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IRISH FORESTRY

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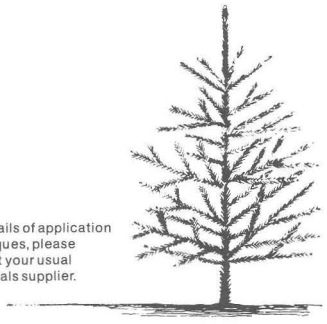

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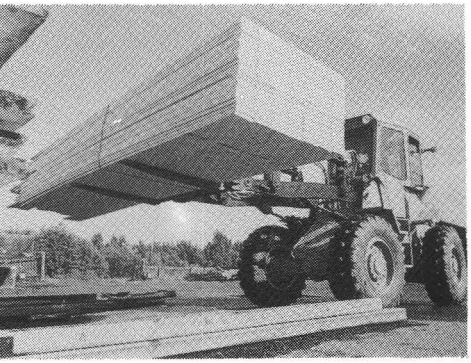

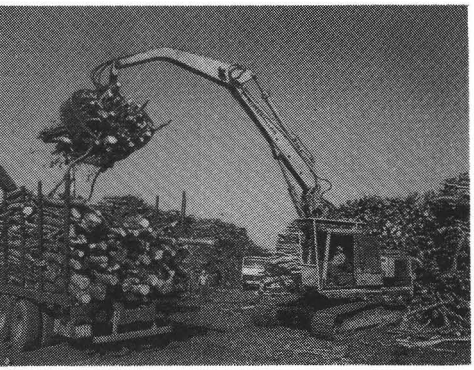

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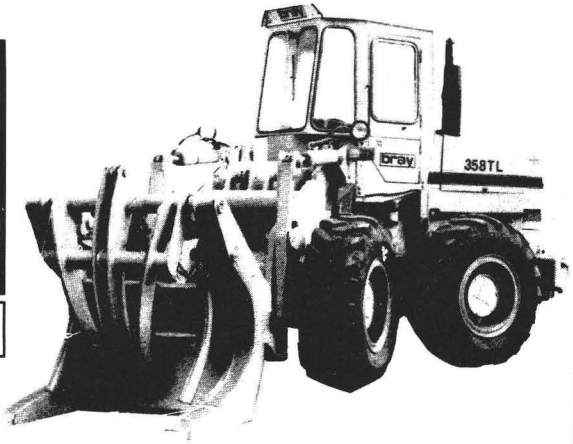

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EDITORIAL

Acid Rain

At the present time there is a great furore all over the world about the pollution of the environment. Acid rain has become a matter of particular concern to North American and European foresters over the past few years. Although the mechanisms involved are not too clear, there is substantial evidence that pollution is bringing about a decline in forest growth and even the total destruction of forest growth and even the total destruction of forest ecosystems.

In Ireland foresters have not paid too much attention to this potential problem. Perhaps this is because of the natural protection which we seem to enjoy from transboundary pollution. But we cannot completely ignore the fact that in Ireland the frequency of the incidence of precipitation with abnormal hydrogen ion concentration has increased, fairly dramatically, over the past ten years. In addition, we have seen serious damage to trees on a local scale. Foresters have traditionally been concerned environmentalists and we should now be alert to protect not only our forests, but also the total environment from the threat which acid rain poses. We should not hesitate either to speak out when we believe that new industrial development, however desirable from an economic point-of-view, poses a serious threat to our environmental heritage.

A New Interpretation of Forest Recreation Management

P. McCusker

Amenity Section, Forest and Wildlife Service, Sidmonton Place, Bray, Co. Wicklow.

INTRODUCTION

We now have 1½ million visitors coming to our forests each year. This figure speaks for the success of amenity developments to date. What we have produced has served us well over the past 16 years. However, I believe that we have now reached a plateau. Before embarking on the next phase of development we need to reflect on, and more clearly define, the nature and the possibilities of the job of recreation. Irish forest recreation has developed with little written policy backing and with even less philosophical debate on the need for, and the direction that such development should take place. The arguments for a written policy have been presented elsewhere and need no further mention here (Kennedy and McCusker 1983). However, the reasoning behind the need for such development should be looked at. We need to crystalise our ideas on why we are in the game of forest recreation.

WHO IS THE FOREST VISITOR?

The first thing we need to do is to get a handle on the forest visitor. Who is he, where does he come from, and what is he coming for? From two forest visitor surveys, (Bagnall *et al* 1978, and Kilpatrick 1964) we find that in the words of the visitors themselves they come for "peace and quiet", "for physical exercise", "for the atmosphere of a forest" which they define as being "restful and refreshing", and "to get away from everyone". From the same surveys we know that virtually all of our visitors come from cities or towns. If amenity developments therefore are to be relevant they cannot be viewed in isolation from major problems confronting urban society.

There is a feeling at large that western society is undergoing some fundamental change. The likely consequence of this change is still only dimly understood. In magnitude it is thought likely to be as great as that which ushered in the industrial revolution. Loss of jobs, frightening though that is, is only part of the problem. The drift

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from the stabilising influence of religion, of any sort, is also only part of the difficulty. There is the fundamental problem of modern man largely no longer able to comprehend the world in which he finds himself. Science has permeated so many areas to such an extent, that the common man does not understand most things (Steiner, 1960). He has been offered comfort at the expense of understanding. I believe that he has traded part of his dignity in the transaction. I am not criticising science here. It is the modern day Merlin. It gives many a life style the envy of medieval kings. I am saying that if we are to remain in the real sense, a human society, we need to infuse into our world a counter balance to the psychological effects of modern technology. In our Irish situation, in particular, I believe that this problem of alienation has been compounded by the mass movement from rural to urban living that has occurred over the last 15 years. By the year 2,000, three million people will be living in urban settlements in this country. Over two million of these will be living in the Dublin area (An Foras Forbartha, 1981).

What has any of this to do with forest recreation developments? In my view — a lot. The visitor coming to our forests is coming out of this urban backdrop. Amenity development can play a part in reducing this sense of alienation. We might examine four streams of development here.

Cultural Heritage

Forest recreation can contribute to an understanding of our heritage. To understand who we are, we need to know where we have come from. Scattered among our forests and among our forest parks in particular, there is a collection of ruins — castles, icehouses, labourers' cottages, sawmills, etc. Most of these buildings are not important enough to fall under the protection of the Office of Public Works. The question therefore arises, whose responsibility are they? They stand on Forest and Wildlife (FWS) property, but I feel that the FWS has never quite made up its mind as to its responsibility for such buildings. In fairness to the organisation, quite often it was the case that remnants of estates were thrust upon it for development into recreation areas. I suspect that the FWS does not see itself as having a brief for maintenance of buildings that are essentially ruins. But these ruins, out of all proportion to their size, add immeasurably to the human interest of our forest parks. Visitors relate strongly to these ruins. They are the evidence of the hand of man of another age. In many cases, these structures loom large as the focal points within our forest parks. If we are not to lose these structures, one by one, there is a need to decide which are worth retaining, and then to make the means available for their

repair. There seems an opportunity here to avail of the Youth Employment Scheme for much of this work. I am not suggesting that such ruins be repaired and roofed. I am saying that many of them justify being stablised and retained as ruins.

There are also a number of ring-forts, burial-chambers, crannogs, etc. standing on forest land. In all, the remains of pre 17th century monuments scattered across the 26 counties run to 200,000 units (Cooney, 1983). These, in combination with more recent monuments such as mine works, water wheels, famine relief schemes, add up to an impressive collection of structures from our past. Many of these are small and are often found half buried in gorse or bracken. When viewed in isolation they seem but of passing importance. However, many of these, if they were linked together, displayed and interpreted, could tell the story of the mythology, folklore and history of our past. We have all come from that history. Developments of this nature could go some of the distance to give us back our sense of who we are. We often talk of the need to revive the Irish language as though it alone can give us an identity. Are these structures not also a language?

It probably would be the case that developments of this nature would function best under the umbrella of a National Heritage Council, if such a Council ever comes into existence. If it does, and if it picks up this idea and requests the involvement of the FWS, I would hope that we would see the social relevance of such developments.

There is a practical side to this sort of development. Bord Failte research since the mid-seventies shows that about 40% of overseas visitors, questioned in surveys, gave one of their reasons for visiting the country to see at least one historic site (Cooney, 1983).

Active Use of Forests

Our receational developments to date are essentially passive in nature. Part of the reason for this is historical. It was not so long ago that we actively discouraged the public from coming to our plantations. When we did in time, open the gates, it was on the understanding that the public would use the forests in 'quiet pursuit' activities. In practice this meant walking and the use of nature trails. These activities proved popular and I am sure they will continue to be so. But there is another type of trail development that we might now consider.

Teenagers need to test themselves and to test their world. They want to show-off to their friends and indeed to themselves. Opportunities to do this in suburban housing estates are either pretty limited or they are anti-social. This is the failure of town

planners, architects and builders. Boredom can result from an absence of fear and danger, the consequence of which we can read about nightly in our newspapers.

The FWS could develop what I would call 'rough trails'. These trails would offer youngsters an opportunity to show what they are made of. Such trails would run across the roughest, meanest topography in the forest. Little more than ropes, logs, and stepping stones would be on offer for the benefit of the user. Danger would be a necessary part of these trails if they are to be of benefit. They could be graded for difficulty. Through publicity, the nature of such trails could be explained to parents. As things stand, for some youngsters, it is far more exciting to root up picnic tables and to burn down forest huts than to walk on tame hiking trails. Forestry could offer city kids a challenge. Not all have the means to buy sail-boards or canoes. "Rough trails" would incur no expense to the user. I cannot say how successful such trails might be. I simply do not know. It would be useful to discuss this idea with adventure sports organisations and youth clubs to get a reaction. I recommend that we do this.

In the matter of development of long distance walking trails, where the FWS is involved directly or indirectly, the criteria should be that such trails be run across interesting topography and not merely on existing roadways of convenience. After all these trails, once developed, are likely to remain in use, essentially unaltered for several hundred years. The quality of trail experience is therefore more important than the number of kilometres laid down in a year.

Pony Trekking

Ireland is well known abroad for its horses. It is also known for its scenery. Yet we have been slow to develop bridal paths. The FWS has been nibbling at the idea for some years now. I think that we should look at the possibilities more clearly. In the Bord Failte Tourism Plan 1982-86 it is stated that one of the intentions is to 'stimulate additional trail riding establishments'. Greater use of forest lands towards this end would help here. In particular I have in mind the Dublin-Wicklow Mountain area where there is potential for year round usage. Discussion with Bord Failte on the capital cost of such developments might be sought. Cost of trail maintenance should clearly be applied against the user. Why should the Forest and Wildlife Service, in particular, be the agency for such developments? The extensive acreage owned by this public body, the generally favourable scenic location of these plantations, and the spread of forest labour over these routes, would make the FWS the logical service to be responsible for this development.

Forest Atmosphere

The forest makes its impact through the mood it invokes, through a weave of colours, sounds, shapes and changing climate. The greater the beauty and variety, the greater the impact. The visual problem of modern plantations is not that they may be formed of conifer species, but the utilisation manner in which these species are planted and tended. The trend is to lay out plantations for the convenience of machines. The tendency is to manage out any spontaneity and unpredictability that might otherwise occur. The results can be visually impoverished landscape.

Tests on visitor preference in the United States shows that there is a preference by the public for forests that appear natural. One interesting survey carried out in Arizona has shown that the physical characteristics of a forest are not the only determinants of public reaction to its scenic beauty (Anderson, 1981). It was found that merely changing the description on a piece of land altered the public perception of the quality of that landscape. In this experiment, using identical photographs, but labelling them under six different classifications among which were "Wilderness area", "Recreation area" and "Commercial Timber Stand", it was shown that the public responded on a decreasing scale to lands labelled with increasing degrees of commercialisation. The same reaction was found by Hodgson and Thayer in California. The more natural a stand appeared to be, the higher the rating it received. We cannot assume that the same attitudes will prevail for the Irish situation. We need to do our own surveys to establish public attitudes in this area. We often make publicity out of the fact that 400 forests are open to the public as though the numbers game in itself was of particular importance. If surveys were to show clear preferences for apparent naturalness it might be best to divide plantations into those to be managed on strict economic criteria with no public facilities considered, and a smaller number of forests, in the main, lying in the proximity of cities and towns, to be managed for atmosphere as well as wood production. For the benefit of visitors this latter group of forests might be identified as "Recreation Forests".

An Educational Function

That we develop nature trails and trail booklets establishes the fact that Recreation Section is in the business of public education. The spur for this type of development was Conservation Year 1970. The spur may have been there, but there are no official documents reasoning the need to become involved in public education. I suspect it was simply seen as 'a wholesome business' in which to be

engaged. In this absence of debate, public education has developed along pretty narrow lines. I would argue three reasons why we should be involved in public education:

(a) Being a public service, and the nature of forest work in particular being so highly visible, it is prudent that we inform the public about the nature of forest operations if we are to prevent unnecessary misunderstanding of what we do. Traditionally we have been obsessively secretive about our work. It would be of benefit to generally loosen up our public relations.

