayes, Dr. Roy	Farnham Road, Cavan.
Healy, John M.	Mountain Grove, Piltown, Co. Kilkenny.
Henderson, Samuel I.	19 High Street, Omagh, Co. Tyrone.
*Hennessy, Dr. Jeremiah J.	Dun Aongus, Rochestown Road, Co. Cork.
Hennessy, Michael	LoughGraney Forest, Feakle, Co. Clare.
Hickey, T. C.	Main St., Rahcormac, Co. Cork.
Higgins, A. P.	Monaveigue, Roundwood, Co. Wicklow.

*Hillgarth, Capt. A. H.	Illannagh House, Ballinderry, via Nenagh, Co. Tipperary.
*Hilliard, J. R. F.	Cahernane Garden, Killarney, Co. Kerry.
Hipwell, George	Forestry Office, Emo, Portlaoise, Co. Laoise.
Hoban, Michael	Cashelmore, Letterkenny, Co. Donegal.
*Holleran, Miss Kathleen	53 Landscape Park, Churchtown, Dublin 14.
*Horan, Rev. Joseph	Oblate Fathers, Inchicore, Dublin, 8.
Horgan, Jeremiah	St. Joseph's, 9 Ashbourne Park, South Circular Road, Limerick.
Hunt, Thomas	21 Rathedmond, Sligo.
Hutchman, Henry	Portglenone Forest, Portglenone, Co. Antrim.
Jack, Dr. William H.	37 Bladon Drive, Belfast, 9.
Jeffers, Christopher J.	"Araucaria", Dunwiley, Stranorlar, Ballybofey, Co. Donegal.
Jennings, Frank	The Grove, Abbeyside, Dungarvan, Co. Waterford.
Johnston, Ernest J.	Hawthorne, Larkhill Road, Sligo.
Joyce, Dr. Padraic M.	29 Linden Grove, Grove Ave., Blackrock, Co. Dublin.
Joyce, Richard E.	Ballydowling, Glenealy, Co. Wicklow.
Kavanagh, Nicholas J.	Forestry Office, Kilcanovee, Kilmacthomas, Co. Waterford.
Keane, Denis F.	Fermoy Road, Mitchelstown, Co. Cork.
Keane, Patrick J.	Choill-na-bFhia, Portumna, Co. Galway.
Kearney, James	"Sa deire", 12 Dr. Mannix Road, Galway.
Kelleher, John	"Rockview", Mountrath Road, Portlaois, Co. Laois.
Kelleher, Patrick	Forestry Office, Bellview Estate, Delvin Road, Mullingar, Co. Wesmeath.
Kelly, Christopher	"Judes Acre", Baily, Co. Dublin.
Kelly, John K.	John F. Kennedy Park, Ballysop, Campile, Co. Wexford.
Kelly, M. F.	Portcliff Killeshandra, Co. Cavan.
Kennedy, Dan	Bridge St., Boyle, Co. Roscommon.
Keogh, Raymond M.	29 Green Road, Blackrock, Co. Dublin.
Kerr, C. Harry	Forest School, Pomeroy, Co. Tyrone.
Kerrigan, P. J.	Camolin, Co. Wexford.
*Kidney, George	"Coole Bawn", Dublin Road, Enniskillen, Co. Fermanagh.
Kilbride, Joseph T.	Ballinastraw, Glenbrien, Enniscorthy, Co. Wexford.
Kilpatrick, Cecil S.	12 Kathleen Ave., Helen's Bay, Co. Down.
Kingston, E. P.	Avondale, Rathdrum, Co. Wicklow.
Kirwan, Nicholas	Carrigduff, Bunclody, Enniscorthy, Co. Wexford.
Knox, David D.	30 Greenwood Park, Belfast BT43JN.
*Kral, J.	1, Ardagh Park Gardens, Newtownpark Avenue, Blackrock, Co. Dublin.
Lambe, Barry	Clonbur, Co. Mayo.
Larkin, Eamon	23B Ardmore Park, Bray, Co. Wicklow.
Leahy, Edmond	Lower Park, Limerick.
Leonard, Michael	18 Casement St., Cavan.
Logan, Henry J.	Campsey Forest Nursery, Campsey, Co. Derry.
*Lomer, Lt. Col. R.G., M.C.	Greenane, Rathdrum, Co. Wicklow.

