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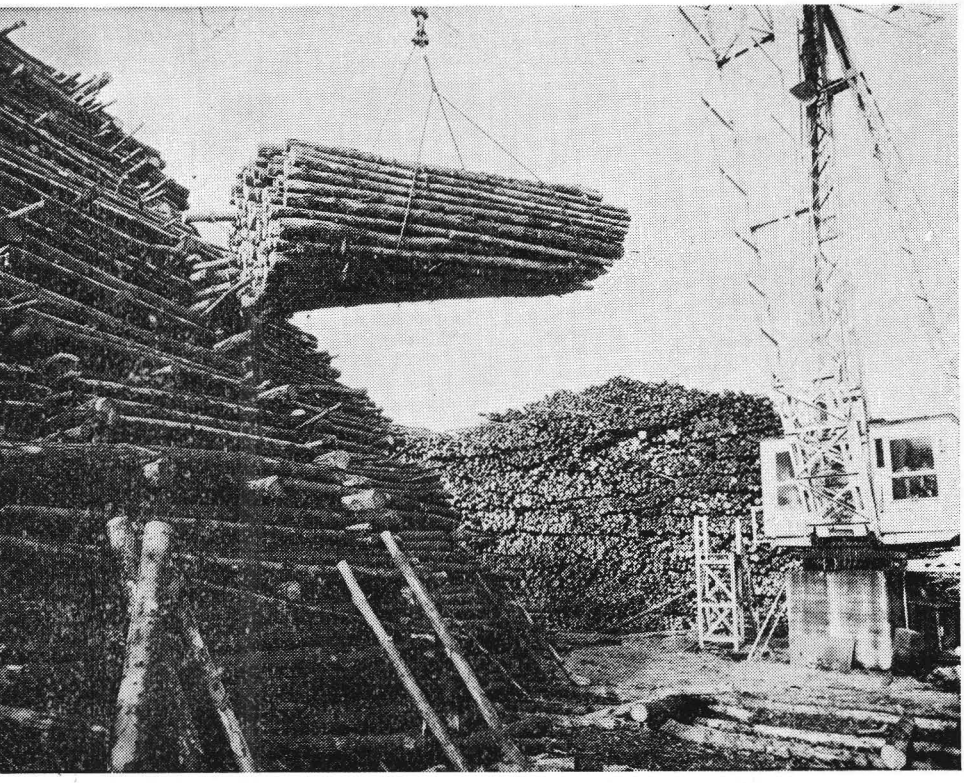

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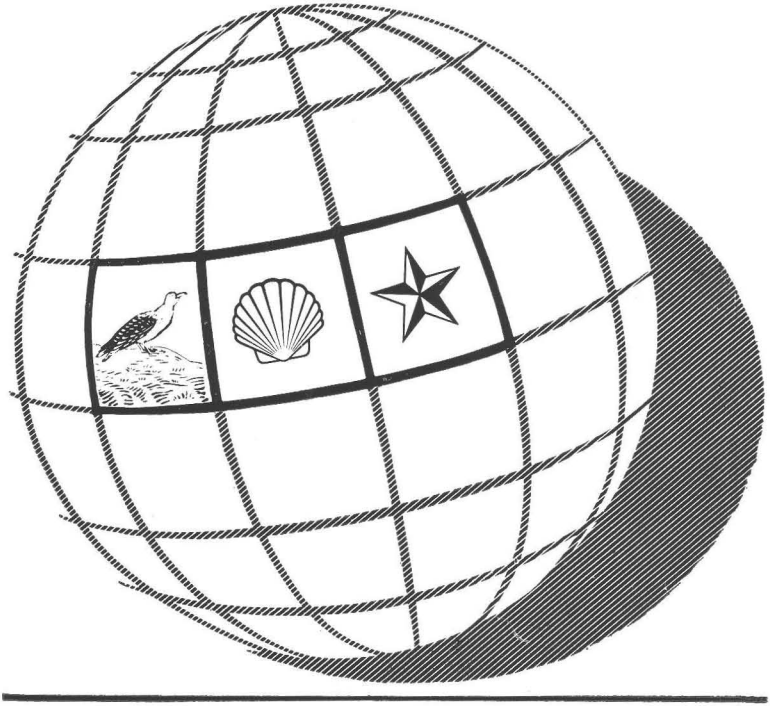

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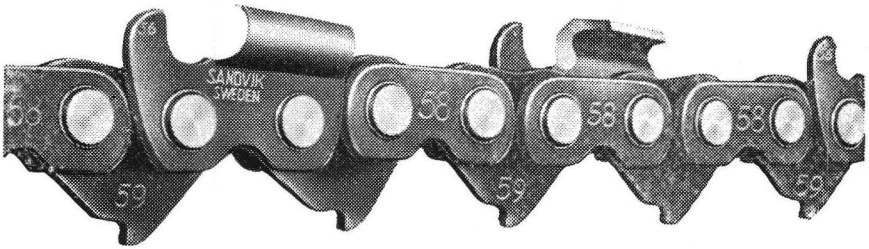

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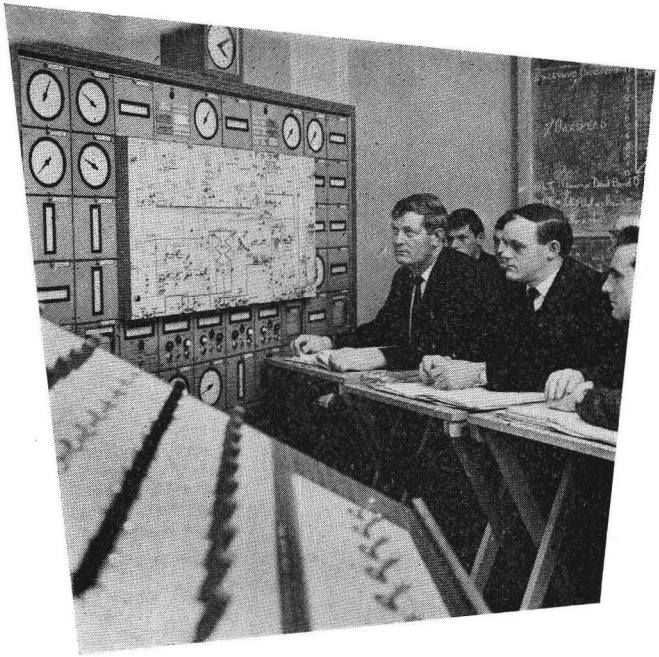

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IRISH FORESTRY

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IRISH FORESTRY

Volume 26 AUTUMN 1968 Number 2

Pinus contorta in Ireland—a forester's guide to provenance identification.