(b) The FWS has the responsibility of implementing the Wildlife Bill. The success of this Bill will largely depend on public acceptance of the need to conserve wild things. Laws and regulations ultimately never protect. Perception of the value of wildlife is the key. Politics is the persuasion of numbers. How easy resources would become available to Wildlife Section if there was widespread appreciation of nature. At the moment there is no such appreciation. There is a saying that is apt here. Through education — understanding: through understanding — appreciation: through appreciation — conservation. I am convinced that at the end of the day, that way lies the success of the Wildlife Bill. We need a far greater input into public education. In my view, Forest Parks should be identified as special areas where nature study and a public consensus view sympathetic towards wildlife would be nourished. In a number of these parks we need to build interpretative facilities and we need to staff these on a year round basis.

(c) There is a second need for interpretative facilities which is more difficult to define. At the beginning of this paper I suggested that considerable numbers of people have partially lost their sense of identity. A guidance into man's place in nature could help here. I am not talking now of education. I am not talking of the mere listing of facts. I am talking of forest park programmes which interpret nature and man's place in it. Done at its best, interpretation of this nature touches on an understanding of our humanity. At its best, it reaches towards the nature of life and all things caught up in this mystery. At its best, it gives an insight, dim though that insight may be, into the face of eternity. And out of this experience can come understanding and contentment. This is clearly a step beyond public education. It is a provocation of the visiting public to reflect on social values and circumstances. In American and Canadian park management this idea is central to their interpretative programmes.

Our society in many ways has lost its way. I am not suggesting that society's problem will be solved by the FWS. They will not. Most of the problems will be solved, if they are to be solved at all, inside city boundaries. They will be solved by many agencies contributing part of the solution. Forest recreation programmes can be part of the solution. We can no longer afford the luxury of merely supplying forest walks, pleasant though such developments may be. We need to develop public usage of forests that is relevant to the social needs of a computer society.

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Effect of Ploughing Direction and Method on the Stem Form of South Coastal Lodgepole Pine

E. HENDRICK, N. O CARROLL and A. R. PFEIFER

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ABSTRACT

The effect of ploughing direction and method on the stem form of lodgepole pine was assessed in two replicated field experiments on low level blanket peat in Co. Mayo. Four ploughing directions were tested: NE/SW, E/W, SE/NW and S/N. Ploughing in the SE/NW direction, at right angles to the prevailing wind, produced three times the amount of stem lean as in the treatment ploughed parallel with the prevailing wind. Three ploughing methods were compared: open furrow ploughing at 1.83 and 3.66m spacing and tunnel ploughing. Tunnel ploughing, a form of subsurface drainage, resulted in significantly less sweep than the open furrow methods.

INTRODUCTION

Over the past 30 years about 80,000 ha of blanket peat have been afforested in the west of Ireland. The two main species planted have been lodgepole pine and Sitka spruce. Although a variety of provenances of lodgepole pine were planted up to 1968, since then coastal provenances from Washington and Oregon have generally been used. Growth rates for these provenances on blanket peat vary from 12-18m^3/ha/year at maximum MAI.

Most of the west of Ireland is extremely windy with a mean annual wind speed of 6-7 metres/second. In addition gales occur frequently with an average of 34 days with gales each year. (Rohan, 1975). Precipitation of 1,500mm or more is spread evenly through the year. Drainage is, as a result, essential to successful afforestation. Open furrow ploughing, creating shallow ditches 25-30cm deep at 4m spacing, is the normal drainage method but in recent years tunnel ploughing (O Carroll *et al* 1981) is being used to a greater extent. Both techniques leave peat ribbons which are usually continuous, although they are frequently broken when extruded from the tunnel plough, expecially where the peat is well humified. Trees are planted on the top of the ribbon, usually by making a slit in the peat and firming-in the plant. During the early years, roots tend to concentrate in the well aerated peat ribbon. These eventually form the main supporting roots and the main stem and structural roots take on an inverted T-shape (Fig 1). Few roots cross the furrow

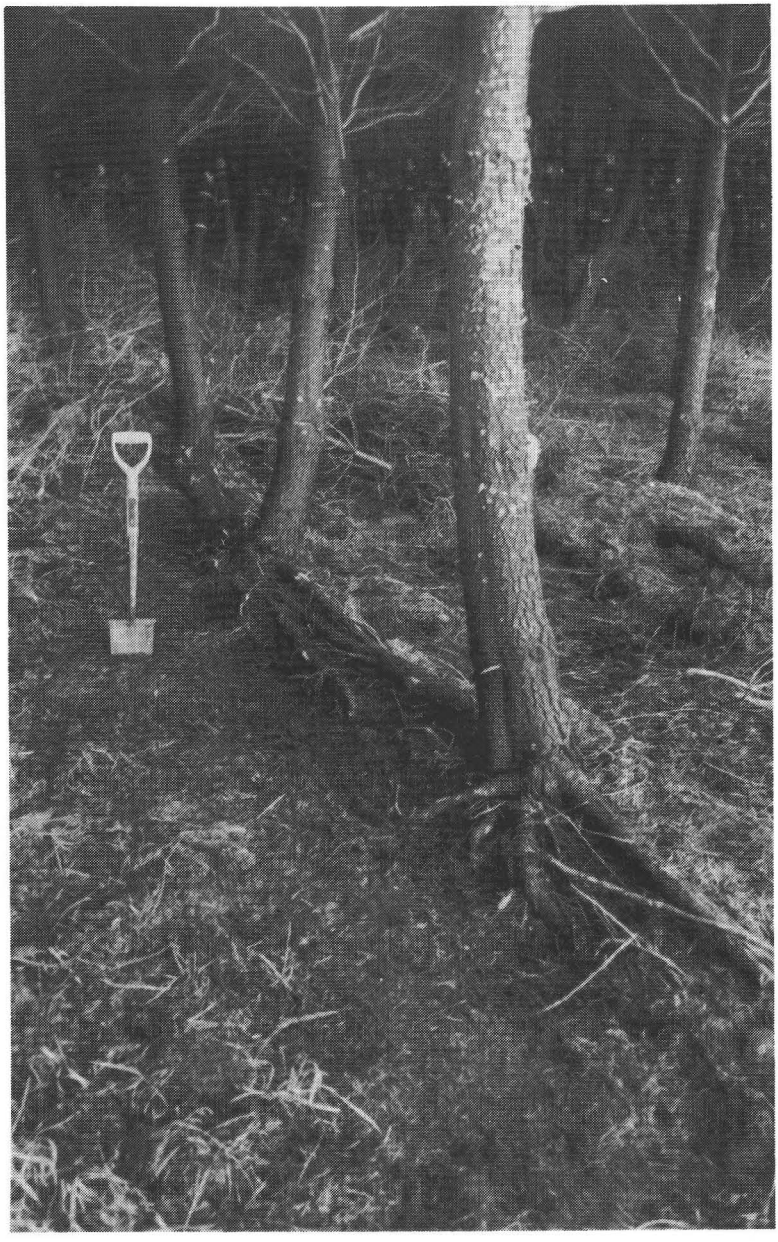


Fig 1. Typical inverted T-shape of stem and roots of lodgepole pine at Gweesalia 1/64 (Bangor Erris Forest).

bottom even after canopy closure and those that do are of small diameter and give little or no support to the tree. The purpose of this paper is to discuss results from two experiments which show the effect of root alignment on stem form and to make recommendations as to how stem form can be improved.

METHODS

Two experiments were established in 1964 and 1967 to examine the effect of ploughing direction and method respectively on the growth and stem form of lodgepole pine and Sitka spruce.

Experiment 1

Gweesalia 1/64 (Bangor Erris Forest), is located in north-west Co. Mayo (national grid reference F75 22) within 200m of the shore of Blacksod Bay at about 5m above sea level. Exposure is severe (tatter flag readings at Belmullet synoptic weather station gave a mean tatter rate of 5.1cm^2/day for the period February '81 to September '83). The vegetation over the general area before ploughing consisted mainly of *Molinia caerulea, Schoenus nigricans, Calluna vulgaris, Erica cinerea* and *E. mediterranea.* The soil is blanket peat with a small admixture of wind blown sea sand. The object of the experiment was to examine the effect of ploughing direction on tree growth under conditions of severe exposure. There were four ploughing directions: NE/SW, E/W, SE/NW and S/N. The site was ploughed by a double mouldboard Cuthbertson plough in 1963. Planting took place the following spring into V-shaped notches cut to half the height of the ribbon with the apices facing SE, S, NE and E respectively. Both Sitka spruce and lodgepole pine of Washington coast origin were planted in two separate 4 x 4 latin squares. Plot size in each case was 40.2 x 20.2m. Plant spacing was 1.83m (6 feet) along the ribbons which were 1.83m apart. Following ploughing an initial fertiliser treatment of ground rock phosphate supplying 36 and 18kg P/ha was applied to the spruce and pine respectively. Copper was also applied at 2.8kg Cu/ha to both species. A further fertiliser treatment supplying 91kg P/ha and 150kg K/ha was applied in August 1969.

Experiment 2

The second experiment, Glenturk 8/67 (Glenamoy Forest), is also located in north-west Co. Mayo, 14km north-west of Experiment 1 (national grid reference F 86 29). The site has an elevation of 15m and a slope of 1°. Exposure is moderate. The vegetation before ploughing consisted mainly of *Calluna vulgaris, Erica tetralix, Schoenus nigricans,* with the occasional *Myrica gale.* The soil is blanket peat, about 1.5m deep which is typical of

much of the North Mayo area. The object of the experiment was to compare the effects of tunnel ploughing and single and double mouldboard Cuthbertson ploughing on the establishment and growth of Sitka spruce and lodgepole pine. The ploughing treatments were carried out in 1966 as follows:

1. Tunnel ploughing at 3.05m (10 feet) spacing. A line of mounds was cut from each tunnel ribbon and placed mid-way between ribbons. Plants were planted 1.83m (6 feet) apart on the ribbon and mounds resulting in a 1.83 x 1.52m spacing.
2. & 3. Double and single mouldboard Cuthbertson ploughing at 3.66m (12 feet) and 1.83m (6 feet) spacing respectively. In both treatments, plants were 1.52m apart on the plough ribbon.

The ploughing treatments were replicated in four randomised blocks with two plots of tunnel ploughing each so that the tunnel plough was replicated eight times. However, there was only one replicate of each of the Cuthbertson ploughs in each block. The ploughing plots, each 27.4 x 18.5m (0.05 ha) were split equally for the two species. The lodgepole pine was of south coastal origin (Oregon or Washington) derived from seed collected in a stand in Cloosh Valley forest, Co. Galway. Initial fertiliser treatment was a spot application of ground phosphate supplying 36 and 18kg P/ha to the spruce and pine respectively. This was followed in October 1972 with a broadcast application which supplied 90kg P, 150kg K and 4kg Cu/ha.

Measurement of basal sweep and direction of lean

In August 1979 stem form and direction of lean were measured at Gweesalia. This was confined to the lodgepole pine since there were no apparent differences in stem form between Sitka spruce treatment plots. Stem form was assessed by measuring the horizontal deviation of the stem 60cm above the centre of the stem base. Twenty trees were measured in each plot. The same trees were also assessed for direction of lean. Direction was assigned to one of the eight cardinal bearings. A further assessment of stem form was carried out in February 1983 at Glenturk and Gweesalia and again was confined to the lodgepole pine. This was done measuring the horizontal distance from the centre of the stem base to the point where the stem became vertical (Fig 2). This point was found using a height rod with a spirit level attached and the horizontal distance was measured to the nearest decimeter. Every third tree in a 20 x 20m assessment plot in the centre of each sample plot was measured. Trees with broken tops and dead trees were omitted and the next tree measured instead. An average of 27 trees were measured in each assessment plot.

Fig 2. Method of measuring maximum stem deviation from the vertical.

Wind direction frequency

Wind direction frequency data are collected at Belmullet synoptic weather station which is about 14km from both experiment sites. Data are presented as the number of simultaneous occurrences of specified ranges of mean hourly wind speed and direction. The period of measurement investigated was from January 1963 to December 1982. Frequencies of wind direction, including all wind speeds up to 28 metres/second (55 knots/hour), blowing to each of the eight cardinal bearings, were then calculated.

RESULTS

Ploughing direction

Ploughing direction had no effect upon survival or growth at Gweesalia up to the end of the 15th growing season (1978). However, the basal sweep assessment taken in 1979 showed quite large and significant effects. The amount of lean in the SE/NW treatment was almost twice that in the NE/SW treatment (Table 1).

Table 1: Effect of ploughing direction on stem form at Gweesalia 1/64.

Ploughing Direction	Deviation from vertical at 60cm height m
NE/SW	0.22
E/W	0.34
SE/NW	0.40
S/N	0.34
Standard error of difference	0.061
NE/SW v SE/NW F = 8.54 significant at P 0.05 level	

The 1983 stem form assessment showed the same trend but the magnitude of the differences was much greater with up to three times the amount of lean in the SE/NW treatment than in the NE/SW treatment (Table 2).

Table 2: Effect of ploughing direction on stem form at Gweesalia 1/64.

Ploughing Direction	Horizontal distance to vertical stem m
NE/SW	0.70
E/W	1.30
SE/NW	2.10
S/N	1.30
Standard error of difference	0.37
NE/SW v SE/NW F = 11.12 significant at P 0.05 level	

Ploughing method

At the Glenturk experiment, tunnel ploughing improved the growth of lodgepole pine compared to both double and single mouldboard (O Carroll *et al* 1981). Stem lean was affected by ploughing method. Tunnel ploughed plots had significant less lean than open furrow ploughed plots (Table 3).