Loughrey, Brendan	"Tara", Shiveragh, Ballyvourney, Co. Cork.
*Lowry, Albert L.	Bachelors Lodge, Navan, Co. Meath.
Lucas, Clements Miss	Lismore, Crossdoney, Co. Cavan.
Luddy, Thomas	Mulranny P.O., Co. Mayo.
Luddy, William E.	Miltown North, Rathnew, Co. Wicklow.
Lynagh, Edward	Athlone Road, Ballinasloe, Co. Galway.
Lynch, M. J.	Caher, Louisburgh, Co. Mayo.
Lyons, P. J.	c/o. An Foras Taluntais, Glenamoy, Ballina, Co. Mayo.
Macken, James E.	36 Killeter Road, Castlederg, Co. Tyrone.
*Madden, Major John W. R.	Hilton Park, Clones, Co. Monaghan.
Maguire, Daniel	8 Carlton Terrace, Novara Ave., Bray, Co. Wicklow.
Maguire, Patrick	Newdown House, The Downs, Mullingar, Co. Westmeath.
Maher, James J.	Ashdale, 10 Leopardstown Park, Blackrock, Co. Dublin.
Mangan, Dermot P.	80 St. Aidan's Drive, Goatstown, Dublin, 14.
Manning, Noel E.	22 Upper Merrion St., Dublin, 2.
Mannion, J. Anthony	Turlough, Castlebar, Co. Mayo.
Maye, Michael J.	Ashford, Cong, Co. Mayo.
*Meath, The Earl of	Kilruddery, Bray, Co. Wicklow.
Melia, James	Glencar Road, Letterkenny, Co. Donegal.
Moloney, Bernard	"Bermar", Carraroe, Sligo.
Moloney, Liam	95 Sweetbrian Lawn, Tramore, Co. Waterford.
Moloney, Thomas	1. Rosehall. Templeogue Road, Dublin 6.
Mooney, Owen V.	6 Brewery Road, Stillorgan, Co. Dublin.
*Moore, Major Gen. D. G.	Mountfield Lodge, Mountfield, Omagh, Co. Tyrone.
*Moran, Frank	Ballyedmondaff, Sandyford, Co. Dublin.
*Morehead, Frederick T.	8 The Terrace, Currabinney, Crosshaven, Co. Cork.
Moriarty, Finian	Lisava, Cahir, Co. Tipperary.
Moroney, Matthew J.	Kilebehenny, Mitchelstown, Co. Cork.
Morris, Niall	48 La Touche Park, Greystones, Co. Wicklow.
*Morrissey, Miss B.	Garden Flat, 21 Waterloo Road, Dublin 4.
Morrissey, P. J.	Mount Anglesby, Clogheen, Co. Tipperary.
Moynihan, Timothy	60 Countess Road Estate, Killarney, Co. Kerry.
Mulholland, Dominic	Devenish, Portglenone Forest, Co. Antrim.
Mulloy, Fergal	Rochestown Avenue, Dun Laoire, Co. Dublin.
Murphy, Donal	Currabaggin, Corroy, Ballina, Co. Mayo.
Murphy, Gerry	Ballynastragh, Gorey, Co. Wexford.
Murphy, Thomas	23 Dunbur Park, Wicklow, Co. Wicklow.
Murray, Hugh F.	Iniscarn Forest, Moneymore P.O., Co. Derry.
Murray, Dr. Neil	Rockfield House, Sandyford Road, Dublin, 14.
Murray, P. J.	Main Street, Ballindine, Co. Mayo.
McArdle, Patrick	Aughrane, Ballygar, Co. Roscommon.
McAree, Diarmuid T.	51 Hillybank Ave., Ranelagh, Dublin, 6.
McBride, Donal	Trusk Road, Ballybofey, Co. Donegal.
McCabe, Maurice	Dunmore, Durrow, Laois.

MacCarthaigh, Sean S.	"Rosshill", Earlwood Estate, Togher Road, Cork.
McCarthy, Dan	Castleventry, Rossmore, Clonakilty, Co. Cork.
McCarthy, George	Forestry Office, Bank Chambers, Kilkenny.
McCarthy, Jeremiah F.	Inchigeelagh, Macroom, Co. Cork.