By J. O'DRISCOLL

Natural Range :

In its natural habitat *Pinus contorta* extends from 64° N in the Yukon to 31°N in Baja California. Its northern limit lies on the Yukon river and its range stretches south through Alaska, Yukon, British Columbia, Alberta, Washington, Montana, Orgeon, Idaho, Wyoming, South Dakota, Nevada, Utah, Colorado and New Mexico. Its altitudinal range extends from sea level up to the timber line at 11,000 feet in Colorado. This immense natural range demonstrates its ability to grow under diverse climatic conditions. Rainfall varies from 11 inches in north western British Columbia to 160 inches off the Alaskan coast. Snowfall is negligible throughout the coastal range but can reach a depth of 38 feet high in the Sierra Nevada mountains. Inland the temperature ranges from minus 55° to plus 100°F., but these extremes occur for only short periods of time. Frost can be recorded in any month of the year throughout the inland range. The climate of the coastal range is typically cool and moist with a narrow range of temperatures. Soil types on which the species grows are very diversified. Along the northern part of its coastal range it is found mainly on peat bogs and muskegs. Further south it occurs on dry, sandy and gravelly sites close to the Pacific Ocean. Inland, good stands are found on soils of granitic, shale or sandstone origin. On well drained calcareous tills having a silty loam or clay loam texture in Alberta stands are of medium to good productivity. Along the Cascade Mountains it is found mainly on wet, flat, poorly drained soils while further east it is found on soils derived from volcanic ash or alluvial deposits.

Throughout its natural range it grows in association with a number of different species. It is found in predominantly pure stands at middle elevations along the Cascade, Sierra and Rocky Mountain ranges. At high elevations it is found in association with *Picea engelmannia* and *Abies magnifica.* It is a minor component

at middle elevations of the Douglas fir — larch association while at lower elevation it is found in association with *Pinus jeffreyi.* Where repeated burning occurs *Pinus contorta* tends to be the first species to colonise the burned sites leading in many instances to formation of pure stands in regions where it was formerly in mixture. Throughout its coastal range it generally exists as a pure stand. In places it may be associated with Sitka spruce. In Alberta it is associated with Pinus banksiana with which it has been known to hybridise.

History : Because of the wide variation in habitat the interaction of genotype and environment gave rise to very different phenotypes. Many 19th century botanists assumed that the species, as it is now known, was in fact a number of separate and distinct species. The first known record of *Pinus contorta* was that of David Douglas, a Scottish botanist, in 1825. He recognised it as a distinct species when he recorded its presence near Cape Disappointment at the mouth of the Columbia river, Washington. This was the shore or coastal provenance as it is now recognised. Other botanists recorded its presence along the coast of western north America but due to its great variability it was often identified incorrectly. Critchfield holds that Douglas made a similar mistake when he identified a pine on the slopes of the Rocky Mountains as *Pinus banksiana.* What he most probably saw was the Rocky Mountain sub-species of *Pinus contorta. Pinus banksiana* is not known to occur within this region. The next major step was when John Jeffrey in 1852 discovered the relatively inaccessible Sierra Nevada form and called it *Pinus Murrayana.* This sub-species, like that discovered by Douglas, was found at different locations by other botanists and given a variety of names. The fourth sub-species under modern classification was not recognised until 1866 when Bolander described the dwarf pine found on the Mandocino White Plains, California. However he referred to it as *Pinus muricata.* Parlatore using Bolander's material described the same pine as *Pinus Bolanderi* in 1868. Engelmann was the first to regard the species as dimorphic, grouping all the inland populations under *P. contorta var. latifolia* in 1871. He was to change his nomenclature to *P. contorta var. Murrayana* in 1880. In 1908 Sudworth stated that *Pinus contorta* was a single "polymorphous" species with no subdivisions. Critchfield in his study "The Geographic variation in Pinus contorta" in 1957 states that *Pinus contorta* has undergone evolutionary differentiation into a series of geographical aggregates of populations which differ from one another in manifold ways. For this reason he proposed to express the regional variation in terms of four sub-species, these being *1.* Coastal *2.* Mendocino White Plains *3.* Sierra Nevada and *4.* Rocky Mountain.

Introduction : Elwes and Henry state that the first introduction of the coastal provenance to these islands was not until 1855 when it appeared in Lawson's Catalogue under the name *P. Macintoshiana.* The inland provenance, though discovered 30 years later, was introduced a year earlier in 1854 when seed and specimens reached

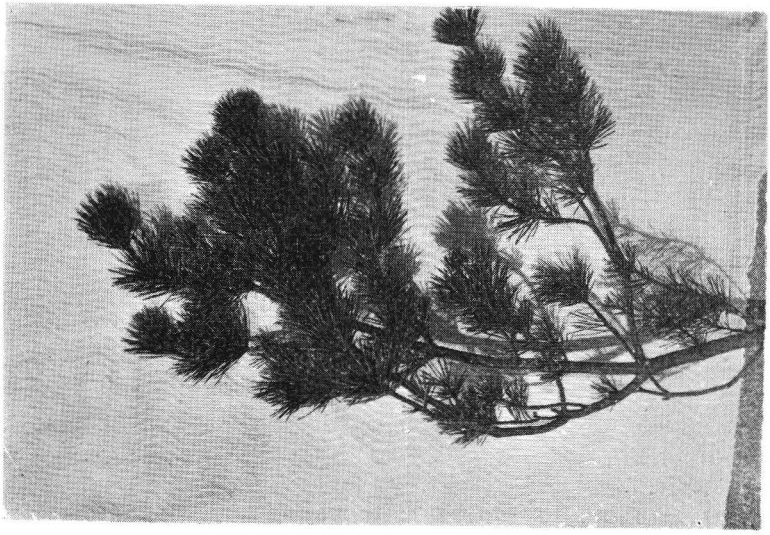
Edinburgh. In 1909 two trees of an inland provenance at Westonbirt had reached heights of 59 ft. and 50 ft. Elwes and Henry state that a tree of typical contorta planted in 1886 at Grayswood, Haslemere, as P. Bolanderi measured 28 ft. in 1906. The first record of Pinus contorta planted in Ireland was in 1928 when Forbes stated that on limestone soil at Cong, County Galway, specimens planted in 1884 reached a height of 70 ft. in 1923. They were planted as *Pinus Bolanderi.*

The importance of provenance was realised by Forbes. He stated that the result of planting *Pinus Murrayana* in the place of *Pinus contorta* may not be serious from an aboricultural point of view but in his experience, the growth of the former is much slower than that of the latter and consequently gives rise to quite different results. In 1918 Forbes had trees of *Pinus contorta* and *Pinus Murrayana* planted side by side at Avondale, Co. Wicklow. At the end of 10 years growth they clearly depicted the relative rates of growth of the two types. He found that the coastal provenance was superior to the inland one. It is said that it was on the performance of these trees that Forbes ultimately selected the type best suited for this country. All plantings of this species in the early twenties were of a heavily branched type with dark green foliage.