Table 3: Effect of ploughing on stem form at Glenturk 8/67.

Method	Horizontal distance to vertical stem m
DMB	0.44
SMB	0.39
Tunnel	0.34
Open furrow v tunnel F = 6.76 significant at P 0.05 level	

Ploughing direction was not, however, consistent between blocks. In two blocks ploughing was at 30°/210°and in the other two at 110°/285°. Because of the complete confounding of direction with blocks it is not possible to test the hypothesis regarding wind direction, nevertheless the maximum deviation in the ploughing treatments in the blocks ploughed at 30°/210° was on average 0.37m, whereas in the other blocks ploughed at a more oblique angle to the prevailing wind it was 0.47m.

Wind direction frequency

The modal wind direction for the measurement period was 220°, almost due SW/NE. Wind direction frequencies together with the proportion of trees leaning in the same directions are shown below (Fig 3). Most trees were leaning away from the direction of the prevailing wind and only four from the total sample were leaning in a SW direction.

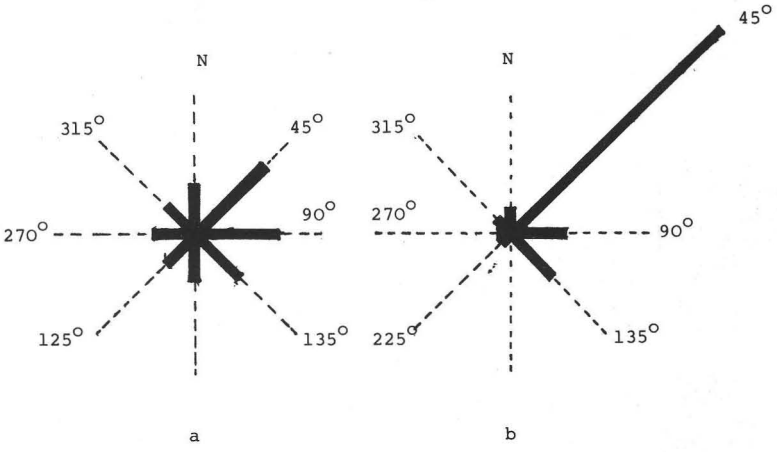


Fig. 3. (a) Frequencies of wind blowing to each of the eight cardinal bearings at Belmullet synoptic weather station (January 1963 — December 1982) and (b) proportion of trees leaning to each bearing.

DISCUSSION

Lodgepole pine of the south coastal provenance is particularly susceptible to basal sweep. The main predisposing factors appear to be low root/shoot ratios of transplant stock, method of planting and type of ground preparation (Pfeifer 1982). Plough ribbons encourage the development of roots in the direction of ploughing. Trees lean away from the prevailing wind (Fig 3) and where root support is in that direction it is to be expected that there will be more resistance to lean than where roots are running at oblique angles. This is confirmed in the results shown in Tables 1 and 2. It can be seen that the greatest deviation from vertical is associated with the ploughing direction SE/NW, which is at or near right angles to the

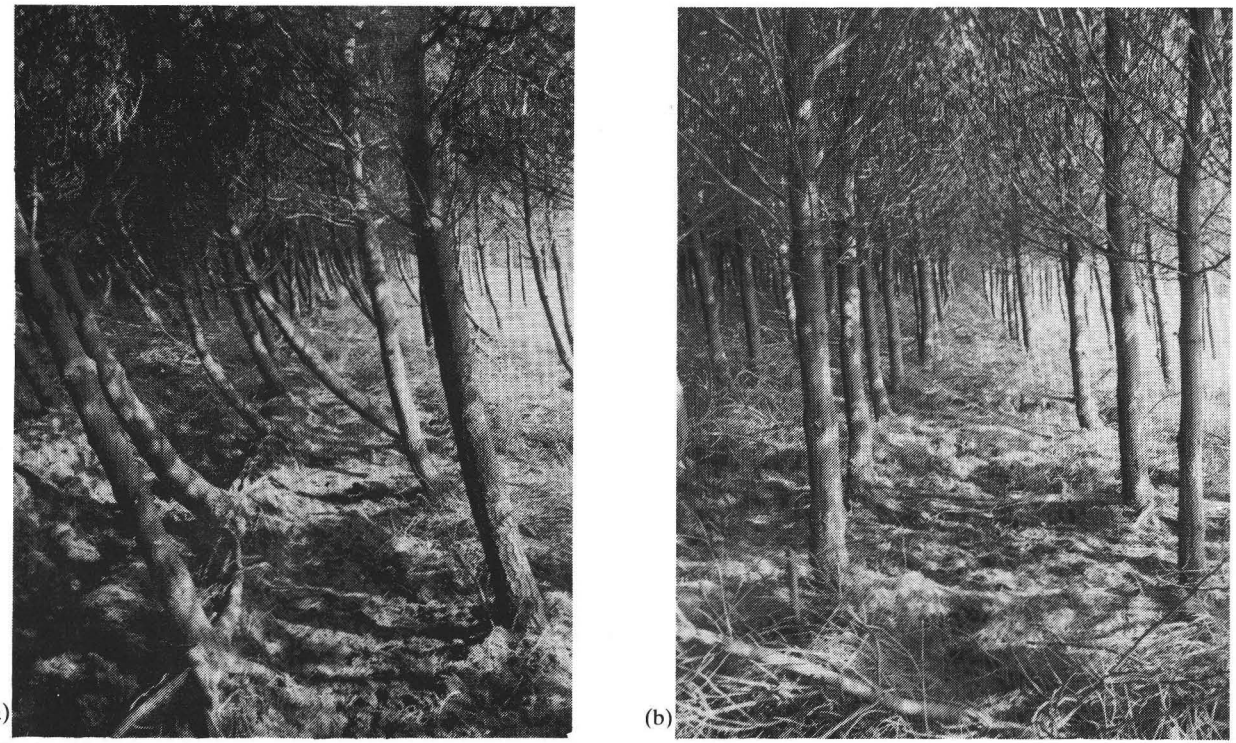
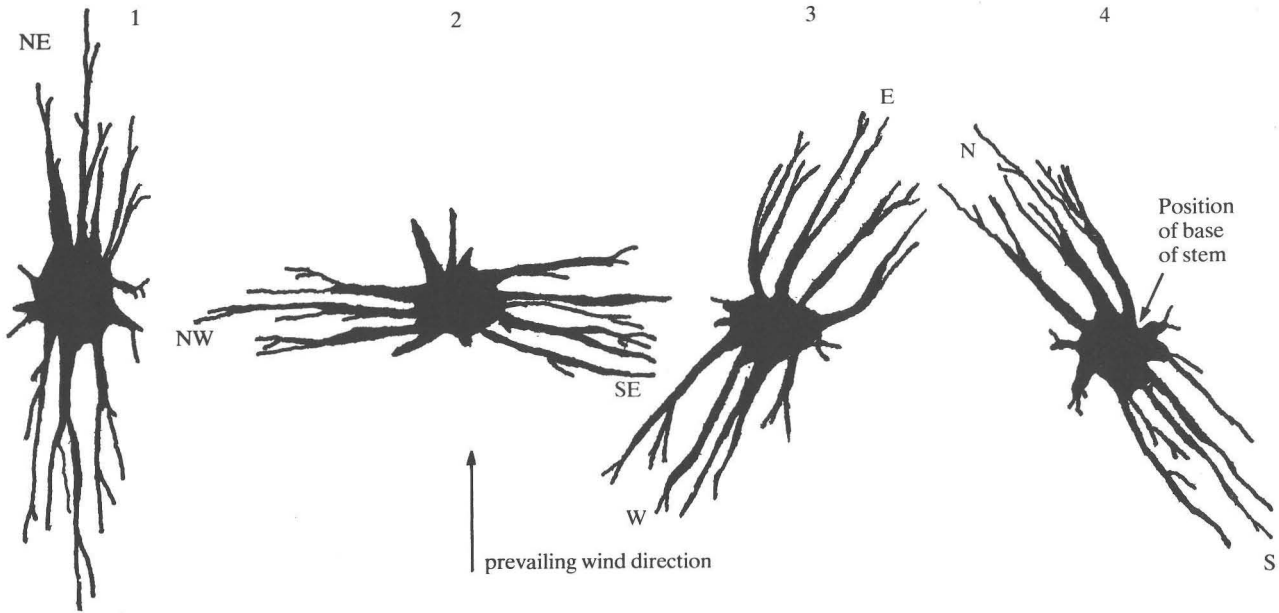


Fig 4. Ploughing a) at right angles and b) parallel to the direction of the prevailing SW/NE wind at Gweesalia 1/64 (Bangor Erris Forest).



1 Main roots aligned parallel with prevailing wind. Maximum resistance and stability. Minimum basal sweep.
2 Main roots alligned at 90° to prevailing wind. Minimum resistance and stability. Maximum basal sweep.
3 & 4 Main roots in intermediate position. Moderate resistance and stability. Moderate basal sweep.

Fig 5. Relationship between main root aligment (resulting from alignment of plough ribbon), wind direction, and severity of basal sweep in a lodgepole pine crop.

prevailing wind. This gives the inverted T-shaped tree/root systems aligned in the most unstable direction, with little or no structural support in the necessary direction. Least deviation is associated with ploughing which is alligned parallel with the prevailing wind direction (SW/NE) thus giving a tree/root system having maximum support in relation to that direction. The other two ploughing directions, being at about 45°deviation from the prevailing wind, are intermediate in their effects (Figs 4 and 5). Some indication of the severity of lean and the difference between ploughing parallel and at right angles to the direction of the prevailing wind is shown in Fig 4.

Method of ploughing is also important in relation to stem form. Cutting the ribbons in the tunnel-ploughed treatment at Glenturk resulted in roots spreading in all directions (Hendrick, 1978) which in turn gave greater support and less sweep (Table 3). While this difference is significant, it is small when compared with the differences between ploughing directions at Gweesalia. It is likely, however, that on exposed sites tunnel ploughing would result in a considerable improvement in stem form.

Stem malformations of the kind described above reduce timber yield because of difficulties in sawing. The compression wood that results reduces chemical pulp yield and timber quality following drying (Low, 1964). As a result, the improvements in form described will have important economic consequences. Stem form can be improved by using tunnel ploughing wherever feasible and ensuring that ribbon breakage occurs as much as possible.

Where open furrow ploughing is resorted to it is recommended that it should be in or as close as possible to the direction of the prevailing wind, after taking other considerations, such as slope, into account.

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Returning to Nature

Part 1: Educating the Eye

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Prior to the 18th century, unproductive land was regarded as unsightly. It did not conform to the classical ideals of order, reason and restraint. From the 18th century the situation was reversed and wild scenery, the landscape garden and Gothic Archictecture were widely admired. It is argued that this dramatic change in sensibility is a result of growing urbanism and increased domination of nature by man. A counter-effect is created of increased emotional involvement with the natural world, albeit a tamed one. This culminates in our present day fascination with forest parks, nature reserves, city greens, wildlife programmes and tree preservation.

Part 1 traces the emergence of the taste for scenery.

In 1423, John Whetamstade, an abbot of St. Alban's, when travelling to Rome described the landscape around Lake Bracciano as *Locum horroris et vastae solitudinis,* (Labarge, 1982). The description typifies attitudes to wild scenery, to the barren and the useless, commonly expressed by commentators and travellers until well into the 18th century. James Howell in the 17th century objected to the "monstrous abruptness" of the "Pyreney Hills" and found the Alps "high and hideous" and "monstrous excrescences of nature". (Rees 1975). 'Natures pudenda' was another favourite epithet. As late as 1733 a compendium of knowledge for children — Plucthe's *Spectacle de la nature,* presented the orthodox view of mountains, including a justification for their existence on the basis of their utility as storage places for water that sustained life by supplying rivers, and as a means of fostering gratitude to God by reminding us "what uncomfortable quarters would have been allotted to us had it not been for Divine Goodness" (Sprague-Allen 1969). Similarly in America early settlers rejected all in nature but the practical and the useful. A Jesuit described the Niagara Falls in 1659 as "a vast and prodigious Cadence of Water which falls down after a surprising and astonishing manner . . . The waters . . . do foam and boyle after the most hideous manner imaginable, making outrageous noise". (Huth 1972). Aesthetic qualities in nature were not considered in these early reports of America. Outside settlements, nature is seen as uncouth.

A waste and howling wilderness
Where none inhabited
But hellish fiends and brutish men
That Devils worshipped (Wigglesworth in 1662)

Elizabethans travelled extensively but only described the useful, the fertile and the small, such as cornfields, meadows and prosperous towns. The taste was for the tamed and fertile landscapes of human cultivation and care. Celia Fiennes travelled around England on horseback in the early 17th century, and admired the wide prospect of cultivated countryside. She visited the Lake District, later frequented by pilgrims of the picturesque, but she thought the steep hills "made travelling tedious and ye miles long . . . Looking upwards I was as farre from the top which was all rocks and something more barren tho' there was some trees and woods growing in ye rocks, and hanging over all down ye brow of some hill". Hills interfered with the view except of "ye clouds" and were so full of loose stones that it was very unsafe to ride down them (Manwaring 1925).