McCarthy, Michael	145 Butterfield Park, Rathfarnham, Dublin, 14.
McCarthy, Ted	Cahir, Kenmare, Co. Kerry.
McCarthy, T. J.	Coill Mhuire, Ravensdale, Dundalk, Co. Louth.
McCloskey, Patrick J.	30 Glendoher Park, Rathfarnham, Dublin, 14.
McConnell, Robert T.	23 Wainsfort Crescent, Terenure, Dublin, 6.
McCormack, Christopher A.	20 Grange Park, Foxrock, Co. Dublin.
McCormack, Nicholas J.	Glencar Scotch, Letterkenny, Co. Donegal.
*McCracken, Dr. Eileen	79 Ballaghmore Road, Portballintrae, Bushmills, Co. Antrim.
*McCracken, Professor L.	79 Ballaghmore Road, Portballintrae, Bushmills, Co. Antrim.
*McCreesh, Miss Evelyn	50 Furry Park Road, Raheny, Dublin 5.
*McCreesh, Miss Kathleen	50 Furry Park Road, Raheny, Dublin, 5.
McDonald, Kevin	Forestry Office, Glenlee, Killybegs, Co. Donegal.
McDonald, Kevin M.	Lisnaskea Forest, Lisnaskea, Co. Fermanagh.
McDowall, David C.	Castlearchdale Forest, Lisnarick, Co. Fermanagh.
McDyer, Turlough	Kilraine, Lifford, Co. Donegal.
McElroy, M.	c/o Mrs. Twomey, West St., Macroom, Co. Cork.
*McElroy, Miss Mary	8 Hughenden Ave., Belfast, 15.
McElroy, Patrick J.	Tollymore Park, Newcastle, Co. Down.
McEvoy, Timothy	17 Cypress Road, Mount Merrion, Blackrock, Co. Dublin.
*McGarry, Liam	8 Quinn's Road, Shankill, Co. Dublin.
MacGearailt, Michael	Kinnitty, Birr, Offaly.
*McGerty, J. Kevin	11, Stillorgan Park, Blackrock, Co. Dublin.
McGinley, John Arthur	Kingscourt, Co. Cavan.
Mac Giolla Coda, Michael	Glengarra, Burncourt, Cahir, Co. Tipperary.
McGlynn, Daniel	88 Priory Avenue, Blackrock, Co. Dublin.
McGovern, Sean	Ballygurrane, Athenry, Co. Galway.
McGrath, Patrick	52 Killarney Road, Castleisland, Co. Kerry.
McGuinness, Edward, O.P.	Cleaghmore, Ballinasloe, Co. Galway.
*McGuinness, Mrs. Terry	Cleaghmore, Ballinasloe, Co. Galway.
McGuinness, W. B.	Main Street, Tulla, Co. Clare.
*McGuirk, John J.	"Aras Mhuire", 53 Seafield Road West, Clontarf, Dublin, 3.
McHugh, Thomas	Woodbrook, Mountrath, Laois.
McLoughlin, Joseph	Kilrush, Dungarvan, Co. Waterford.
*McLysaght, Edward	Raheen, Tuamgraney, Co. Clare.
McMahon, Don B.	Masseytown House, Macroom, Co. Cork.
McMenamin, Seamus	Lenaboy Gardens, Upper Salthill, Salthill P.O., Galway.
McNamara, Joseph	c/o Mr. Phelan, Killarainey, Moycullen, Co. Galway.
McNamara, Michael	"Dairin", Little Island, Co. Cork.
McNamara, Sean	Main Street, Donegal Town, Co. Donegal.

MacOscair, Patrick	38 Windsor Road, Rathmines, Dublin, 6.
McSorley, John A.	Forester's House, 65 Derrynoid Road, Draperstown, Magherafelt, Co. Derry, BT457DW.
McSorley, John	Fivemiletown, Co. Tyrone.
Naughton, John J.	Ballinahinch, Co. Galway.
Neff, Mrs. Jennifer A.	Department of Botany, Belfield, U.C.D., Dubin, 4.
Neff, Michael	435, Woodpark, Ballinteer Avenue, Dundrum, Dublin, 14.
Neilan, James	Tinahely, Co. Wicklow.
Nyhan, Cornelius	c/o. Murphy Daly's, 4 Main Street, Kenmare, Co. Kerry.