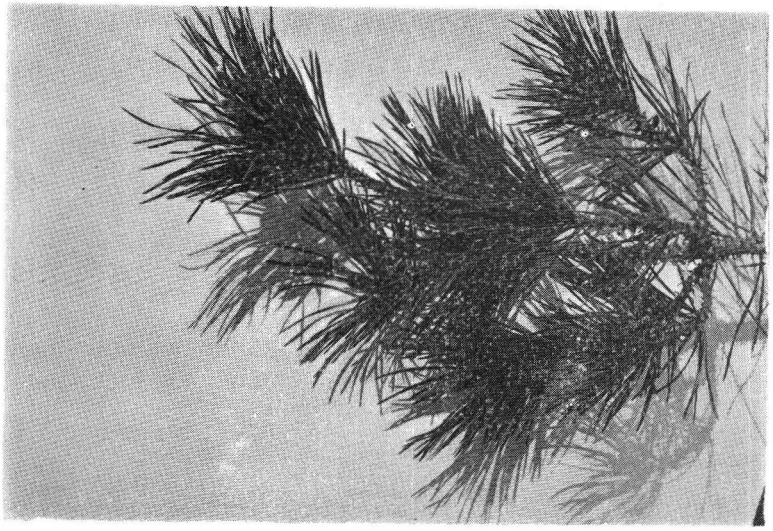
Classification : Pinus contorta was first introduced on a commercial basis to Ireland in 1923 when 7 lbs. was purchased from Manning and Co., Seattle. Unfortunately no record of origin was given. In subsequent years the importance of this species increased and further quantities of seed were purchased from a wide variety of origins. In some instances origins were given but these proved on the whole to be rather vague and they could never be authenticated. It could be said that the seed came from two broad regions, coastal and inland. Over the years from the variety of provenances planted, a pattern emerged which permitted the species to be sub-divided into three broad categories based on their growth performance under Irish conditions. The three groupings were *1* Coastal — covering that region of Washington and Oregon along the Pacific Ocean. *2* Lulu island — covering a small area in the Frazer River delta and 3 Inland — covering that region of the species range well removed from the coast. No attempt has been made to further sub-divide any of these broad groups as was carried out by Critchfield. In drawing up these headings only the macrophenotypic characters were used, no recourse being made to microscopic features. These macroscopic features were used to draw up a table by which the forester in the field would be in a position to identify the three main groups as found in Irish forestry. In using this table it is essential that it be applied to a stand of trees rather than to a particular individual. Due to the heterogenous nature of the species it is possible to get representatives in a stand showing some of the features of one of the other groups.

To simplify examination, the trees under review are divided into two broad areas, the stem and the crown. Within each of these areas

the main features are described. The description takes the form of a comparison of the features of each of the three groups into which the species has been divided. The general performance of the trees under review also assists in arriving at a conclusion as to the group to which the trees can be assigned but this can be strongly influenced by site conditions.



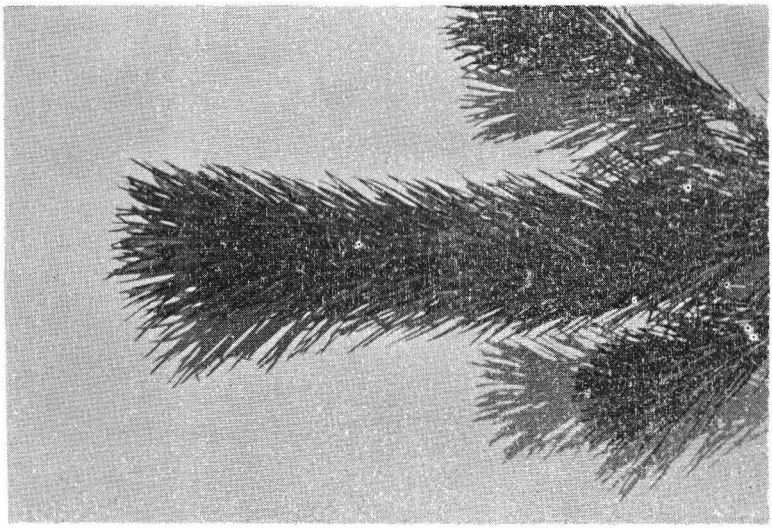
Lulu Provenance — needle in tufts caused by regular yearly male flowering.



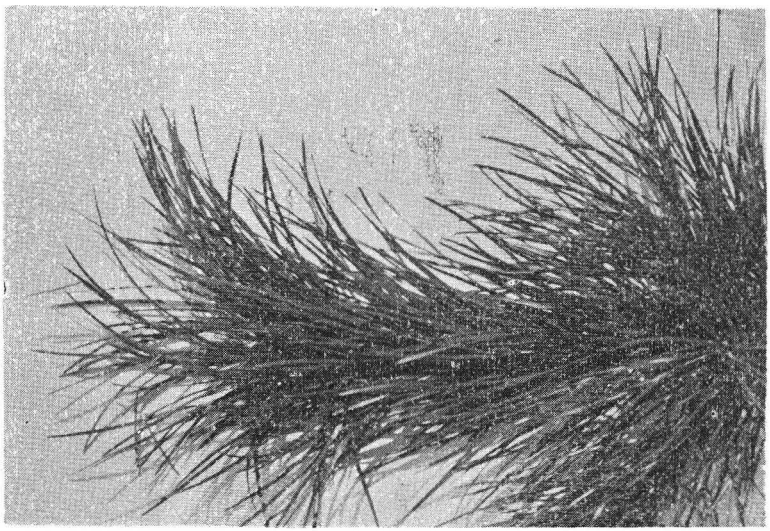
Lulu Provenance — short needles more loosely appressed to stem.

STEM : GENERAL :

Coastal : Continuous, usually devoid of forks which can be attributable to genetic control. Shows rapid diameter growth, heavy. May include flaws attributable to loss of leader bud due to storm damage during earlier years.



Coastal Provenance — short needles closely appressed to stem.



Inland Provenance — long needles standing out from stem.

Lulu : Continuous, straight, usually devoid of forks. Light, does not show rapid diameter growth.

Inland : Continuous, straight more likely to contain forked individuals, more so in some provenances than in others. Does not show rapid diameter growth.

BASAL SWEEP :

Coastal : Very prevalent particularly on exposed sites.

Lulu : Absent due to lack of vigorous growth.

Inland : Absent though showing good height growth on many sites.

BARK :

Coastal : Generally rough and thick, well fissured giving rise to blocks. In some instances, moderately smooth and fairly thin. Colour is generally very dark brown. In some of the thick-barked phenotypes bark tends to have a corky consistency.

Lulu : Generally smooth, though in older stems low down it is sometimes rough. It never however approaches that of coastal, plates are usually small and very thin. Colour is variable but usually dark brown at lower end of stem and somewhat greyer higher up.

Inland : Smooth, very thin with very pronounced small swellings similar to lenticels over the entire stem. Where rough plates occur they are usually very thin. Grey in colour.

NODAL SWELLING :

Coastal : This is a very pronounced feature particularly on the more vigorous trees. The swollen area around each branch tends to amalgamate with its neighbours in the whorl until a very definite ring of swelling occurs. The degree of swelling varies from tree to tree.

Lulu : Nodal swelling is not seen in this provenance. This can in all probability be attributed to its general lack of vigour.

Inland : Swelling does occur in this group but it is confined to where the branch enters the stem. Characteristically following pruning the stem is covered with small nodules. This feature is more pronounced in the older stages of development.

CROWN :

Branch : Number, length and form

Coastal: Very vigorous strong and long, giving rise to large knots in the timber. Characteristically there are from 5 to 8 per whorl. Of this number 3 to 5 respectively are usually dominant branches, the others being less vigorous. In some instances there is a minor whorl of branches, due to lammas growth. Branches are usually straight and devoid of twists.