The taste for the fertile man-made landscapes of Europe was not expressed until early in the 15th century. Medieval Christianity encouraged an aloofness and puritanism from earthly things, embodied in Petrarch's famous description of his ascent of Mount Ventoux in the 14th century. He admired every detail until he reached the top, and then he read a passage out of the Confessions of St. Augustine on the renunciation of earthly pleasures and "angry with myself, I closed the book. Long since I ought to have learned . . . that nothing is wonderful but the soul, which, when great itself, finds nothing great outside itself" (Cassirer 1948).

Earlier travel writing was bald and factual, and did not generally describe the countryside. An exception was Gerald of Wales. He travelled around Ireland in the late 12th century. His descriptions combine fanciful speculation with passages which clearly derive from observation and experience (O'Meara 1951). Another writer of the time, Gilles Le Bouvier, says that Ireland was notable for the pilgrimage to Lough Derg, and the fact that it was the poorest country in the world (Labarge 1982).

Early journeys, dating from 500 A.D. were religious wanderings and pilgrimages impelled *pro remedio animae* for the love of God and to gain a country in heaven. The pilgrimages to Jerusalem, Santiago de Compostela and Rome were fraught with danger from wars, robbers, wild beasts in forests and unfriendly inhabitants in towns. Indeed Europe during the Middle Ages knew few periods of peace. Latini in 1294 spoke of open manor houses in the Ile de France and Froissart in the next century spoke of times "when the

countryside was fat and full of good things" (Tuan 1979). But such peace was shortlived. The violence in the countryside would have an influence on the medieval landscape. In 1285 a statute enacted in Winchester required a clearance of 200 feet on both sides of the road to deprive robbers of hiding places. (Salisbury 1948). Antagonistic attitudes towards the wilderness of forest and mountain would derive from memories of this violence. In Medieval Europe, people on the plains saw mountains as haunted with demons, because mountain dwellers lived outside the feudal system and mountains were retreats for persecuted sects and for outlaws. The etymology of the words *wilderness* and *forest* indicate the former association with fear and terror. Wild comes from the old English weald or woeld i.e. forest, and wild-deor is the place of the wild beast. Forest and foreigners share the base word *foranus* meaning *situated on the outside.* A forest was a maze through which wayfarers would venture at their own risk — the risk being disorientation, or violence from bandits or witches. A present day connotation of wilderness would be any place where a person feels lost or perplexed. *Savage* and *silva* similarly share a common root. When Elizabethans spoke of a wilderness they meant a dense wood. To them, the Irish remained wood-born savages. To take a person out of the woods was to civilise them (Nash 1967).

Although conditions for the lone traveller in Europe did not improve until the 1700s, the number and category of travellers did increase from the middle ages. They ranged from exiles on purposeful vagrancy to adventurers, monks, diplomats, and from the 13th century, scholars in pursuit of learning. The specifically religious journey gave way to journeys which combined scholarship, *gentlemanly* pursuits and Christian devotion. The first travel book, Pylgrymage by Guyeforde, was published in 1506 (Shepard 1968), and during this time, a growing interest in the notion of cultivated landscape being an object of beauty is expressed. In the memoirs of Pope Pius II of the early 15th century, he refers to "the indescribably lovely" country around Siena, and admires "its gently sloping hills planted with cultivated trees and vines, or ploughed for grain" (Glacken 1973).

Despite the proclaimed horror of mountains, the Swiss Alps were toured and described by Johannes Stümpf in 1548. His descriptions were confined to people and curiosities observed. He did not express any pleasure he may have derived from the Alpine scenery. (De Beer 1966). An indication of what may have been understood by *gentlemanly pursuits* is given in Fynes Morrison's record of a visit to a Swiss spring in 1692. The Swiss springs were reputed to have therapeutic properties from earliest times and attracted travellers

"many having no disease but that of love. Howsoever they faine sickness of body, come hither for remedy, and many times find it". Naked ladies entered the baths, apparently surrounded by men sitting in galleries joking and chatting and "refreshing their minds as women enter and leave the water" (De Beer 1968).

It was not until the end of the 17th century that the Alps and other forms of wilderness began to be circumspectly scrutinised. In 1688, the English critic John Dennis crossed the Alps and experienced "a delightful horror, a terrible joy, and at the same time that I was infinitely pleased, I trembled" (Nicholson, 1959). He felt an enlargement of the spirit never produced in him by familiar beauty — that is the beauty of fertile man-dominated landscapes and the beauty associated with regularity and proportion. Addison toured in 1699, and though he expressed relief at the sight of the plain after the Alps, he retrospectively admired the Alps and defined what became known as the sublime, i.e. the awe experienced in confronting the vastness of nature and as revealing God in his greatness.

In 1732, a Swiss poet, Albrecht von Haller published "Die Alpen", a series of poems which introduced the Alps to literature and by the middle of the 18th century Thomas Gray was able to write "not a torrent, not a cliff but is pregnant with religion and poetry".

From the 1740s onwards, travellers began to enjoy the natural scenery of Ireland and England. In 1779 Young published his Tour of Ireland, and gloried in the lakes of Killarney. Earlier in 1750, Mrs. Delaney found the lakes of Killarney *enchanted.* William Ockenden in 1760 also visited Killarney and his party "were quite transported with a marvellous scene of pure nature . . . more exquisite than I had ever seen, either in France, Italy or England . . . We rested upon our oars within the bowery bosom of this sublime theatre . . . and remained there for some time enraptured with the beauties we beheld". Derrick travelled there in 1760 and enjoyed the driving mist and wind and "the showers posting round the borders of the mountains, upborn by the wings of the wind. The impetuous cataracts and the mountains in some places bald, white and naked . . . in others crowned with flourishing trees". They awakened his religious emotions to such a pitch that he described one of his letters as a "travelling rhapsody" (see Sprague-Allen 1969). As the feeling for scenery grew, the word tourist was coined for a person hunting for scenery. Sprague-Allen (1969) finds the word in use in 1789, in the obituary of Mrs. Boswell "wife of a celebrated tourist". *Beauty* could now be seen in what was previously regarded as barren and chaotic.

The 18th century was pre-occupied with discussions on aesthetic theories. They defined the categories — the beautiful, the sublime and the picturesque. Edmund Burke distinguished the beautiful from the sublime on the basis of sensations elicited. The sublime was a source of terror, but a terror associated now with the awe and delight to be had from natural landscapes. William Gilpin in 1792 defined the picturesque as the pleasing qualities of nature's roughness, irregularity and intricacy. The word itself shows the link between painting and scenery. An earlier definition of the picturesque was the scenery's capabilities of being formed into pictures. It has been argued (Manwaring 1925, Hussey 1927) that the taste for scenery was formed by Italian and Dutch landscape paintings of the 17th century.

The Italian paintings were those of Claude, Poussin and Rosa, of whom Claude is regarded as the most important in the development of landscape aesthetics. He painted scenes of the Roman Campagna and the Alban hills and imbued them with a mood and serenity which invoked an ideal world of the past lived tranquilly in pastoral groves. His sources were the literary tradition of the pastoral from Virgil and Horace. His discovery of pastoral beauty liberated the abstraction *scenery* from nature and this form of beauty still continues as a dominant aesthetic by which the visual world is perceived. The Dutch naturalistic school of the 17th century painted familiar unidealised views of the countryside where man and nature were prospering amidst tilled fields, roads, rivers and seascapes.

The emergence of landscape paintings in the 17th century is significant because it was new. Prior to the 17th century, art had to deal with historic or religious subjects, with landscape only as a background. 17th century landscapes became an accepted subject of art. They provided the visual foundation for landscape aesthetics and to that of seeing the natural world as scenery. They provided criteria by which the visual world could be perceived. Landscapes were reconstructed in imagination according to principles of composition that had to be learned. Gentlemen carried a *Claude* glass, a tinted convex mirror which framed the scene and reduced local colour to the brown monochrome of a Claude.

The pursuit of the picturesque and the reverencing of nature was rampant by the end of the 18th century. Itineraries were planned so that the best way of approaching the landscape for viewing would be achieved. In 1857, the Baltimore-Ohio railroad company arranged a journey along *the Picturesque Line* of America for writers, artists, and photographers, with all comforts provided including dark rooms for immediate processing of photographs (Huth 1972).

Picturesque aptitudes of the landscape were critised as if an art exhibition was being reviewed. Artists did not think it amiss to make adjustments to remove blemishes in their depictions of a landscape which did not conform to picturesque rules. Gilpin's *Forest Scenery* (1791), discusses the handling of woodland as picturesque material. He regarded the oak as the most useful in this respect, adding dignity to the ruined tower and new grandeur to the pastoral scene. The ash was less picturesque, the lightness of its foliage redeeming it somewhat. The elm was better suited to receiving light and shade essential to picturesque effect. He thought poplars were no use, but the horse chestnut and the birch were particularly picturesque. He was one of the first to admire Scot's pine, and tried "to rescue it from disgrace and establish it as a picturesque tree" (Hussey 1927). Despite Gilpin's love of nature, he still found it necessary to adjust nature to principles of art — to the adjunct, paint what you think, not what you see.

By the end of the 18th century, the rapture was becoming commonplace, and the picturesque was becoming obvious. The finer minds did not require the picturesque in their communing with nature. Wordsworth was proud of his immunity

> 'Although a strong infection of the age,
> Was never much my habit-giving way
> To a composition of scene with scene
> Bent overmuch on superficial things,
> (Prelude. Book XII)

It was now possible to enjoy nature and scenery for their own sake, in the sense that painterly criteria were not required to mediate between man and nature. Wordworth nevertheless objected to a proposed railroad from Kendal to Windermere by playing down the idea of a spontaneous aesthetic response to landscape. He argued that a long course of aesthetic education was necessary to instil a taste for barren rocks and mountains. The urban lower classes could derive no benefit from immediate access to wild nature. What they needed was a preparatory course, starting with Sunday excursions into nearby fields — (Wordworth's Guide to the Lake in Thomas 1983).

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The Economics and Management of the Forest Habitat for Pheasants

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INTRODUCTION

Basic ecological requirements for pheasants include the availability of food, roosting sites, cover for shelter and concealment, and the presence of open areas for territorial display (Lachlan and Bray 1976). Since these are rarely supplied by any one vegetation type, pheasant range is a phenomenon of edge effect. The suitability of the forest for pheasants then will depend upon its capability to provide edge. An ideal forest habitat might then be described as a structurally diverse woodland of mixed hardwood and conifer composition which would allow incident radiation reach to the forest floor to encourage growth of shrubs, thickets and herbaceous plants, interspersed with open areas either within or exterior to the forest.

The provision of an optimum habitat for pheasant is most certainly competitive with commercial forestry which is the primary reason for the association of pheasant shooting with less intensive forest management systems. Theoretically 5% of woodland areas is all that need be unproductive of timber to create suitable conditions needed to maintain a breeding stock of pheasants (Gray, Eley Game Advisory Service, 1966). However, part of the remaining 95%, although classed as "productive", may not yield as high a financial return from tree species planted for habitat improvement rather than for productivity. Competition also exists for other limited resources such as labour, machinery and capital input. Problems may also arise in the timing of forest operations such as grass cleaning, thinning and felling which may need to be either delayed or brought forward to accommodate pheasant breeding and shoot management. The incorporation of shoot management in a forest management plan certainly poses many financial pitfalls but it should be stressed that shoot management is also concerned with sound economic practice. To assess the feasibility of integrating pheasant shooting and forestry a number of theoretical management options were tested on a study area where the intensity

of forest management might perhaps allow for the provision of a pheasant shoot for monetary gain.

THE STUDY AREA

Knockrath Woodlands lie within the Vale of Avonmore in southern Co. Wicklow, approximately midway between the villages of Laragh and Rathdrum (Map Reference S.H. 775665; O.S.S. No. 115-6" 1 mile). They comprise of some 274 ha of mixed high forest of diverse structure. Table 1 shows a classification of the forest area in terms of land use and forest structure.

Table 1: Land use classification for Knockrath Woodlands for 1983. (Student working plan for Knockrath Woodlands, 1983-88).

Land use	Area	No. of sub-compartments	Average area per subcompartment
Mixed broadleaved high forest	21.4	14	1.53
Coniferous high forest			
(1) Establishment	22.2	7	3.2
(2) Thicket	34.0	12	2.8
(3) Small Pole	41.5	24	1.7
(4) Large Pole	13.3	7	1.9
(5) Small Timber	26.0	12	2.2
(6) Large Timber	71.7	24	3.0
Total	208.7	86	2.4
Scrub/unplanted	18.6	6	3.1
Pasture	25.5	5	5.1
Total	274.2	111	2.47

The natural climax vegetation found on the predominantly acidic soils occurring in Knockrath (Carey, 1970) was sessile oak which co-exists with beech as dominants in the canopy. Much of this area of broadleaved high forest (BHF) had been allowed to degenerate allowing the development of rich shrub, field and ground layers including, bracken, bramble, and bilberry. The predominant species found in the coniferous high forest (CHF) were Douglas fir, Sitka spruce and the larches.

The scrub is generally found on poorly drained peaty podzols

where cover consists of alder *(Alnus glutinosa)*, birch *(Betula spp.)* and *Juncus* communities. Areas that were as yet unplanted were characterised by strong growth of bracken and bramble. A relatively large area was under pasture which was let for grazing.