O'Brien, Michael	137 Forest Hills, Rathcoole, Co. Dublin.
*O'Brien, Timothy	82 The Rise, Mount Merrion, Co. Dublin.
O'Brien, Timothy V.	Beaghy, Stradone, Co. Cavan.
O'Canainn, Sean	Ostan Raharc na Coille, Bothar an Aerphort, Castlebar, Co. Mayo.
O'Carroll, Joseph	23 Maunsell's Road, Galway.
O'Carroll, Dr. Niall	12 Mapas Road, Dalkey, Co. Dublin.
O'Carroll, Thomas	Linden, Templerainey, Arklow, Co. Wicklow.
O'Cinneide, Reamonn	Cul na Grein, Bothar Poond, Causlean an Bharraigh, Co. Muigheo.
*O'Conaire, Proinsias	24 Cypress Road, Mount Merrion, Co. Dublin.
O'Connell, Timothy	Forestry Office, 16 Eyre Square, Galway.
O'Connor, Diarmuid	8 Main Street, Bantry, Co. Cork.
O'Connor, Liam	Kilmallock Road, Kilfinane, Co. Limerick.
O'Connor, Valentine J.	Site 17, Lakeview, Claregalway, Co. Galway.
O'Donnell, Seamus	No. 4 Mansion Apartments, High Road, Letterkenny, Co. Donegal.
O'Donoghue, Patrick J.	C'onroche, Enniscorthy, Co. Wexford.
O'Donovan, James	Annacurra, Aughrim, Co. Wicklow.
O'Donovan, Michael F.	19 Ashbrook, Ennis Road, Limerick.
O'Donovan, T. G.	Main Street, Newport, Co. Tipperary.
O'Driscoll, Cornelius J.	"St. Martin's", Avondale, Rathdrum, Co. Wicklow.
O'Driscoll, John	6 Taney Avenue, Goatstown, Dublin, 14.
O'Dwyer, Robert	Clonmore, Cahir, Co. Tipperary.
O'Dwyer, William	Ballinalee, Co. Longford.
*O'Ferrall, Roderick More	Kildangan, Co. Kildare.
O'Flanagan, Liam P.	Asham, Patrick's Road, Silversprings, Clonmel, Co. Tipperary.
O'Grady, Peadar P.	10, Camaderry Road, Bray, Co. Wicklow.
*O'Hara, Francis Cooper	Coopershill, Riverstown, Sligo.
*O'Hare, Patrick J.	Rathellin, Leighlinbridge, Co. Carlow.
O'Kane, Daniel B.	Teavin Road, Dungiven, Co. Derry.
O'Keeffe, P. Anthony	Castlebar Street, Newport, Co. Mayo.
O'Kelly, Patrick F.	Hillview, Lower Street, Rathdrum, Co. Wicklow.
O'Leary, John J.	Forestry Office, 3 North Main Street, Macroom, Co. Cork.
O'Mahony, James N.	Rowls, Broadford, via Charleville, Co. Limerick.
*O'Mahoney, Thomas J.	36 Hazelbrook Road, Terenure, Dublin, 6.
O'Mahony, Timothy	Forestry Office, Custom House, Galway.
O'Malley, Patrick	Gorey Road, Arklow, Co. Wicklow.

O'Neachtain, Martin	Coldwood, Craughwell, Co. Galway.
O'Neill, Brendan	Shelton Abbey, Arklow, Co. Wicklow.
O'Neill, Patrick A.	Villa Maria, Aughrim, Arklow, Co. Wicklow.
O'Reilly, Bernard T.	Clonroche, Co. Wexford.
O'Reilly, James J.	Clonbrusk, Athlone, Co. Westmeath.
O'Riordan, James	"St. Helliers", Main Street, Castleisland, Co. Kerry.
O'Shea, John J.	Camaderry, Rylan, Co. Cork.
O'Sullivan, Daniel S.	Ballydowling, Glenealy, Co. Wicklow.
O'Sullivan, Michael J.	Clonmore, Cahir, Co. Tipperary.
Parker, Reginald E.	Botany Dept., The Queen's University, Belfast.
Parkin, Kenneth, F.	18 Clover Hill Park, Belfast, 4.
*Patchett, Major D. M.	Oakgrove, Killinardrish, Co. Cork.