Lulu : Light and not very vigorous. Tend to be of moderate length. Characteristically there are 4 to 6 per whorl. They are usually straight and devoid of twists.

Inland : Light and generally not very vigorous. Tend to be variable in length. Characteristically there are 2 to 4 per whorl. They are normally rather wavy.

NUMBER OF GROWING POINTS PER BRANCH

Coastal : In keeping with the vigorous nature of the tree, there is a high number of growing points per branch. This gives the tree its rather characteristic dense crown.

Lulu : The number is moderately high but due to the needle arrangement and lack of vigour, crown is not very dense.

Inland : Number is very low and it appears to correspond with the number of branches per whorl. Due to this feature and the wavyness of the branches the crowns are very open.

BRANCH ANGLE :

Coastal : Is described as from flat to ascending. Their position in the crown will have an influence on the exact angle.

Lulu : Very definitely ascending entering the stem at an acute agle. This makes for a narrow crowned tree.

Inland : Generally flat. There is a tendency for the branch ends to turn upwards.

INTERNODAL BRANCHES :

Coastal: As a rule internodal branching is absent but not always. There is a suggestion of internodal branching in the form of minor branches at the whorl. This is in fact lammas growth.

Lulu : Seldom occurs in this group.

Inland : It is quite prevalent and gives the tree an impression of being extremely branchy. As with the normal branches, internodal branches are very light, short and wavey. It does not appear in regular whorls.

NEEDLES : *Colour*

Coastal : Normally rich dark green. It must however be borne in mind that site factors will control colour to a greater or less degree.

Lulu : Predominantly they are a metallic grey—dark green colour. Applcation of fertiliser may alter it but they normally revert to the grey-dark green colour.

Inland : Characteristically they are a light green or yellow green colour. When compared with the other two groups it is many shades lighter.

NEEDLE LENGTH :

Coastal : On average they are 2 inches in length but can range from $\frac{1}{2}$ to $2\frac{1}{2}$ inches. Site conditions will have an influence on their length.

Lulu : Short $\frac{1}{2}$ to 2 inches long.

Inland : Long in comparison to the other two groups. Range is from 2 to 4 inches with an average length of 3 inches.

RETENTION AND APPEARANCE

Coastal : On each branch needles are retained from 2 to 6 years, the higher figure being the most usual. In their first year needles are appressed to the branch giving it a well clothed appearance. On young trees needles are retained on the stem for a few years. Needles are straight.

Lulu : Needles are retained from two to six years in the coastal group. On average they are retained for 4 years. Needle arrangement is such that they stand out from the branch giving it a prickly appearance. Added to this is the fact that the needles appear in small groups separated by bare stem (see flowering). Needles are straight.

Inland : Needle retention is from 1 to 4 years with the most common length of period being 2 years. Needles stand out in no regular pattern from the stem of the branch. This gives the branch a loose hairy appearance when viewed from a distance. Needles themselves are twisted and hang very loosely.

FLOWERING :

Coastal : Flowering is confined to definite regions for the sexes. Female flowers are predominantly in the upper one third of the crown and male flowers in the lower two thirds of the crown. Though flowering can occur at an early age, when plants have been two years in the field, it is most prevalent when the tree reaches the age of 10 years. Ths period of prolific coning would appear to continue for about 5-10 years. Thereafter coning appears to be confined to seed years.

Lulu : The outstanding definitive feature of this group is its prolific coming and flowering from an early age. Regardless of year it produces vast quantities of male flowers at every growing point except that of the terminal shoot. When the empty pollen sacks are shed they leave gaps between each successive year's growth. This gives each branch a tufted appearance. There is no definite zoning of sexes as in the coastal group. Female flowers are produced in equal profusion throughout the entire area of the crown. If not picked they tend to remain for a number of years on the stem. This can also occur on Coastal but is less noticeable due to crown density.

Inland : Production of flowers is not very prolific. It tends to follow the same distribution pattern as that of the coastal group, female flowers being mainly confined to the upper one third of the crown and male to the lower two thirds. Some provenances within this group have the habit of retaining cones for many years on both stems and branches though the branch may be long since dead.

GROWTH FORM :

Coastal : Provenances within this group show very good vigorous growth both in height and diameter. Due to the very dense crown there is almost complete suppression of ground vegetation once the canopy has closed.

Lulu : Within this group both height and diameter growth are poor. Early development is vigorous both in the nursery and for a short period following planting in the field. A stand is characeerised by the almost complete lack of suppression of ground vegetation and no apparent closure of canopy.

Inland : Though height growth in some provenances is moderately good, diameter growth is generally poor. This allied to the very light crown, results in only moderate suppression of ground vegetation even though there is in some provenances on good sites a closure of canopy.

STABILITY :

Coastal : Due to its vigour it is liable to windblow from an early age. On exposed sites where not blown it develops a characteristic basal sweep.

Lulu : No wind blow of any consequence has occured in this group a fact attributable to its general lack of vigour.

Inland : This group is not prone to wind blow on the majority of sites. Where it occurs it is generally only odd trees which are blown.

Two minor groupings within the coastal sub-group occur but are of no great significance since they are not widely planted. The first of these is the "Rainer" provenance characterised by its very ascending branch form. In all other respects it is similar to the normal coastal provenances. The second minor grouping is the Mendocino provenance. Macroscopically this cannot be differentiated from the normal coastal provenances.

Examples of the three main groups are to be found in close proximity in

Rathdrum forest	Ballintombay porperty, C.11, C.10. C.12.
Forth forest	Forth Commons, C.15.
Ballyhoura forest	Skahanagh, C.175, 19, 159.
Cloosh forest	Cloosh Valley, C.66, C.10, C.119.
Balleybofey forest	Croughonagh, C.19, C.20, C.3.

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SUMMARY OF MAIN DISTINCTIVE FEATURES

Feature	Coastal	Lulu	Inland
A. *Stem*			
General	Straight, heavy	Straight, light.	Straight but sometimes forked, light.
Basal Sweep :	Very prevalent	Absent.	Absent.
Bark :	Rough, well fissured blocks, thick, dark brown.	Smoth, thin grey-brown.	Smooth, "lenticels present.
Nodal Swetling	Very pronounced, particularly on vigorous trees.	Absent.	Swelling does occur but confined to braanch base.
B. *Crown*			
Branch	Very vigorous, 5 to 8 per whorl, straight.	Not vigorous, 4 to 6 per whorl, straight.	Not vigorous, 2 to 4 per whorl, wavy.
No. of Growing Points per Branch	Large number giving branch well clothed appearance.	Moderate number.	Few.
Branch Angle	Flat to ascending.	Ascending.	Flat.