Materials And Methods

Managment Options

There were two fields of action involved in the managerial options that were to be tested on the estate. These were (i) a possible increase in the resident pheasant population by release of pheasant poults and (ii) a possible interference in normal management policy with an intended modification of the forest habitat to improve it for pheasants. Four options were chosen from a 2 x 2 matrix based on a null or positive action. Broadly then the options were:

(1) no release and no interference in forest management;
(2) the release of pheasants with no interference in forest management;
(3) no release of pheasants with modification of the forest habitat, and
(4) the release of pheasants with modification of the forest habitat.

Option 1

This option required no intervention in the normal planning and running of the forest estate. An estimation of the present worth of shooting rights was made on the basis of the overall quality and distribution of ground cover catalogued for each sub-compartment (Long 1983), and on the potential yield of pheasants for the 1983-84 shooting season. The potential yield was extrapolated from a census of breeding cocks taken in late March and early April of 1983, using reproductive indices and juvenile survival rates detailed by Leopold (1961).

The adoption of this course of action would not place any restrictions on the future management of the estate. However, the rewards to be reaped from the sale of shooting rights would not be very great.

Option 2

Option 2 involved the introduction of artificially reared birds into an unaltered forest habitat in order to increase the value of shooting rights. Four strategies were considered for the rearing of 5,000 pheasants, the costs of which are listed in Table 2. The cost of rearing pheasants from the unhatched egg (Strategy I & II) includes all costs inclusive in the subsequent rearing of both day-old chicks and poults (Strategies III & IV respectively).

Table 2: Comparison of the costs of materials for the four suggested rearing strategies.

Strategy	I	II	III	IV
Nature of Cost	Value (IR£, 1983)			
Incubator and Rearing Equipment	879.64	560.10	560.10	—
Eggs/Birds	372.74	1,732.74	4,100.00	10,500.00
Fuel	1,633.20	1,633.20	1,633.20	—
Food	873.72	873.72	873.72	—
Miscellaneous Cost	1,300.00	1,300.00	1,300.00	1,300.00
Labour	8,320.00	8,320.00	8,320.00	5,720.00
Cost of Release	3,474.58	3,474.58	3,474.58	3,474.58
Total Cost	16,853.88	17,894.34	20,261.60	20,994.58

I: Incubation of home produced eggs; II: Custom hatching of home produced eggs; III: Purchase of day-olds; IV: Purchase of 6 week-old poults.

The incubation of home produced eggs (Strategy I) has problems inherent in the uneven production of eggs by hens during the laying season. This problem can be overcome by sending eggs to a commercial game farm to be 'custom-hatched' (Strategy II). For a fee the keeper can then obtain regular batches of day-old chicks for rearing. Direct buying of day-old chicks bypasses the costs and time involved in the production of eggs from captured wild stock. Shoots which may not wish to commit themselves to the high cost of capital, food, fuel and labour required in rearing from the day-old stage may prefer to buy six-week old poults. These, like home reared stock, must be conditioned for a time in release pens before being allowed complete liberty in the wild. Their release into permanent pens in the forest encourages birds to remain in the immediate area once they have become free-ranging, providing suitable sites have been selected and birds are fed regularly.

Practically, the most economic method of rearing is the custom-hatching of home produced eggs and the subsequent rearing of day-old chicks to their release at six weeks of age (Long 1983). The poults then released into centralised sub-compartments containing optimal hiding and roosting cover interspersed with sunny areas. The site would be specifically located to limit movement of pheasants out-side the estate as far as possible and to allow adequate control of predation.

Option 3

In this an attempt was made to encourage an increase in the present pheasant population by modifying the forest habitat. A number of theoretical management practices which laid emphasis on an increase in ground cover and edge were costed (Table 3). These would provide the required criteria for a suitable pheasant habitat:

(a) Heavy thinning of the upper canopy. BHF would be managed by the selection system in order to provide structural diversity and to ensure a sustained yield. In coniferous crops it was thought to be more practical to remove 80% of the yield class per annum along a ten meter wide external margin to a limit of one hundred stems per hectare.

(b) A delay in canopy closure brought about by an increase in initial planting espacement or a later respacing operation. As well as making thinning operations more economical for the forester the delay would also provide prolonged ground cover.

(c) The replacement of coniferous crops with hardwoods. This would be implemented along some external edges where the topography might make it uneconomic to thin and harvest commercial conifer crops.

Table 3: Breakdown of management practices and affected areas involved in the modification of Knockrath forest for options 3 and 4.

Management Practice	Area (ha)	
	Option 3	Option 4
(a) Heavy thinning of BHF	8.1	6.5
Heavy thinning of CHF	5.74	2.44
(b) Replacement of CHF	5.23	15.0
(c) Planting of *Lonicera*	4.14	1.68
(d) Establishment of coppice	2.1	2.8
Underplanting with Norway spruce	1.6	—
(e) Widening and formation of rides	4.57	3.55

(d) the restriction of grazing under mature coniferous crops to encourage the growth of denser ground cover of bramble and bracken.

(e) The introduction of plant species to the shrub and field layer to improve available ground cover — most especially the shrub honeysuckle *(Lonicera nitida)*. Their introduction would perhaps be most beneficial in those areas where the borders of coniferous plantations had been heavily thinned or where mature coniferous woodland adjacent to open land was lacking in ground cover. Maximum benefit would be derived by positioning plants as flushing points or a holding cover.

(f) The underplanting of hardwood crops with coppice, suitable conifers or the provision of coppice-with-standards. Coppicing ensures a regular succession of habitat for pheasants and also has the added advantage of an open canopy through which it is easier to flush or put up birds when shooting. Coppicing was traditional to Knockrath where oakwoods were so managed for charcoal production. The demand for oak has now declined unless timber is of first quality. The preferred species for a standard would then be ash which demands a high market value for turnery and sports goods. Hazel and sycamore are first class species for coppice — both occur naturally in Knockrath and are readily saleable as firewood for which there is an ever increasing market.

In the case of light demanding tree species such as larch, pine, ash and oak which have thin crowns that don't effectively shade the

ground, yield can be improved by mixing them with shade-bearing species. This gives an opportunity of planting Norway spruce under mature broadleaves lacking in ground cover and later marketing them as Christmas trees.

(g) A decrease in the size of production units and an increase in border area ratios. Structural diversity would be conferred by producing a mosaic of age classes and increase in edge. However, this would be associated with a decrease in economies of scale. Edge effect can also be promoted by the use of well positioned rides to break up uniform blocks of timber. Further improvements can be gained by widening the recommended road formation width to 20m and by planting shrubs along the margins for cover.

(h) The utilisation of scrub areas and 'natural' clearings. It can prove invaluable to retain even the smallest areas of scrub and bramble to fulfil cover requirements for pheasants. Natural clearings left unplanted can increase the importance of the surrounding area by providing open areas surrounded by a shrub border.

Option 4

This option required a combination of the two preceding options in which pheasants would be released into a modified forest habitat in order to gain a long-term increase in population density. If the annual release of pheasants is to be successful it would be helpful to zone the forest into areas where shoot management has priority and areas where commercial forestry is of greatest importance. The delineation of shooting blocks would then allow more intensive development of the habitat. Two blocks were chosen in areas consisting largely of pre-thicket crop (Table 4) and were modified as follows (Table 3):

(a) A heaving thinning of the upper canopy of mature BHF and CHF.

(b)The replacement of conifers with hardwoods which, in this case, centred upon the establishment of pheasant coverts. This consisted of a central block of pure hardwoods (ash) surrounded by an exterior margin of conifers. A 20m wide ride ran down the centre leading to a terminal flushing point consisting of pure coppice and low shrubs.

(c) The encouragement of under-storey growth in existing oak woodland,

(d) The introduction of shrubs. Apart from the inclusion of *Lonicera nitida* in pheasant coverts it might also be introduced to some hardwood and larch areas.

Table 4: Structural breadown of Knockrath forest for Option 4.

Structural Type	Shooting Block I		Shooting Block II		Commercial Forest		Total
	Area	% age	Area	% age	Area	% age	100%
Closed canopy CHF	14.5	10	10.0	6	128.0	84	152.5
Open canopy CHF	27.8	49	10.5	19	17.9	32	56.2
Mixed BHF	6.9	32	3.1	15	11.4	53	21.4
Scrub/unplanted	10.0	50	—	—	9.9	50	19.9
Pasture	4.7	19	10.3	43	9.2	38	24.2
Total	63.9	23	33.9	12	176.4	65	274.2

(e) An improvement in the present system of rides with the aim of breaking up each shooting block into separated drives to improve shooting.

The reared pheasant poults would be released into permanent release pens which should be centrally located in each shooting block. The use of pheasant coverts as pens would be ideal since they would provide mature timber, coppice and shrub cover all serviced by a wide sunny ride.

The Evaluation of Managerial Costs and Benefits

Economic comparison between the four options is difficult due to the differing nature of various costs (for instance, annual costs are not directly comparable with capital costs). Since capital costs were initial purchase prices they do not occur in the following years. Capital costs were, therefore, converted to annual equivalent values (AEQ) which took account of the cost of borrowed capital which must be repaid over a defined time period. Similarly changes in revenue arising from a change in forest management policy in order to accommodate shoot management had to be accounted for. In this case revenue which accrued over the standard rotation for each tree species was calculated using present timber market prices and then discounted back to the present. This value was then converted to an annual equivalent value per hectare to facilitate comparison between revenue or losses arising from changes in planting regimes, and for addition with other costs and revenues.

In terms of value of shooting rights the four options were grouped by the type of shooting each would provide. Options 1 and 3 would give rough or 'walking' shooting whereas the other two options would yield higher quality driven shooting. Incomes from the sale of shooting rights were based on approximate present market values.

Results

The costs and benefits accruing from each managerial option are shown in Table 5.

Option 1

Option 1 requires no intervention in the normal running of the forest estate and should have no effect (cost) on forest management. The apparent shortage of pheasants (0.82 birds per hectare) that was present on the estate is reflected in the low value of shooting rights. If shooting rights were to be let in a similar fashion to Forest and Wildlife Service properties a price of 25p per hectare might be obtained.

Table 5: Economic comparison of costs and benefits of the four managerial options tested.

OPTION	1		2		3		4	
Nature of cost/benefit	Cost	Benefit	Cost	Benefit	Cost	Benefit	Cost	Benefit
Pheasant rearing			14,419.76	—			14,424.81	
Pheasant release			3,474.58				3,474.58	
Modification of Forest Habitat								
Heavy thinning of BHF					—	340.20	—	312.00
Heavy thinning of CHF					51.37	—	20.15	—
Replacement of CHF					—	375.05	—	—
Provision of coverts					—	—	—	950.57
Establishment of coppice					—	109.56	—	175.17
Planting of ground cover					74.52	—	21.67	—
Underplanting					—	555.27	—	—
Road and ride-line improvement					55.28	—	50.64	—
Sale of shooting rights	—	68.55	—	20,000.00	—	137.10	—	22,000.00
Subtotals		68.55	17,894.34	20,000.00	181.57	1,517.58	17,991.85	23,437.74
		—		17,894.34		181.57		17,991.85
Net Benefit		68.55		2,105.66		1,336.01		5,445.89

Option 2

Option 2 will involve some interference in forest management since it requires ground for the rearing and release of birds and a need for co-operation between forest and shooting interests. The costs incurred in the rearing and release of birds would place a financial burden on the estate but this would be recouped by the later sale of shooting rights. The release of pheasants in large numbers inevitably means a driven shoot in which beaters flush birds over standing guns. Since the number of pheasants that will be seen by each gun should be greater, the price of a day's shooting could be high (in the order of £200 per gun). At least ten shooting days could be expected for ten guns which would bring in a total revenue of £20,000 per anum. The returns of shot birds should be around 35% of the released stock and the income gained from selling these should be more than offset wages for beaters and gun dog handlers.

Option 3

Option 3 attempts to improve pheasant breeding success by modifying the forest habitat to gain an increase in the number of potential territories. The calculation of the costs involved in these alterations had shown that it was actually more profitable to improve the habitat for pheasant even though there was a net loss of 2.7% in the productive forest area. Unfortunately the habitat is unlikely to be the only limiting factor on population increase. Predation, shooting and inclement weather during the breeding season all take their toll of birds. In consequence, the population is likely to take a long time to grow significantly from such a small initial number of birds. It would seem unrealistic to expect a rise in value of shooting rights above 50p per hectare.

Option 4

The increase in benefits derived from changes in forest management in Option 4 over those in Option 3 was a direct consequence of the concentration of shooting interest in two select areas. This meant a decrease in loss of productive forest area to 1.77% and an increase in the area of CHF that would be replaced by pure ash crops (Table 3). The inclusion of the costs of pheasant release gives a net monetary loss. However, by nature of its centralisation and layout this option would provide the better shooting giving an added premium of at least £20 to the price of a day's shooting. The cost of pheasant release should thus be covered by the annual income of £22,000 from the sale of shooting rights.

DISCUSSION

In comparing the four options it is perhaps more logical to separate them in terms of 'fields of action'. From the point of view of pheasant release, providing the market value of driven shooting maintains a level above the cost of rearing and release, it will always be of more value to release pheasants if planning to let shooting rights.