*Perry, Lionel	Greenport, Ballyshannagh, Letterkenny, Co. Donegal.
Pfeifer, A.	Spafield, Abbeyleix, Portlaoise, Laois.
Pfeifer, Stanley R.	Spafield, Abbeyleix, Portlaoise, Laois.
Phillips, John C. L.	"Pook's Hill", Bunninubber, Kiladeas, Enniskillen, Co. Fermanagh.
Pickles, Gordon Harold	Cashelmore Veneermill, Creeslough, Co. Donegal.
*Pim, Miss Sheila	Old Bawn, Bray, Co. Wicklow.
*Power, William	25/26 O'Connell Street, Waterford.
*Prager, Fritz P.	Drumdoe House, Corrigeenroe, Boyle, Co. Roscommon.
Prendergast, Thomas	Duntaheen Road, Fermoy, Co. Cork.
Prior, John	"Greenville," Portarlington, Laois.
*Proby, Claud	31, Kildare Street, Dublin 2.
Purcell, Thomas	17, Clonard Lawn, Sandyford Road, Dublin, 14.
Quinlan, Kevin	Bahy, Ballyshannon, Co. Donegal.
Quinlan, P. J.	c/o. McNeeleys, Dinenhall Street, Castlebar, Co. Mayo.
Quinlivan, James G.	Rathconnell, Mullingar, Co. Westmeath.
Quinn, Simon	Farranderry, Kingsmill Road, Bray, Co. Wicklow.
Quirke, William	Castle Street, Loughrea, Co. Galway.
*Reidy, Daniel C.	Verdun Arms, 318 West Avenue, Elmira, New York 14904, U.S.A.
Riordan, T. G.	Sheena, Drumkeeran, Co. Leitrim.
*Robertson, Douglas Hartridge	Gamaltha Road, Nenagh, Co. Tipperary.
Robinson, J. Desmond	Poulaphouca, Ballymore Eustace, Co. Kildare.
*Robinson, Miss Margot	c/o Flynn, 1, Lincoln Place, Dublin, 2.
Robson, William L.	Portglenone Forest, Co. Antrim.
Rochford, James P.	c/o. Mr. M. Boland, Ballygowan, Silvermines, Nenagh, Co. Tipperary.
*Rogers, Bernard	16 Mount Prospect Grove, Clontarf, Dublin, 3.
*Roper, Reginald, G.H.	51 Merrion Square, Dublin 2.
*Rosse, Lord	Birr Castle, Offaly.
Roycroft, John V.	Forestry Office, Castle Street, Cahir, Co. Tipperary.
Ryan, Edward	Kilmaccomma, Clonmel, Co. Tipperary.

Ryan, John F.	Latina, 29 Westgate, Bishopstown, Co. Cork.
Ryan, J. G.	"Swedin", Elphin Road, Carrick-on-Shannon, Co. Leitrim.
Ryan, Patrick	15 Templeville Road, Templeogue, Dublin, 6.
*Ryan, Patrick	Farming & Gardens Dept., Great Southern Hotel, Killarney, Co. Kerry.
Savill, Peter S.	Forestry Division, Dundonald House, Belfast, BT4 35B.
Scannell, Daniel	19 Summerhill Drive, Clonmel, Co. Tipperary.
Schmeltz, O. S.	St. Mary's Road, Edenderry, Offaly.
Shannon, Michael	Forest Office, Nun's Cross, Ashford, Co. Wicklow.
Sharkey, Malachy	Kylemore, Hyde Park Avenue, Blackrock, Co. Dublin.
Sheridan, Martin	Cloonagh, Delvin Road, Mullingar, Co. Westmeath.
Shine, William	Lisheen, Gurteenroe, Macroom, Co. Cork.
*Shirley, Major John E.	Lough Fee, Carrickmacross, Co. Monaghan.
*Silcock, Col. John E. Dunford	Estate Office, Curraghmore, Portlaw, Co. Waterford.
Simpson, A. W.	24 Castlehill Park, Belfast, 4 3GU.
Spillane, Eugene	Burnfort, Mallow, Co. Cork.
Stevenson, Barry	Tullygarvan, Buncrana, Co. Donegal.
*Stewart, R. R.	6 Leinster Street, Dublin, 2.