Feature	Coastal	Lulu	Inland
Internodal Branches	Generally absent.	Absent.	Prevalent.
C. *Needles*			
Colour	Rich, dark green.	Metallic grey-green.	Light green—yellow green.
Length	Short, ½ to 2½ inches.	Short, ½ to 2 inches.	Long, 2 to 4 inches.
Retention and Appearance	2 to 6 years. Appressed to stem in first year, straight.	2 to 6 years. Stand out from stem, straight.	1 to 4 years. Loosely standing out from stem, wavy.
D. *Flowering*	Female confined to upper ⅓ male to lower ⅔ of crown, flowers 5-15 years.	Profuse, regular male and female flowering all over crown.	Not very prolific, cones retained on stem and branches for many years.
E. *Growth Form*	Very vigorous growth both in height and diameter, complete suppression of ground vegetation except on poor sites.	Height and diameter growth poor, no suppression of ground vegetation.	Height growth moderately good, diameter growth poor, moderate suppression of ground vegetation on good sites.
F. *Stability*	Prone to wind blow.	Not very prone to wind blow.	Not very prone, only odd trees.

Evaluating forest disease problems

G. DE BRIT[1]

ABSTRACT

This article is intended primarily for forest managers. It is suggested that forest managers may be somewhat reluctant in accepting the value of investment in forest disease prevention or control, because no positive effect on timber production is seen to derive from this type of investment. Economic evaluation of a disease, it is stressed, must be based on a thorough biological evaluation.

The article shows how two types of forest disease problems are evaluated: 1, an existing forest disease problem, and 2, a potential forest disease problem. *Rhizina undulata* is used as an example of the former situation, and *Fomes annosus* as an example of the latter situation.

INTRODUCTION

It is probably true to say that the major emphasis of any forest enterprise to-day is placed on increasing forest productivity. I am confining my remarks here to timber production and excluding consideration of other aspects of forest production such as amenity development and wild life management. Efforts to increase timber production in this direction are concerned with increasing the timber producing potential of forest land and of the trees which grow on forest land. Examples of forest management practices to achieve this end are drainage, control of competing vegetation, fertilization, thinning and species selection. All these factors operate in a positive way, i.e. they modify timber production. The change can be seen or measured. Measures aimed at preventing or controlling forest diseases do not operate in this way. They do not visibly increase timber production but safeguard existing and future production. This difference, I consider, can lead to reluctance in accepting the value of investment in tree disease prevention or control. It is perhaps necessary to examine this a little more closely. Should a forest manager invest in a positive production factor, e.g. fertilizing, he can measure an increase in production deriving from this investment. If, on the other hand, he invests money to prevent a forest disease situation becoming established he can not see any increase in timber production deriving from this investment. The benefit in this situation is the prevention of anticipated loss to existing or future production. My suggestion is that a forest manager will have more sympathy with the former type of investment. This is perhaps understandable, as an investment of the latter type will frequently leave a suspicion about its value, apart from the fact that it does not result in increased production.

The purpose of this article is to describe how forest disease problems are evaluated. I will indicate particularly how investment in prevention or control methods can be justified.

[1]Research Officer, Research Branch, Department of Lands (Forestry Division), Dublin.

DEFINING THE PROBLEM

There are two quite distinct aspects to be considered in defining the problem. The first concerns a tree disease problem which exists in the country. A forest manager will be aware of any significant problem which exists in his area. He may not be aware of the cause of the problem, but he will be aware of its effects. Communication between the forest manager and the forest pathologist will enable a reasonable assessment of the nature and scope of the problem. To illustrate the evaluation of this type of situation I will use the disease, group dying of conifers, caused by *Rhizina undulata.* The second aspect, which is particularly relevant to our situation in Ireland, involves the evaluation of potentially dangerous pathogens, especially those which are known to be damaging in other countries. To illustrate this aspect I will use *Fomes annosus* which causes butt and root rot of conifers.

DEALING WITH AN EXISTING FOREST DISEASE PROBLEM

Background

The disease, group dying of conifers, became apparent in Ireland in 1952. Murray (1954) had reported a similar condition in England. Briefly, it can be said that groups of trees in pole stage stands of a range of conifer species died. No explanation at that time could be offered to account for the occurrence.

Association with Rhizina undulata[1]

Mr. W. Shorten, who was Forester in Glendalough at that time, noticed a fungal fructification frequently associated with the groups of dead trees. McKay and Clear (1953), identified this fungus as *R. undulata.* The fungus was recoverable from affected trees, but attempts to inoculate healthy trees were unsuccessful.

Biological Evaluation

It seemed very likely then that *R. undulata* was the causal organism, but this could not be proved because of the failure to inoculate successfully healthy trees with the suspected pathogen. This point is of more than academic interest because failure to understand the mode of action of the pathogen renders impossible a logical preventive or control process.

It had been noticed in Ireland (de Brit and O'Carroll, 1967), and in England (Murray and Young, 1961), that fire sites were frequently associated with groups. These workers hypothesised

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[1]*Rhizina inflata* is a synonom for *Rhizina undulata.*

that there was a relationship between the disease, fire sites and the fungus; by experiment they sought to demonstrate and explain this relationship. These experiments confirmed the relationship between the three factors but did not support the various hypotheses put forward to explain the relationship. Jalaluddin (1967) has since shown that germination of ascospores of *R. undulata* is stimulated by exposure to a high temperature, especially over the range 35-45° C, for certain periods. The fungus can then invade coniferous roots.

Formulation of Preventive or Control Measures

The control of this disease lies obviously in the field of prevention, i.e. not lighting fires in pole stage coniferous stands. However, it would not have been possible to arrive at this simple solution if the biology of the pathogen and its relationship with its host and environment had not been worked out. Fires would continue to be lit. Everytime *R. undulata* ascospores were present where a fire was lit the disease could become established. At each such fire site more fructifications of *R. undulata* would be produced. This in turn would increase the risk of each subsequent fire initiating a new disease centre. Eventually a situation would be reached where everytime a fire was lighted a new disease centre would be initiated.

Economic Evaluation

No economic evaluation was made of this particular disease situation, because the implications were obvious, and the prevention costs negligible. Obvious damage was being done to valuable timber by tree mortality, although it should be pointed out that the timber was salvageable. Residual stands were rendered more liable to wind throw because of the disease, resulting in management and marketing problems and costs. Those portions of stands affected by the disease remained unproductive until the next rotation, perhaps 20 years away. As I have mentioned above, none of this was evaluated, but it would be interesting to determine, for academic reasons if no other, the monetary benefits accruing from this preventive measure.

In making an economic evaluation of the disease this is the situation against which the cost of preventive measures would need to be judged. As has been indicated above, with this particular disease such an analysis was not necessary because of the negligible cost of preventive methods. The point is emphasised to indicate the magnitude of the losses which are incurred in the absence of preventive measures.

DEALING WITH AN ANTICIPATED FOREST DISEASE PROBLEM

In dealing with the disease *group dying of conifers* it can be seen from a forest management or economic viewpoint to be

a fairly simple problem to evaluate. The disease causes recognisable and measureable damage and the preventive measures are simple and non-costly. Not all disease situations are as simple as this. Many will require a careful economic evaluation of the damage and an equally careful economic evaluation of control or preventive methods. In saying this, I should point out that in describing *group dying of conifers* as a simple disease situation I do not intend to devalue the vital contribution made by various workers in elucidating the underlying causes of this disease. Without this work no simple answer would have been available. To underline this I can say that a thorough knowledge of any forest pathogen and its relationship with its host and the environment is necessary before consideration can be given to control or preventive measures.