It is theoretically more profitable to modify the forest habitat to benefit pheasant shooting. This profitability is due to three main features. Firstly, previously unmanaged hardwood crops would now be selectively thinned to promote natural regeneration and thus gain from a formerly untapped source of revenue. Secondly, the establishment of understories (either coppice or Norway spruce) in broadleaf stands would utilise biotic resources that the overstory is unable to exploit giving a greater level of productivity per unit area. The third and greatest source of benefit is associated with the replacement of CHF with hardwoods — either pure ash or coppice — with ash standards in this case. The price per cubic meter for hurley ash plus the additional firewood produced is a far greater reward than can be expected from returns given by any coniferous species. In fact two species (Japanese larch and Scots pine) actually showed a negative return to investment at the 5% discount rate used. The losses that were incurred were from the heavy thinning of CHF borders, the loss of productive land in the provision of wider and increased number of rides, and the cost of planting *Lonicera nitida* as ground cover. The cost of road and ride line improvement can be offset to some extent by the planting of Christmas trees along road margins during the early stages of rotation (Eley Game Advisory Service, 1965).

Option 4 shows the greatest overall return between the four options. It involves the wide scale replacement of CHF with majority ash pheasant coverts and the formation of several new rides. Realistically the forest manager is unable to make wholesale clearance of growing tree crops unless they have reached financial maturity. Instead, the forest manager is far more likely to opt for a strategy such as Option 2 where forest management is largely uninterfered with. In this case birds would need to be released in centralised areas consisting of pre-thicket crops (for cover) and a strategic course of post-release feeding would need to be followed to assure the concentration of birds for shooting.

The enterprising forest manager who is looking for ways of reducing costs involved in the releasing of birds and increasing revenues from forest produce should later think in terms of a change in forest policy. By increasing the number of possible territories

a resident breeding population of pheasants may be seen to increase following restocking (Lachlan and Bray 1976). This would allow a drop in future pheasant release numbers and its associated cost. Leopold (1983) stressed the importance of high interspersions of habitat types to encourage a higher density of territories for birds such as the pheasant. The major factor that determines territorial location appears to be the length of habitat edge where ground cover (shrubs) abuts to open field layers (Lachlan and Bray 1973, Ridley 1983). Where interspersion is high, habitat edge is increased, and the field of vision between neighbouring cocks will be reduced possibly resulting in a higher density of breeding territories (Lachlan and Bray 1976). Modification of the forests habitat would involve the maximisation of edge to increase territory numbers. Initially, this might give a net loss to investment since concentration would be upon road and ride line improvement, heavy thinning of CHF edge and the planting of ground cover. Later modification would include heavy thinning of BHF, underplanting, and most important, the establishment of a managed coppice system. These would counteract the previous measures and yield a positive return.

A change in forest policy need not necessarily be entirely confined to modification of the habitat. In fact one of the major sources of friction between forest and shooting interests can be forest operations and their timing. However some new operational policies have actually aided shoot management (Eley Game Advisory Service, 1966). The move to wider initial planting espacement with commercial conifers can reap benefits for forester and shoot manager alike. For the forester it means savings in the cost of plants, planting and subsequent weeding operations as well as a delay in first thinning which yields more valuable thinnings and shortens the financial rotation for saleable sawlog. For the shoot manager an increase in planting espacement means a delay in canopy closure, thereby, prolonging the period for which new plantations form a suitable habitat for pheasants (Lachlan and Bray 1973). Respacing operations would provide a similar effect.

Normal weeding operations in the forest generally coincide with the pheasant nesting season. This is usually in the period early May to the middle of June when hens that are disturbed may abandon the nest. This is also the main hand weeding season so the switch to chemical weeding has been an improvement for shoot, as well as forest, management. The most effective time for chemical control of weeds (especially grasses) is early in the season before pheasants are far into nesting so disturbance is slight. Spot application of chemical will free the trees from competition whilst leaving

intermittent undergrowth for nesting and shelter (Eley Game Advisory Service, 1966). Two operations that are of benefit to shoot management are the provision of inspection paths and brashing. Inspection paths allow penetration by beaters and assist in predator control. Brashing of semi-mature conifer crops adds ground cover where such cover is likely to be sparse. Cost precludes the cutting of many inspection paths and brashing has now become totally uneconomic since the low pruning of timber adds no monetary value to final wood prices at the present time.

Thinning and felling operations can have disastrous effects on shoot management when carried out near release areas. These operations are a necessity to commercial forestry and unless land has been zoned otherwise, there will be need for co-operative planning. Shoot interest should be warned at least five years in advance of operations so that they may avoid the major disturbances caused by tree felling.

Contractors may cause problems especially since their objective is to make maximum profit from forestry operations. It is often in the interests of both forest and shoot managers to bind contractors to conditions which compel them to consider vested interests in foresty and shooting. Conditions should include specified routes of extraction, time limits for the completion of operations and the removal of lop and top.

In the long term it would be possible to integrate forest and game management even further and to achieve maximum prices for shooting rights. Over a longer time period, such as the rotation, major habitat changes may be made with a view to the centralisation of shooting in specific areas. The definition of commercial forest areas and shooting blocks would allow a clear statement of priorities to be made for each zone. Future rotations in shooting blocks could then be planned to optimise pheasant holding capacity while at the same time improving upon the quality of birds shown to guns.

In conclusion, in areas where the intensity of forest management might allow it, it is theoretically possible to combine shoot and forest managment whilst still making a profit from both enterprises. To be successful close co-operation between the two interests is needed with a view to long term plans in which the forest area would be divided to give a clear statement of priority to either pheasant shooting or commercial forestry.

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OBITUARY

Patrick Flynn
(1920-1984)

Pat Flynn was born in Mullagh, Co. Clare in 1920. He attended the Christian Brothers School in Ennistymon until 1939, travelling daily by train. In later life he regaled his friends with many hilariously funny stories of his experiences on the West Clare Railway. On leaving home in 1940 to enter Avondale Forestry School, Pat took with him a deep religious faith, a native shrewdness and a most fertile mind. At Avondale he pursued a course of studies and practical training in forestry.

On completing his training he was appointed forest foreman at Dunmanway. This was for him an important appointment because it was here he met Betty, whom he married in 1950.

In 1947 he was assigned to his first forest chargeship at Galtee, Co. Tipperary, where he remained until 1954, when he was transferred to Cong, Co. Mayo. Here he took charge of the sawmill. Pat had a particular liking for this side of the forestry enterprise and over the next five years he built up a large reservoir of knowledge of timber conversion. It was during his chargeship that the new sawmill at Cong was constructed and put into operation. It was here too that Pat's business acumen was clearly demonstrated.

In 1959 Pat left Cong to pursue a totally new discipline when he was promoted to Grade III Inspector and assigned to take charge of Work Study in the Cork Division. Work Study had been introduced in the Department only a short time previously and his main function was to implement and maintain the Incentive Bonus Scheme for forestry workers. This he did with his usual unostentatious efficiency.

He was promoted to Inspector Grade II in 1964, and in 1977 was promoted to Inspector Grade I and transferred to Dublin to take charge of the Department's Work Study Division.

In 1978 he left Work Study to become head of the Department's Timber Utilisation Division. In this post his business talent, his

diplomacy, and his ability to think on his feet were widely recognised. He was very highly regarded by the many members of the timber trade with whom he came in contact.

In November 1983, Pat went on sick leave suffering from what was at first thought to be a minor ailment but he never returned to the work he loved so well. His health deteriorated gradually and he died on Sunday, the 19th of July, 1984. That was the day Cork beat Tipperary in the Munster Hurling Championship. Pat, who took a keen interest in Gaelic Games had enquired about the result of the match minutes before he died.

Pat Flynn was always noted for his attention to personal appearance, for his innate gentleness, good humour and sincerity and in the last months of his life his great strength of character was evident as never before when he accepted the inevitable outcome of his illness with total resignation and without a hint of complaint.

His many friends in the Society and in the Department extend to his wife Betty, and to his children, Geraldine, Mary and Padraic, deepest sympathy.

The writer would wish to acknowledge the very close friendship he was privileged to have with Pat over many years.

Ar gcúig céad slán leat a Phadraic dhilis, is uaigneach sinn gan tú inniu.

Benny Moloney.

Society Activities

SOCIETY OF IRISH FORESTERS 42nd ANNUAL STUDY TOUR

14th-18th May, 1984

WALES

Monday, 14th May

The first day of the 1984 Study Tour began at the University of North Wales at Bangor where we were met by Dr. Geoff Elliot and Mr. Roger Cooper of the Department of Forestry and Wood Science. Dr. Elliott welcomed the Society to Wales and wished us well for the coming week. He went on to give a brief history and description of the work of the Department. It was founded in 1904 as the Department of Forestry and it was not until 1970 that a full honours course in Wood Science was added. The need for wood science training is a growing one as timber production from British forests is increasing by 5% annually. There are more than 150 students enrolled in the Department. Professor Laurence Roche, a native of Co. Wexford, is Head of the Department. Due to a previous committment, however, he was unable to meet the Society. In recent years there has been increased emphasis on tropical forestry in the Department and a postgraduate course in Agroforestry has been initiated. After his brief discourse Dr Elliott introduced Mr. Roger Cooper who gave an introduction to forestry and forest based industry in Wales. The total forest area of 241,000 ha covers 11.6% of the land area and 12% of the total forest area of Great Britain. Conifers predominate, comprising 170,000 ha of which about 75% is owned by the Forestry Commission. The remaining 70,000 ha is mainly broadleaved woodland mostly privately owned and less intensively managed. Forestry Commission planting reached a peak during the 1950s when over 5,300 ha were planted annually. Recent years have seen a decline in both the amount of planting and the involvement of the Forestry Commission. In 1983, for instance, of 1,400 ha established over two thirds was privately planted. Previously the great bulk of new planting was carried out by the Commission. Sitka spurce is the main species comprising 52% of all planting; this is followed by larch at 14% and Norway spruce at 12%. The mean Yield Class for all species is 11.5, for Sitka spruce it is 12.0. Total roundwood production in 1982 was 730,000m^3 which was 15% of total production in Great Britain. Of this 680,000m^3 was coniferous timber, the vast bulk of which was produced by the Commission. Outlets for thinnings were seriously reduced in the late 1970s and early '80s, with the closure of plants at Ellsmere and Bristol which had a capacity of 150,000m^3/annum. There is, however, a major new paper pulp plant under construction at Shotton on the site of the old British Steel works which will have a capacity of 450,000m^3/annum for small dimension thinnings and sawmill residues. The sawmill industry is thriving and there have been substantial increases in timber prices in recent years. Current prices in pounds sterling and underbark volumes are: pulpwood (7-14cm) £10-12/m^3, 'bars' (14-18cm) £24/m^3 and logs (18cm+) £35/m^3. The two latter categories have increased in price by 60% over the past two years. Projections estimate that timber production will reach 1.5 million m^3 annually by the end of the century and this represents an income of £200,000,000 sterling in present terms.

After a short break for coffee, we had three short presentations. The first was by Dr. D. M. Harding on forestry and water resources. Up to the 1950s water engineers encouraged forest establishment in catchments. The supposed beneficial effects were an improvement in water quality and a slower release of rainfall.

This view was challenged during the 1950s and '60s when evidence became available that forests lose more water through evapotranspiration than does grassland. Recent work by the Institute of Hydrology has compared water yields from two catchments in Wales. The Severn catchment is 67% afforested, having been planted mostly during the 1940s. In contrast the Wye catchment is almost all grassland. Water yield had been computed from both catchments on a unit area basis. Yield from the Wye catchment was 12% greater than from the Severn. Dr. Harding in his presentation and in the brief discussion at the end of the morning discussed some of the implications of these findings and it was agreed that investigations of this kind would be most desirable in Ireland. The next speaker, Mr. R. A. Smart, dealt with the great spruce bark beetle, *Dendroctonus micans,* which is a serious pest of spruce in England and Wales. It was first reported there in 1973 and is thought to have arrived in unbarked timber from Germany. The current approach to control is to designate Scheduled Areas where the beetle is known to occur. Stands within these areas which are known to be infected must be clearfelled. The timber is debarked and the bark residues are treated with insecticide. Timber cannot be moved outside the Scheduled Areas unless under licence. One of the problems in controlling the pest is that it can persist at infected sites in stumps and slash after clearfelling. A specific predator of *Dendroctonus, Rhizophagus grandis* is being bred for a release programme in 1984. It is clear that this pest is of major economic importance and any measures that are necessary should be taken to prevent its occurrence in Ireland. (An information note on the pest was issued by the Forest and Wildlife Service in August, 1982). The last speaker of the morning, Mr. F. Curry, gave a talk on forestry and bird populations. Afforestation has a varied effect upon bird populations, some species such as golden plover and dunlin almost disappear after planting, while birds of prey such as buzzard, short-eared and long-eared owls and kite increase. This is due to an increase in small mammal populations following fencing and fertilisation. Leaving roadside margins unplanted can help to maintain black grouse populations and their main predators such as hen harrier and merlin. Nest boxes help to encourage cavity nesting birds and leaving dead stems standing at clearfelling help siskin and firecrest populations. After Mr. Curry's presentation there was time for a very short discussion on some of the matters dealt with during the morning. We then made our way to the Senior Common Room in the Top College where the Principal, Sir Charles Evans, was our host for lunch. With appetites replete the President of the Society, Dr. Niall O'Carroll thanked Sir Charles, the staff of the Department of Forestry and Wood Science and the other speakers for a most informative morning and for providing an excellent lunch.