*Sullivan, Harry	25 Durham Road, Sandymount, Dublin, 4.
Swan, Maurice	17 Landscape Crescent, Churchtown, Dublin, 14.
Sweeney, Michael	Forest & Wildlife Service, North Slob Refuge, Wexford.
Sweeney, Tony	Abbeytown, Boyle, Co. Roscommon.
*Switzer, E. V.	Derrymount, Killaloe, Co. Clare.
*Switzer, Mrs. M.	Derrymount, Killaloe, Co. Clare.
Thornhill, John J.	Forestry Office, Delvin Road, Mullingar, Co. Westmeath.
Toal, James P.	Drumcairne Forest, Stewardstown, Dungannon, Co. Tyrone.
*Tottenham, Mrs. Alicia L.	Ballycurry, Ashford, Co. Wicklow.
*Tottenham, Charles B. Capt.	Ballycurry, Ashford, Co. Wicklow.
*Tottenham, Geoffrey J.	Meelick House, Whitegate, via Limerick, Co. Clare.
*Tottenham, Robert E.	Mount Callan, Inagh, Co. Clare.
Turner, William H.	Loughermore Forest, Derry.
Twomey, Sean	Forestry Office, Military Barracks, Castlebar, Co. Mayo.
*Tynan, P. V.	Bowaters Irish Wallboard Mills Ltd., Athy, Co. Kildare.
*Vanderwel, A. J.	Aughrim, Co. Wicklow.
Vaughan, James	Shrone, Glengarriff, Co. Cork.
Verling, Patrick	Dun Mhuire, South Douglas Road, Cork.
*de Vesci, Viscount	Abbeyleix, Laois.
Walsh, Daniel	19 Beechwood Park, Mallow Co. Cork.
Walsh, Maurice	Church Road, Sneem, Co. Kerry.

Watson, Frank A.	Dublin Road, Arklow, Co. Wicklow.
White, Patrick J.	40 Merval Drive, Clareview, Limerick.
Whyte, John	Western Forestry Co., Ballinasloe, Co. Galway.
*Williams, Peter	19 Bryan Road, Edgerton, Huddersfield HD2 2AJ, Yorkshire, England.
Wilson, H. John	155 Millbrook Lawns, Tallaght, Co. Dublin.
Wilson, J.	Blackslee House, Braade, Derrygonnelly, Enniskillen, Co. Fermanagh.
*Wilson, Peter	Glendale, Ardnacassa, Longford.
Wilson, Trevor	4 Lough Leau Park, Carryfudd, Belafast 8.
*Wilson-Wright, J. M.	Newtown House, St. Margaret s, Co. Dublin.
Woodworth, C. Dudley	Irish Landowners Convention, 31 Pembroke Road, Dublin, 4.
Wright, William J.	Forestry Branch, Ministry of Agriculture, Mountjoy Road, Omagh, Co. Tyrone.
Young, Colman	21, Seacrest, Bray, Co. Wicklow.

STUDENT MEMBERS

Byrne, Michael	New Road, Tullamore, Offaly.
Conway, Edmond	Kinnitty Castle, Birr, Offaly.
Duignam, Seamus	Derrinurn, Drumkeerin, Co. Leitrim.
Hutchinson, Kevin John	Killamuck Cross, Abbeyleix, Laois.
Kilroy, William A.	The Square, Gort, Co. Galway.
McTernan, Thady	Conray, Gurteen P.O., Manorhamilton, Co. Leitrim.
O Brien, John	Ardagh, Rosecarbery, Co. Cork.
O'Rourke, Peter	Main Street, Louisburgh, Co. Mayo.
Roche, Patrick	Ba'lymacallen, Ballyhooly, Co. Cork.
Ryan, Noel	Avolia House, Avolia, Mountmellick, Laois.