Disease caused by *Fomes annosus* is not so easy to evaluate. It will be noticed that I have applied the term "anticipated" or "potential" threat to this pathogen. I do so in the knowledge that it is known to be present in many forests in this country and is considered a serious threat to timber production in certain areas. The greater proportion of our forests, however, have been established in relatively recent times and most of these forests have been established on sites which have not carried timber in historical time. As the pathogen is considered to be incapable of existing freely in soil outside a woody substrate, it can be assumed that these sites, at planting, are free of *F. annosus*. The problem is in predicting how the pathogen will behave in these new conifer forests.

Background

In continental Europe this disease has been known for a considerable period of time. European foresters and forest pathologists have concerned themselves with silvicultural and preventive methods to minimise the impact of the disease. In certain parts of North America *F. annosus* is considered to be indigenous, e.g. Washington, British Columbia, North Eastern United States, South Eastern United States. It is thought primarily to be a problem in managed coniferous plantations, Low and Gladman (1960) report Rennerfelt putting losses due to *F. annosus* in Sweden at £4 million per annum, losses due to decreased growth and windblow due to root rot not being taken into account. Low and Gladman (1960) report Zycha in Germany estimating a probable reduction in timber yield of between 10% and 15% per annum. In Denmark, Yde-Anderson (1962) reports that direct losses due to *F. annosus* amount to £300,000 per annum, and a further £200,000 is lost by such drawbacks as attend silviculture. Also in Denmark, Nannestad (1961) estimated in a Norway spruce plantation in Zeeland a reduction in annual profits due to *F. annosus* of ca.32% and a reduction in capital value of ca.47%. In England, Rishbeth

(1957) estimated an overall loss from killing by *F. annosus* at Thetford of about £1 per acre per annum. There is, therefore, considerable evidence of serious financial loss due to attack by *F. annosus*. Let us now consider some of the biological aspects of the pathogen.

Biological Evaluation

F. annosus causes root rot and/or butt or stem decay over a wide range of coniferous species. The type and the severity of the damage caused being dependent on, among other things, the particular tree species involved. In general, pines are thought not to be affected to a significant degree by butt or stem rot. Damage to this genus is thought to be confined mainly to roots. The spruces, firs and larches are susceptible to butt or stem rot and root rot; once again there is considerable variation depending on the species. Western hemlock and western red cedar are both considered highly susceptible to butt or stem rot. These susceptibility indications are for the most part based purely on observation rather than on experimental work.

Distinction has been made here between *F. annosus* acting as a killing agent in pines and as a butt rot agent in butt rot susceptible species. The basis for this distinction is related to species susceptibility and resistance. This is an unclear field at present; for the purposes of this article it is sufficient to say that differences do exist between species, but that the reasons underlying these differences are not as yet fully understood.

Risbeth (1951) was the first to demonstrate the mode of infection. He showed that airborne basidiospores of the fungus could colonise freshly cut stump surfaces following thinning or felling. The fungus then grew into the stump body and eventually down to the stump roots. When an infected stump root comes in contact with a healthy root of a standing tree the pathogen could pass from the infected stump root to the healthy root. This is the main method by which healthy standing trees become infected. Further spread of the pathogen from this initial focus of infection is dependent on contact of infected roots with healthy roots. Other methods of infection, e.g. colonisation by basidiospores of damaged butts of standing trees, or brashing wounds, have been demonstrated, but these are considered to be of relatively little significance.

Rishbeth (1951b) working with Scots pine in East Anglia showed that damage due to *F. annosus* was considerably greater on sites which had formerly been used for agricultural purposes. He established a positive correlation between increasing pH and disease incidence. This work relates to *F. annosus* working as a killing agent in pine plantations. In tree species which are susceptible to butt or stem rot, sites with a former agricultural history and high soil pH are again considered to be significantly related to disease severity. However, considerable damage can

be done on a wide range of mineral soil types of low pH. Such evidence as is available suggests that significant losses are not likely to be incurred on wet, acid, deep peats.

The reason for referring to this point here is to indicate the effect of site type on disease severity in the two susceptibility classes mentioned. In tree species which are susceptible to root rot but not to butt rot—pine species for example—the major disease effect is tree mortality. Tree mortality due to *F. annosus* of these species occurs only on sites which have high pH values and which favour transference of the fungus from infected to healthy roots. On other site types, ones for example with low pH values and which otherwise are unfavourable to the rapid transference of the fungus from infected to healthy roots, tree mortality does not occur. The disease may be present in standing trees but the incidence of root infection is not sufficiently high to cause tree mortality. With species which are susceptible to butt rot, site variation is not so critical; that is to say, on sites which favour disease development serious butt rot losses may be expected, but on sites which are less favourable to disease development significant losses may still be incurred. This is because root infections of standing trees, which would not be sufficient to cause mortality in butt rot resistant species, will cause stem decay in butt rot susceptible species.

Bearing in mind the soil types normally encountered in forest plantations in Ireland, and the major tree species planted, it seems likely that the pathogen's potential threat is as a butt rot agent. The effect of site variation on disease incidence and development has been mentioned above. I will enlarge a little on this now. The primary method of infection, as has been stated, is by infected stump roots coming in contact with healthy roots of standing trees, and the fungus transferring from the infected to the healthy root. The influence of site on the infection process is at the point of root contact. Assuming a susceptible host, it is thought that the main influence at the point of root contact is microbiological; that is to say, whether micro-organisms antagonistic or inhibitory to *F. annosus* are present or not. Whether these organisms are present or not is largely dependent on soil factors such as pH, moisture content, organic matter content and nutrient status. Many workers, including Rishbeth (1951b), Froelich et al. (1966) and Holmsgaard et alia (1968) have related various soil factors to disease severity. Most of these studies indicate disease severity to be correlated with one or more of the following factors: high soil pH, low soil moisture levels, low organic matter content increased sandiness of soil and former arable farm history. The precise role which these and other factors play in modifying the infectivity of the pathogen is not fully understood, but their effect on soil organisms which are antagonistic or inhibitory

to *F. annosus* is considered to play a dominant role in influencing the infection process.

What is apparent from studies on the influence of site variation on disease severity is that *F. annosus* can cause significant damage over a wide range of site types. Based on present knowledge, it is possible to predict sites on which very heavy losses are likely to be incurred. There are, however, considerable gaps in knowledge concerning the behaviour of the pathogen on other site types. It will be necessary for us in Ireland to evaluate the disease based on information available in relation to species susceptibility and site variation.

Formulation of Preventive or Control Measures

Rishbeth (1959a), who worked out the mode of infection, suggested a disease prevention method based on this knowledge. He argued that if colonisation of freshly cut stump surfaces by airborne basidiospores is the primary factor in the infection process, then prevention of this should prevent infection of healthy standing trees. He achieved this by treating the freshly cut stump surfaces with cresote. Cresote is toxic to *F. annosus* spores, so that basidiospores landing on stump surfaces treated with creosote failed to germinate and colonise the stumps. The pathogen could not, therefore, proceed further. Experiments have shown that treatment of stump surfaces with creosote significantly decreases the incidence of the disease when compared with control areas with no creosote stump treatment.