For the afternoon session we made our way over the Menai bridge to Anglesey, to Newborogh Parc Mawr on the shores of Caernarvon Bay. Our hosts for the afternoon were Dr Graham Mayhead, District Forest Manager, Mr. Tom Carter, Newborough Forest and Mr. Griffiths, all from the Forestry Commission. The main object of the afternoon was to demonstrate the problems associated with conservation, amenity and recreation in managing the forest which is a Site of Special Scientific Importance (SSSI), designated under the Wildlife and Countryside Act. The forest covers an area of 952 ha of which about 720 ha have been planted mainly between 1947 and the early 1970s. The climate is mild with an annual rainfall of 900mm. Before afforestation the whole area was mobile and semimobile sand dunes. The main species is Corsican pine which suffers from nitrogen deficiency in some places. In recent years over 150 ha have been fertilised by helicopter with urea at 150kg N/ha. Returning to the main object of the afternoon's visit, Dr. Mayhead explained that most management activities within the forest must be notified to the Nature Conservancy Council. Particular areas of interest within the forest have specific proposals relating to future work and a record is kept of work which is done. The forest lies within an Area of Outstanding Natural Beauty (AONB) and the

Countryside Commission is the body which decides on this status. Before returning to Llandudno Mr. Ernest Johnston paid thanks to Dr Mayhead, Mr. Carter and Mr. Griffiths for a most enjoyable and interesting afternoon. Back on the bus we retraced our steps passing near Llanfairpwllgwyngyllgogerychwyrndrobwllllantysiliogogogoch, amongst other places.

Eugene Hendrick.

Tuesday 15th May

Morning

On the second day the Society were guests of the Forestry Commission at Gwydyr forest. Gwydyr is one of the oldest forests in Forestry Commission ownership — the first plantings were carried out in 1921. Now, its 6,000 hectares of mainly coniferous plantations surround the popular tourist village of Betws y Coed on the hillsides and plateaux above the rivers Conwy, Llugwy, Lledr and Machno. Height ranges from near sea level to 300-400m. Rainfall ranges from 1140mm in the north of the forest to 2030mm in the south. Species choice and growth rates are appropriately varied.

Despite the considerable influence of tourism in the area generally, major fellings started in the late 1960s, and the present felling programme is 45,000m^3, of which 30,000m^3 will be done by Forestry Commission staff. It was fitting therefore, that the first stop of the day should be at a clearfell site. At this stop near the village of Dolgarrog and overlooking the Vale of Conwy the Tour leader Dr. Graham Mayhead introduced Mr. David Robertson, Conservator North Wales and the local staff — Mr. Bill Taylor, District Forester (Harvesting & Marketing), Mr. Chris Griffiths District forester (Management), and Mr. Barry Moore and Mr. D. Johnston Harvesting foresters.

Mr. Johnston then described the site and the extraction equipment. The main species was DF, P/1932 Yield Class 18, with some GF, NS, WH and SP. The average pole size was 1.32m^3. The main extraction equipment on view was a Timberjack skidder which had the power to cope with the big trees in steep and broken terrain. The harvesting operation was done by a team of five, two of whom could drive the skidder. Felling averages 4.3m^3/hr, extraction 8.7m^3/hr and conversion at roadside 7.6m^3/hr. Obviously therefore two and sometimes three of the team are engaged in felling and debranching. The average skidding distance to roadside seemed to be about 75-100m.

Ninety-five percent of the produce on this site was sawlog (>18cm TDUB) 1% was bars (14-18cm TDUB, corresponding to our small sawlog), and the remainder was pulp and stakewood. The total cost of harvesting was £4.69/m^3 OB and the price paid for the sawlog at roadside was £29.70/m^3 OB. During the discussion which then followed it emerged that the method of measurement for sale depended on the purchaser. Most logs are sold by volume and measured onto the lorry. Where the logs were sold by weight a volume/weight ratio of 1.2 was used for fresh logs. Although the material seemed suitable it was interesting that no transimssion poles were produced. In Great Britain there is a tendency to put most power lines underground.

The party then boarded the coach which slowly travelled through the towns of Llanrwst and Betws y Coed, and along the Lledr valley to the next stop near the village of Dolwyddelan. The main topics here were a spacing experiment and harvesting in unthinned Sitka spruce. The experiment is one of a series in Britain planted in 1935. The crop has had a minimal thinning: removal of dead trees only. The following measurements taken at 48 years of age describe the crop.

UNTHINNED SS P/35, YIELD CLASS 10

Initial Spacing (m)	Top Height (m)	Trees/ha		Mean DBH cm	Vol/ha m^3	PAI 1978-83 m^3/ha	Volume to: 18cm TD m^3/ha	Volume to: 24cm TD m^3/ha
		No.	% Survival					
0.9	18.3	2669	22	16.2	428	18	92	12
1.4	18.3	2536	48	17.5	483	21	143	41
1.8	18.7	1911	64	20.5	513	24	243	82
2.4	18.5	1321	79	24.0	494	25	325	138

Dr. Mayhead led the party through each of the four spacings before the discussion inevitably centered on volume production/timber quality at different spacings. As can be seen from the table there is a considerable increase in volume of larger dimensions with increased spacing. Against this must be offset the lowering of quality due to larger branches and increased ring width. Battens sawn from material from a similar experiment which had recently been felled were dried to 18% moisture content (22% specified in most applications) and machine stress graded. The grade level was M75. Generally the results as expected showed that the closer the spacing the stronger the timber. The low yield of saw-logs from closer spacings offset any gain in strength. The material from the 2.4m spacing was considerably weaker than that from 1.8m spacing.

The general thinking in the Forestry Commission at the moment is not to extend spacing beyond 2.0m because of quality problems. Also the situation in Britain is different from Ireland in that they do not get an appreciable increase in price for larger sawlogs. This may be because highly automated British mills are not as adaptable as their Irish counterparts. The discussion then centred on the economics of combining initial wide spacing and high pruning, without any broad concensus emerging.

Afternoon

As we finished our picnic lunch the rain which had threatened during the morning was most welcome to the District staff as it eased the fire danger — evidence of which we had seen on the coach journey from Dolgarrog. The first stop after lunch was about 400m from the spacing experiment — to view cable crane extraction on a clearfell of a similar unthinned SS P/35 YC 8 crop planted at 1.5m x 1.5m. Unfortunately, due to either a breakdown in communications or because he was an Irishman the contractor failed to appear and we did not see the system operating. The cable system itself was an Igland Jones Mini Alp powered by a County tractor. Normally it is operated by a team of five — two felling and trimming, two on the cable system and one jointing and stacking. It takes two men about 5 hours to dismantle, move to next location and set up the system. Mean production is about 250m^3 (=.75ha) per set up, with haulage distance up to 250m. Average load is 1.4m^3.

The average vol/ha is 328m^3 and the average pole size is 0.182m^3. In Forestry Commission operations the average output in this type of material is 4-5m^3/hr. This is considered very expensive and is the main reason for contracting out. The produce from his site is sawlogs 37%, bars 20%, pulp 27%, chipwood 15%. The cost to the FC to mark and tariff is £0.75/m^3 and harvesting is £7.90/m^3, giving a total cost of production of £8.65/m^3 sterling. Again, the method of sale depends on the purchaser. The sawlogs are cut into standard 7.3m and 3.6m lengths for ease of loading and measuring. If sale is by weight the vol/weight ratio is got by measuring and weighing the first ten loads to a mill, with periodic checks thereafter.

During the discussion it was pointed out that replanting on this site would be done without any windrowing of brash. It was accepted that beating-up would be necessary but hopefully the brash would have broken down by then. The rain was falling heavily now, so we boarded the coach and headed towards the final stop of the day. We went back through Betws y Coed and along the A5 to Bryn Engan in the valley of the Llugwy. Here the theme was conservation and regeneration of oak woodlands. The group was led through a large area of oak planted 1866-70 which was thinned heavily in the 1950s with a view to natural regeneration. Some beech and mixed conifers were also interplanted in groups in the 1950s. However, the site is now notable for an almost complete absence of oak regeneration and a rich flora of light demanding species — bryophytes, ferns, lichens and birches. Thinning work is now favouring the oak, but some mature oak is being removed to enable a few groups of sessile oak to be planted in tubes.

The discussion centred on the reasons for the failure of the oak to regenerate naturally. Some of the ideas put forward included a lack of scarification, sheep grazing and over-usage by the public. In conslusion, Mr. T. Mannion on behalf of the Society thanked our hosts for an interesting and pleasant day.

P. Raftery.

Wednesday, 16th May

First Stop: Meeting with Institute of Chartered Foresters at Dolgellau. This day was sponsored by the I.C.F., whom we met at Dolgellau. The tour leader was Mr. Walker. After a short introduction we drove to the estate of V. Gaskell Esquire. (Nannau Estate).

Theme for Visit: Integration of forestry in relation to other land uses with special reference to Snowdonia National Park.

The woodlands of Nannau Estate are managed by Flintshire Woodlands Ltd., and two of their staff, Mr. Walker and Mr. Radford conducted members around the estate.

An outline history of the estate was given at outset by Mr. Walker. The following were the salient points.

1. Since the 70s the woodlands have been actively managed.
2. Many of the older stands had been felled/replanted and the majority of the remainder have been thinned.
3. An active plan to extend the plantations had been set in motion. Existing plantations have been acquired from the B.F.C.

Age Structure of Woodlands	
Pre 1900	16.2ha
1930-1939	0.7ha
1940-1949	0ha
1956-1959	40.6ha
1960-1969	61.7ha
1970-1979	8.5ha
1980-1984	33.3ha
For planting	99.1ha
Unplantable	7.3ha
Total Area of the Estate:	1629ha

Agricultural Policy: The integration of the agricultural and forestry interests is the ultimate objective.

The first stop on the estate was at a commanding viewpoint. The discussion which took place revealed a number of important points.

Conservation:

1. The estate is in the middle of Snowdonia National Park and is accordingly greatly constrained with regard to forest operations.
2. Any proposed planting is subject to scrutiny by the B.F.C. before a grant is payable. In the park the planting had to be further approved by the parks officer.
3. Planting can be carried out without permission if the grant is not sought, but the I.C.F. will only handle work that is grant aided.

Mechanics of Control: The way in which the controls over planting are effected were comprehensively outlined. The process is quite involved. All interested bodies have to be contacted and their objections have to be taken into consideration. Maps, plans, etc., have to be drawn up and one or more joint meetings take place on the site.

Planning Authority: Under a 1961 voluntary agreement forestry was not forced to submit itself to the above authority. In recent years pressures have arisen to reverse this and hence foresters are keen to see that the existing controls work.

Private Consultants: Background information and history was given on the private forest consultants working in the United Kingdom. Their role and input was also discussed at length.

The dedication scheme of 1941 exposed the lack of expertise available to the estates. The initial response was the setting up of co-operatives to share costs and pool expertise between the smaller estates. However they did not all survive and today there are only 4 out of a peak of 50. The co-ops undertake the whole range of operations. They are in direct competition with the management companies which are a more modern phenomenon.

The final stop was at a recent planting on a small scale. At this site the discussion revealed a number of interesting points.

1. *Labour:* The tendancy for almost all estates is to replace permanent labour by using contractors. This tendancy arises for two reasons. Firstly the permanent staff are not competitive and secondly they are unable to make the transformation from establishment to harvesting.
2. *Tax:* An outline of the tax reductions that are enjoyed by forestry was given but it was emphasised that these were not as attractive as might first appear.
3. *Afforestation of Small Areas:* The adverse economics of planting these is offset by the increasing resource accruing to the estates.
4. *Public Roads:* In numerous areas the poorness of the public roads would be a direct constraint on the utilisation of the plantations at clear fell time. There were even suggestions that forestry might make contributions towards the upkeep of roads which they had reason to use. This was felt to be a proposal that would have a devastating effect on the profitability of forestry in most areas.

Visit to Dolymeen block of Llanbyrnmair Forest: This is managed by the Economic Forestry Group on behalf of a number of private owners. This block had been recently roaded and planted in the spring. Mr. A. Smith-Jones along with Messrs Proctor and Plume conducted the party for the visit.

Economic Forestry Group: This is one of the many private companies that grew up after the 50s to channel funds into private afforestation. It provides a complete service for the private investor. Initially it does the following:

1. Identifies land available for planting.
2. Assesses its potential.
3. Arranges purchase.
4. Provides an investment survey.

The E.F.G. manages forests right through the rotation and has approximately 0.25m acres on its books. Discussion highlighted the following in regard to the E.F.G.

Labour: Almost totally contract.

Ownership: Owned by shareholders.
Charges: For time spent on work only.
Returns: Felt to be about 4% in real terms.
Constraints: Increasing opposition from pressure groups hindering development.
Costs: On block visited felt to be around £500/ha (includes management).
Land: Paid between £600-£700/acre.
Roads: Cost approx. £15/metre.
Fertiliser: Planting received the standard application and will receive extra if it is perceived to be necessary.
Species: One species only (i.e. S.S.) planted because of simplicity of marketing. Felt that it was more profitable to plant SS rather than L.P.(c) though it would require fertiliser.
Thinning: Depend on the market situation whether done or not.
Internal Rates of Return: Computer evaluation has shown that rates are not greatly affected by thin on no thin option.
Owner: Has the final say whether thinning done or not.
Stability: The more stable sites were not becoming available for planting due to pressure groups.
Plant Supply: The E.F.G. have their own nursery.
Drainage: This tends to be determined by what the owner is willing to spend; (generally 10 chains/ha of plough drain and 50 metres/ha of machine drainage).
Provenance: This is the responsibility of the nursery.
Stocking: Important to get adequate stocking at the start as the owners tend to be reluctant to spend extra money after 3-4 years.
Roading: This is normally left to Yr. 20 but in this instance done at the outset to suit the financial profiles of the owners.
Fire: Insurance against this risk is available. The cost is approx. 20p per £100 risk.
Rainfall: For this site approx. 70-80 inches/ann.
Y.C.: Hoping for Y.C. 14 but will probably be less.