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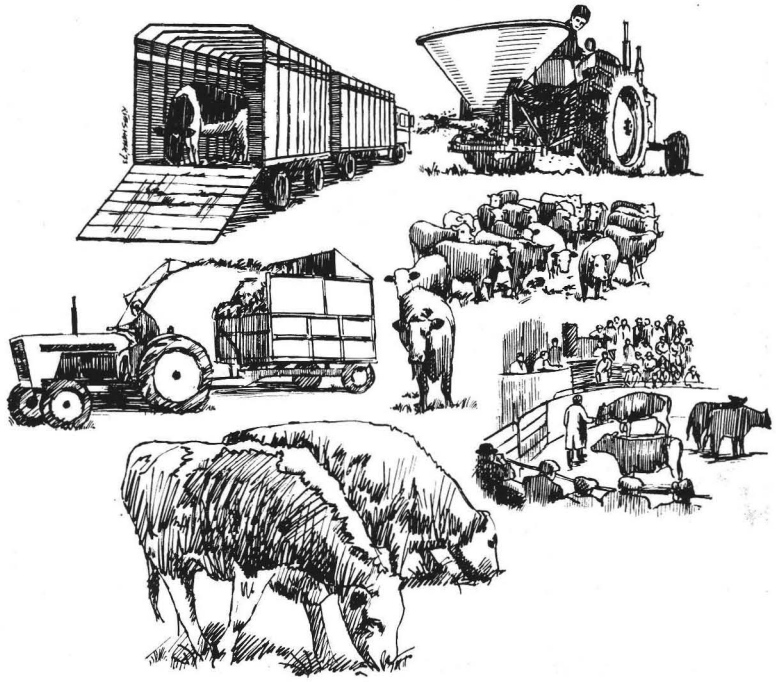

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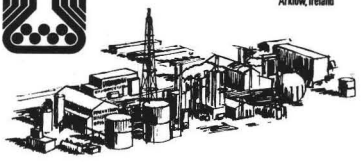

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