The principle of stump protection having been worked out, Rishbeth (1959b, 1963) and many other workers including Yde-Andersen (1967), and Driver (1963) have sought to refine the technique. Creosote had certain disadvantages as a stump protectant. Its composition could be variable, the component toxic to *F. annosus* could, therefore, also vary. It is toxic to a wide range of wood colonising saprophytic organisms. This means that stumps treated with creosote are not decayed rapidly, but remain potentially liable to colonisation by *F. annosus* for a much longer period than untreated stumps. Thus, subsequent damage to a creosote-treated stump, during extraction operations for example, can lead to a breakdown in protection. This disadvantage can be important in another way. In areas where *F. annosus* is already present, and spread of the disease is taking place by root contact between infected and healthy roots, stumps which have been treated with creosote are liable to become infected below ground by root contact. The fungus can obtain complete possession of such a stump without competition from saprophytes from above. Further below-ground spread of the pathogen by root contact can develop from this new infection location. A final disadvantage of creosote is that it does not penetrate appreciably into the

stump body. This makes timing of the creosote application critical. If a *F. annosus* basidiospore lands on a freshly cut stump surface, germinates and grows into the stump body, it will very quickly be away from the influence of the creosote. Creosote, to be effective, needs to be applied to the cut stump surface immediately after felling.

The disadvantages encountered with creosote indicate in a negative way what properties a good chemical stump protectant should have. It should be of constant composition. It should be capable of penetrating well into the stump body in order to make the timing of application less critical; it should be selectively toxic, ideally toxic only to *F. annosus* but allowing other organisms to cause rapid breakdown of the stump. This would reduce the risk of subsequent stump damage causing a breakdown in protection, and would protect more adequately already infected stands.

Many chemicals have been screened as possible stump protectants and quite a few promising protectants have emerged. These have been evaluated under field conditions in many countries. Some are currently being used in general forest management. None of the protectants evaluated so far could be described as perfect, but many are considerably more efficient than the pioneer protectant, creosote. It is not necessary here to trace the development of these stump protectants, nor to describe the advantages and disadvantages of individual protectants. It is sufficient to note that in England sodium nitrite has emerged as the most efficient chemical stump protectant evaluated so far, and in the United States boron based chemicals are proving satisfactory stump protectants. It will be necessary to test the efficiency of the more promising protectants under Irish conditions.

It has been stated that one of the main properties which a chemical stump protectant should possess is selective toxicity to stump colonising organisms. Ideally a protectant should be toxic only to *F. annosus* allowing other organisms to cause a rapid breakdown of the stump. This has lead to an examination of the possibilities of biological control. Basically, the idea is to inoculate stumps after felling with organisms which will quickly colonise the stump, are non-pathogenic, and compete successfully with *F. annosus*. This method of prevention or control is more efficient than chemical stump protectants if a suitable organism can be found. All the criterion for a good stump protectant enumerated earlier are achieved. There are a couple of additional benefits deriving from biological stump protection. Inoculation of freshly cut stump surfaces with organisms which compete with *F. annosus* increases the level of natural control exerted by these organisms. Potential hazards associated with the use of chemical stump protectants are eliminated.

Rishbeth (1963) has done the pioneering work in this field. He has developed the use of a fungus *Peniophora gigantea* for pine species. Efforts are being directed in many countries to determine suitable stump colonisers for other tree species; of particular interest to us in Ireland will be the finding a suitable stump coloniser for Sitka spruce.

I have gone to some lengths to describe what is known concerning the biology of this pathogen. I have also indicated aspects of the disease which are as yet not fully understood. Finally, I covered preventive or controls methods being developed or employed in other countries. It is now necessary to evaluate the damage potential of the pathogen in Ireland and relate this to prevention or control costs.

Economic Evaluation

I have said that *F. annosus* is known to occur over a wide variety of locations and sites in the country. In only one instance (O'Carroll and O Muirgheasa, 1963) has a precise measurement of the losses incurred been worked out. Many of the tree species which we plant are known to be susceptible to attack by *F. annosus,* both from observation within the country and from experience in other countries. Many forest site types within the country are potentially capable of allowing significant disease development. This comment is based on work carried out in other countries, and on limited observational work within this country. A significant proportion of our forests are established on deep wet acid peats. Present knowledge suggests that these will be low risk sites.

In summary, it can be said that no large scale *F. annosus* problem exists at present in our forests. Enough is known concerning site types, species composition and incidence of the pathogen, relating to the accumulated knowledge of its behaviour, to suggest that it is a potential threat to timber production in certain areas but not in others. What is lacking is precise information in our situation. It is necessary, therefore, for us to determine accurately what impact the disease has on our major tree species on our major site types. Information of this sort can be obtained only by careful observation and experimentation. The nature of this disease dictates that much of this work will be carried out over a long period. Consequently, the necessary data on which to base a realistic economic evaluation will not be available for some considerable time. Preventive or control measures are carried out now on the assumption that the disease does or will cause intolerable damage. It is necessary to confirm or invalidate this assumption by investigation as described above. It is not possible to evaluate the cost of preventive measures without data on the effect on timber production of the disease. The assumption that the disease is potentially damaging is an interim decision or evalua-

tion based on the available knowledge both within and outside the country. It may or may not be a valid assumption. If it is shown to be valid, the cost of preventive or control measures can be balanced against known loss figures and a decision to continue or discontinue control measures taken. If the assumption is shown to be invalid, control measures can be discontinued. This error of judgment will mean bearing the cost of the control measures during the period in which the assumption was in operation. If, however, it was decided not to implement control measures a different situation arises. Firstly, it may be shown that the pathogen does not in fact cause serious damage, in which case the decision not to carry out control measures is shown to be correct and there will be no change in policy. The alternative situation is that the pathogen does cause significant damage. This error of judgment is likely to be considerably more costly than the first error. It has been stated that the length of time necessary to evaluate the impact of the disease would be lengthy, perhaps 20 years or more. During this period no stump protection would have been carried out and large areas of forests would have become infected with *F. annosus*. A situation very much akin to closing the stable door after the horse has gone would exist. A forest disease problem of considerable importance would have developed which would affect timber production and management practices, not just in the present rotation, but also in succeeding rotations.

This is the reason why stump protection measures are adopted now without a full appreciation of the pathogen's potential. It is a considered policy based on the pathogen's known and potential impact in other countries, and on an assessment of its potential in our environment. The cost of this protection measure has to be borne until sufficient data becomes available to allow a final decision to be made. The implications of a judgment error in this situation are minimal when considered against the consequences of the other judgment error.

CONCLUSIONS

I started this article by suggesting that because tree disease prevention or control does not visibly increase forest production, a certain reluctance in accepting the value of an investment in prevention or control measures might exist. I have attempted to assuage this assumed reluctance by examining in some detail two disease situations. I consider this to be relevant because it shows the basis on which an investment of this sort is deemed necessary or not.