A profile of the people who invest in private forestry and the mechanics of how the money is attracted and channelled into tree planting, was outlined.

Arthur McGinley, on behalf of the group, thanked all those involved for the interesting visit they had provided.

P. O'Kelly.

Thursday, 17th May

Morning

The tour leader Mr. R. Stumbles, secretary of the local branch of the Institute of Chartered Foresters, introduced the group to the directors of Western Softwoods, Mr. Paul Marsh, Mr. David Roberts and Mr. C. Burd.

The 22 acre site was first purchased in 1979 and production was started less than eighteen months after. Nearly all the machinery is Swedish and it is the most modern mill in England and Wales. Thirty five people are employed at the moment and it is hoped that another ten will be employed when the mill reaches full production by the end of the year. At the moment the mill operates on a two shift basis and consumes a total of 1800m^3 per week. The mill was sited in this area, because it was envisaged at the time, that the production of softwoods from the forests of mid and south Wales would double by the 1990s to 2000. At all times roughly two to three weeks supply is in stock, logs of various lengths are sorted in the wood, and each shift operates on one length logs, depending on the material required.

Firstly we came to the tanalising plant where material of 20% moisture was

treated with CCA salts for fencing material. The new de-barker butt reducer was the next stage which was installed for three reasons:

(1) Logs longer life.
(2) Chips salable without bark.
(3) Bark salable.

Then came the most impressive stage of the operation where the computer played its role. After leaving the de-barker each end of the log was photographed, the information was in turn fed to the computer, so that when the logs moved further down the conveyor belt all logs of equal sizes were piled together.

The mill proper consisted of one reducer band saw and three twin band saws which were capable of taking logs of up to 40cm. A stress grading machine was also on site for special orders, as was a dryer.

Afternoon

In the afternoon the tour leader Mr. Stumbles took us to Tintern Forest (St. Pierre Wood) where we met three members of the Foresty Commission Mr. D. Parsons, Mr. J. Honson and Mr. Rix.

The forest itself is one of the oldest in south-east Wales and is roughly 3500ha of which roughly 30% is hardwood and 70% conifer.

St. Pierre Wood was a traditional beauty spot written about by Wordsworth. The wood was leased by the Commission from Etton Court Estate in 1935 at which time it was Oak Coppice with occasional standards, beech, birch and ash.

In the years from 1935-40 the broadleaf coppice and standards were clearfelled in trenches, and replanted with beech in one area, and beech and European larch in another area.

In the years 1965-75 the market for small broadleaf timber was poor, and with the increased emphasis on economics, managers were encouraged to continue the conversion to conifers. In the areas that were left alone the local forester feels that it is much easier managed than the mixed crop especially when it has been thinned while also availing of the good prices that exist for hardwood in the area at present. He also pointed out that in limestone areas such as these, hardwoods grow nearly as fast as the softwoods, and the apparent national decline in area of hardwoods has now encouraged a change in policy towards retention of hardwoods in the lowlands. It was also stated that broadleaf species were most beneficial to wildlife and for nature walks.

The tour leaders and speakers were all thanked on behalf of the Society by Mr. D. Gallagher, for a very educational day. The party then returned to the Kings Head Hotel, Monmouth where the Annual Dinner was held.

Pádraig O'Halloran.

Friday, 18 May

Tour Leader: Mr. A. Rix, Conservator, Forestry Commission, South Wales.

Following our overnight stay in the picturesque town of Monmouth close to the English border we set off on our final day of the tour. Brilliant sunshine made our journey through the coalmining area of South Wales a fitting climax to a very successful tour.

Following the cessation of coalmining in the Rhonda Valley the Forestry Commission started planting in 1960. No thought was given to amenity at the time. Now the object is to get rid of the harsh lines on the borders by the judicious planting of Japanese Larch. Also on the lower slopes the planting is 60/40 in favour of hardwoods. No beating up is carried out, the object being to leave the plantation at wide spacing. There are some unplanted areas left throughout, rock outcrops are

left bare, the spruce is planted in masses on the plateaus. Some of the spruce is respaced for the Christmas tree market, planting is irregular.

We boarded the bus again and carried on to the second stop Lluent-wen Reservoir. On our journey through the vast forest, the serious damage caused by fires was very much in evidence. The incidence of fires in the South Wales Coalfields is higher than in any other part of Britain. On average there are 300 fire starts a year resulting in an average annual loss of about 100ha. This year had been a catastrophic fire season with some 700 fire starts and over 1,100ha burnt in the South Conservancy of Wales. 90% of these fires are caused by arson. At Stop 2 we were welcomed by Mr John Hunt and Mr. Roger Bushly who gave us a talk and demonstration on fire prevention and control procedures. Conventional fire-fighting methods include men with belting beaters, cross country fire tenders, with 100 gallons of water and 200 gallon foam trailers towed behind Landrovers. A very impressive demonstration using a "mock fire" situation was enacted using different types of equipment.

Our next stop was at Craig y Llynn fire tower where Mr. Stan Heaven gave us a talk on the growth of conifers in the coalfields. Two thirds of the area afforested is planted with Sitka spruce, the remaining one third with pines (Corsican, Scots, lodgepole) and Japanese larch. Average YC for Sitka is 9, pines YC 7, Larch YC 10. The pines and larch are planted on the steep sided valley, while the spruce is planted on the plateaus and hill tops. Underlying rock is sandstone, free draining on slopes, impeded on the plateaus, 50 to 90 inches rainfall per annum. Climate mild, little frost. Establishing plantations is difficult due to sheep trespass and fires. When the crop is established pollution from the industrial belt stretching from Swansea to Port Talbot is a problem. The spruce receives annual attacks of the Green Spruce Aphid, it also suffers from a physical distortion known as "bent top".

We boarded the bus for our final stop of the tour which took us to Swansea City and a look at a community project known as the Lower Swansea Valley Project. This is a very heavy industrialised area with an acid rain problem which burnt off the vegetation. It was also a toxic waste dumping area Copper mining was carried out here in the 1700s and this was the location of the smelter plant. Sulphur was given off in smoke at the rate of 300 tons every day. When the copper smelting finished the area was totally ruined, an "industrial wasteland". The Forestry Commission started in 1970 to plant this area with the help of the local community. The vast hills of waste were levelled by dozers and trees were established. The main species being lodgepole pine, Corcican pine, Japanese larch, Norway spruce, birch, alder. The project was completed in 1966 with more than 100,000 trees planted covering a total of 20ha. Today the area has become an important asset to local schools for rural based education in an industrial landscape. This indeed has been a success story. The President of the Society Dr. N. O'Carroll closed the tour by thanking those responsible for making it such a success.

Michael Davoren.

Tour Participants

T. Purcell, J. E. Johnston, E. Hendrick, J. Cronin, M. Cosgrave, Mrs. M. Cosgrave, M. Davoren, Ms. M. Newman, A. Van de Wel, P. O'Halloran, D. Gallagher, E. Lynagh, J. Doyle, P. Raftery, K. McDonald, L. Moloney, P. Kelleher, T. O'Regan, C. Fahy, Ms. J. Tottenham, R. Tottenham, B. O'Neill, R. Jack, M. Fogarty, M. Donnellan, P. Doolin, A. Mannion, N. O'Carroll, Miss L. Furlong, M. O'Brien, J. Kilbride, J. Crowley, J. McHugh, T. Crehan, J. Treacy, J. Brady, J. D. Fitzpatrick, A. McGinley, D. Houlihan, M. Shannon, T. Riordan, G. Mawn, P. Kelly, G. Hipwell, P. O'Kelly, P. MacAuliffe, G. Fleming, L. Collen, Mrs. E. Collen, M. Holloy.

Book Review

ECONOMICS OF WOODLAND MANAGEMENT

D. R. Helliwell. pp. 63. 1984. Packard Publishing Limited, 16 Lynch Down, Funtington, Chichester, West Sussex PO18 9LR, United Kingdom. ISBN 0 906527 074.

This booklet is intended for those with a non-professional interest in forestry, such as farmers, naturalists, parish councillors, ramblers or potential woodland investors. It should also be of interest to the woodland owner, but it has little new to offer the forester or forestry student. The author has managed to cram thirteen chapters into fifty-three pages of text resulting in a treatment that is often sketchy and sometimes superficial. The first chapter on photosynthesis, energy and labour, contains some pertinent comment in these energy conscious times. It is pointed out that the ratio of energy gained to energy used shows timber production to be superior to a number of agricultural crops. In addition the author feels that while there is no immediate liklihood of manpower replacing the chainsaw, the use of even larger and heavier tractors may have reached or passed its peak. This latter view is shared by many engaged in harvesting.

Chapter two attempts to relate plant growth and productivity to a number of environmental factors while chapters three and four introduce the economic component in the booklet title. Time preference and risk is discussed, but not to the extent that it will help the reader to assess the attractiveness of an investment.

Beginning with silvicultural systems in chapter five the silvicultural theme permeates through chapters ten and eleven on tree species and forestry practice with useful comment on means of avoiding windthrow and a warning not to delay thinning. In the final chapter the author remarks that "it is a little strange that the Forestry Commission still remains completely committed to the clear-felling system as its only basic silvicultural system". It is even more strange to hear advocates of this system use the same arguments in its favour that Continental foresters use for shelterwood systems.

Harvesting and timber production are treated in chapters six and ten with some useful tabular data. One must ask, however, why the author shows a price differential *per* m^3 in favour of more productive sites when he feels that fast growth may lead to low density material suitable only for lower grade purposes.

Chapters seven and eight deal with nature conservation and amenity, but in view of the self-imposed space constraints by the author non-market values get little more than mention. Yet he pulls a rabbit out of the hat and assumes that "the overall value of nature conservation in Britain has been given a figure of £20,000 million". The situation is, however, partially redeemed by the pertinent comment on amenity that "the general form of the forest can be more important than the actual tree species present. A spruce forest can be beautiful if appropriately managed".

The inter-relationships between forestry and other land uses are touched upon in chapter nine, while ownership and management come under chapter twelve. It is difficult to fault the author for his sketchy treatment of the complex area of grants and taxation, but one would like eleboration on why he advocates the removal of the Schedule D option except on land that has not carried commercial timber recently and why he would like an increase in liability for income tax on annual profits!

The note on the cover states that the term 'forest economics' has deliberately been avoided in the title as that term conjures up visions of complicated formulae and

economic procedures which are a mystery both to the layman and to the practising forester. While many forestry advocates might agree with this assessment of our attitude to forest economics, they will in this instance regard the inclusion of the term 'economics' in the title as pretentious. There is nothing in this book to tax the intellect of the non-economist and the quantitative economist will look in vain for some material which might relate to the title. While the tables of costs and benefits in chapter eleven and in appendix two are extremely useful, they can hardly be regarded as 'economics'. The booklet is a readable, common sense approach to woodland management and not an economic treatise. When viewed from this standpoint it will provide the non-professional reader with a useful insight into forestry.

Padraic M. Joyce.

NOTICE

NINTH WORLD FORESTRY CONGRESS

Mexico City, June 24th-July 20th, 1985

The theme of the Congress is

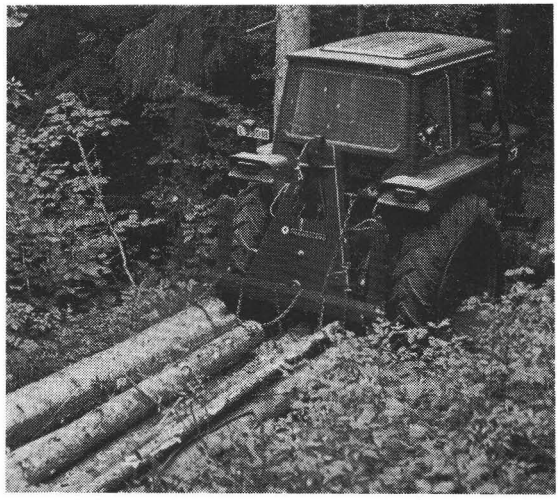
"Forestry Resources in the Integral Development of Society"

Mexico possesses a wide range of forest ecosystems from arid zones, which carry more then 300 plant species, through the temperate to cold zones with more than 37 species of pines alone, to the tropical regions, which have over 320 plant species. This ecological variety has enabled Mexico to maintain an economically vigorous forestry tradition. Study tours in the last week of June and the third week in July will provide an opportunity to visit areas of major forestry interest in order to observe the natural flora, management practices, industrial activities, protection areas and wildlife.

Information available from:

IX Congreso Forestal Mundial,
Comite Organizador,
Progreso 5, Edificio 2,
Mexico, D.F., 04110, Mexico.

FRANSGARD TIMBER WINCHES



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