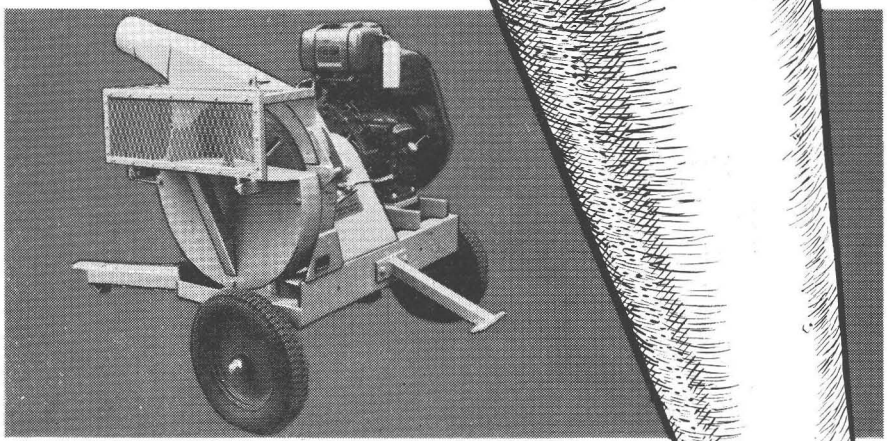

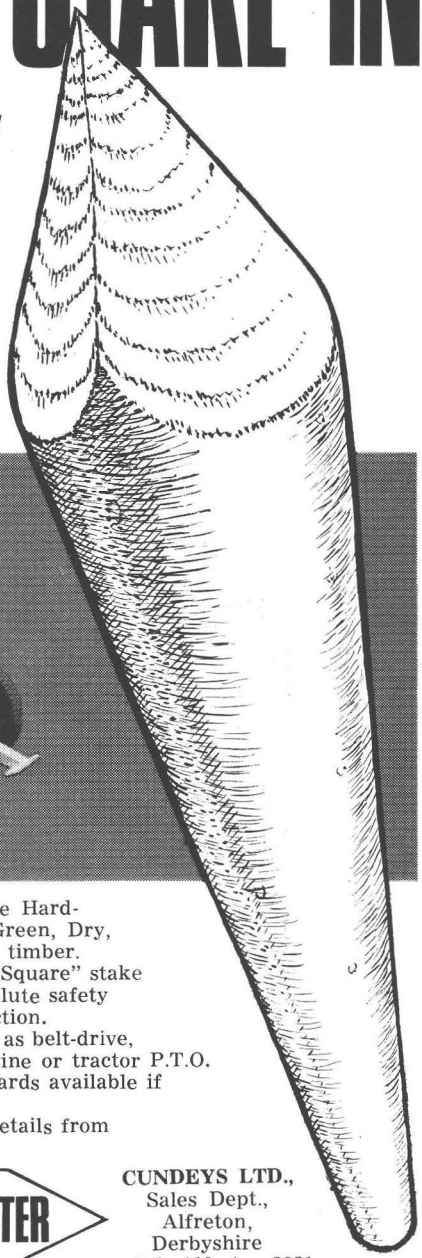

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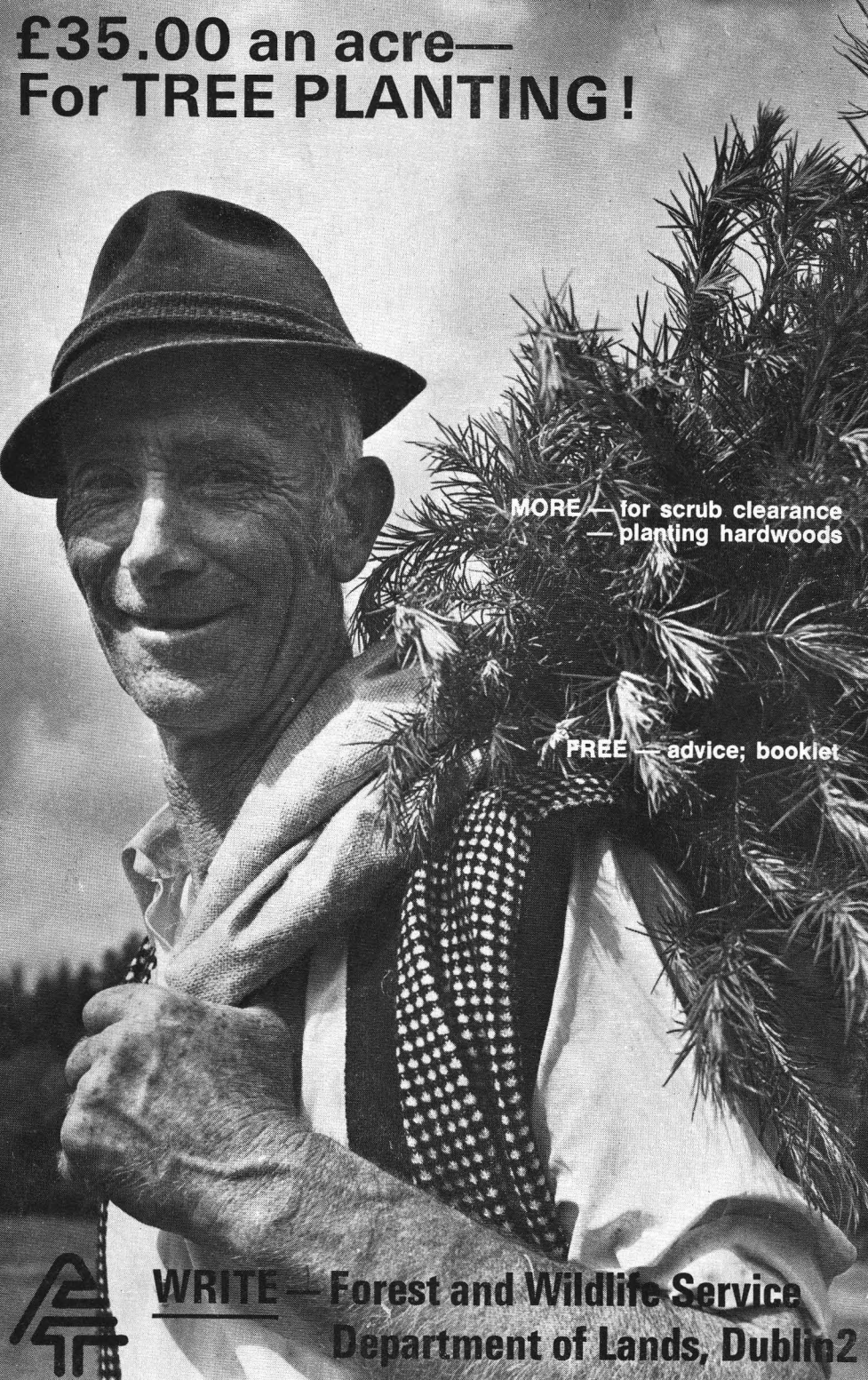
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