In the first situation, that of an existing forest disease problem (*group dying of conifers*), it is perhaps easier to appreciate the value of a prevention or control investment. The disease causes recognisable damage to existing production. The

forest manager will be very anxious to obtain a solution to this problem. He will be prepared to invest money to safeguard his existing and future productions from this disease. The second situation is somewhat different (*Fomes annosus* butt and root rot). No disease situation has developed. The threat to timber production is potential, not existing. Investment in prevention or control measures in this situation, as I have described, may be shown to be unnecessary, but, as I have also described, it may prove to be essential. It follows, I think, that a very careful evaluation of the biology of the particular pathogen involved, in this case *F. annosus,* and its relationship to its hosts and environment is vital if a sound appraisal of the threat is to be made. Careful consideration will also have to be given to the magnitude of the potential threat. That is to say, assuming the worst, how big an impact on timber production could the pathogen make? This type of control investment may be considered as a form of insurance, an insurance designed to protect the larger total investment in timber production, present and future, from specified, evaluated, potential pathogens.

Both of the diseases considered lend themselves to preventive rather than control methods. This is because an understanding of the biology of the pathogens indicated methods of preventing the diseases becoming established. With forest diseases it is undoubtedly true to say that prevention is better than cure. It is invariably difficult and costly to control an established forest disease situation. More and more I consider that, in forest tree disease research, efforts will be aimed at prevention rather than at direct control. It is not appropriate to consider in detail this subject in this article. I mention it here because I think it can influence a forest manager's thinking on investment in forest disease control. If the future holds prevention rather than control, as is the case with both *R. undulata* and *F. annosus* then forest managers will not see many disease problems in their plantations. This gets me back to my original supposition. Does the forest manager consider he is getting value for the money he has invested? The purpose of this article has been an attempt to show that he does.

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Some Monterey trees in Ireland

By A. Mitchell, Agr.(Forest)B.

At first sight it seems strange that trees found in nature only on the Monterey peninsula in California, a place of hot, dry summers, should grow with singular speed and luxuriance in cool, damp Ireland. In fact, they do not really like Monterey at all. They only grow there, which is not the same thing. During the onset of the Ice Ages, the trees of the Rocky Mountain complex could move south ahead of the cold, following their preferred climate towards, and into, Mexico, since the ranges run north and south. When this was (as we hope) all over, the trees migrated north again. Some, however, took a wrong turning. Erosion by the sea had cut the minor range and left the stub as a peninsula. The trees could go no further, and as the hills and valleys behind became drier and hotter, they could not retreat. So there they stuck, with the climate warming up and the beach huts and golf courses arriving. They would be far happier on the Olympic Peninsula with the Sitka spruce and Thuja.

In the autumns of 1966 and 1968, with the very kind co-operation of the Irish Forestry Division, Mr. A. M. S. Hanan and I were enabled to visit a large proportion of the biggest

and finest trees in Ireland. We measured over 2,400 specimens in the 22 days, and the best that we saw of three species from Monterey are remarkable trees and will be detailed here.

The Monterey Cypress, Cupressus macrocarpa

This species was introduced in 1838, and was commonly planted from about 1850. The first feature to note is that the habit of growth in Ireland is different from that in England. In Ireland even young plants have very vigorous branches thrusting out at a low angle, about 30 degrees above horizontal. These shoots are dense, but slender cones in outline, and project well beyond the general crown. The trees set out with the utmost vigour to become the biggest aces-of-spades there ever were; huge rounded, squat, but shortly pointed bun-shapes. This is emphasised where they are multiple stemmed from the base, but occurs almost as strongly where they have a single bole for some considerable height. Even in Cornwall this is less marked than in eastern Ireland, and there is nothing comparable with those in the west. In most of England, and certainly in the east, this tree is either a columnar or conic tree on a single stem, or where it is a multiple, it is a broad cone until old enough to flatten out like a Cedar of Lebanon, a form which seems not to occur often in Ireland. The faster growth is obviously one reason for the Irish trees being a different shape from those of, say, Suffolk, but growth in Cornwall and Devon is about the same as in Kerry or Mayo. No tree in Britain can, I am sure, match the golden "lutea" trees at Ashford Castle, Co. Mayo, which are broader than they are high.

Beginning with the hardly measureable trees which bush from ground level, none can equal that at Powerscourt. Planted as recently as 1898, it was in 1966, 90 ft. x 37 ft. 5 in. at ground level. The forty or more trunks contain a prodigious quantity of timber for 68 years growth. The next biggest of this sort are at Emo Park, 95 ft. x about 30 ft., and at Kilmacurragh, 90 ft. x 24 ft. 10 in. both at ground level. Of those on a leg of one foot, or of minimum girth at that height, the biggest is at Fenagh House, Co. Carlow, and 86 ft. x 22 ft. 7 in. At Hamwood, Co. Meath, is a fine tree now 85 ft. x 21 ft. 7 in. at two feet, a vast, globular bush on a two-foot leg. This is surely the one recorded as dating from 1844, but in 1903 one there was noted as x 10 ft. 6 in. but with a clean stem to five feet, so, unless there was then a second tree, the lowest branches have grown since then.

The largest tree properly measurable at five feet, is one on the lawn at Adare Manor, Co. Limerick. The top is dying back a little, but the bole is 22 feet round and clear of branches for 15 feet. On the same estate, but by a gate in the Deer Park is one of 85 ft. x 21 ft. 9 in. with a five-foot bole, and

beside this are two more, 100 ft. tall; one with a girth of 13 ft. 11 ins. and a clear bole of 15 feet. Also in the Deer Park, by a road, is the finest bole of this species we have seen. This tree is 108 ft. x 16 ft. 11 in. and has been pruned clear to 42 feet, long enough ago to be smooth now. The tallest Monterey cypress we found is by the river at Powerscourt, and 118 ft. x 15 ft. 5 in. At Derreen, Co. Kerry, a magnificent tree was 110 years old and 21 ft. 10 in. in girth, with a five-foot clear bole in 1966, so this is the equal of the biggest at Adare, by now. Other big trees are: Clonmannon, Co. Wicklow, 75 ft. x 17 ft. 10 in. (15 feet clear); Birr Castle, 90 ft. x 17 ft. 3 in.; Rossdohan, Co. Kerry, 78 ft. x 17 ft. 6 in.

One more specimen must be mentioned, for it may be unique. At Glencormac, Co. Wicklow, we found near the burnt house, a large, spreading and decisively pendulous tree of 50 ft. x 11 ft. 4 in., with just five feet of bole. It could only be var. "pendula", and is, in fact, given as such by Mr. Fitzpatrick in his records of 1931, when it was 20 ft. x 5 ft. 6 in. This variety is not even mentioned in any authority so far consulted, but it certainly exists at Glencormac as a most splendid tree. It is to be hoped that it will be spared during any re-building there.

The Monterey Pine, Pinus radiata

This was introduced by Douglas in 1833, but no original tree is now known, and few from before 1850. Growth in Ireland is of the same habit as that in England, with open-grown trees heavily branched and wide of crown, and rarely exceeding 100 feet in height, despite growing the first 80 feet in as little as 30 years.

Only one of this species had to be measured as low as one foot up the bole. This is a huge tree at Hamwood which at that height has a girth of 29 feet. In 1905, it was 17 feet, and in 1931, it was 22 feet 6 in. It is now 85 feet tall and was probably planted in 1844. At Adare Manor one was planted in 1841, and was 72 ft. x 7 ft. 6 in. by 1891. This is probably the tree which is now 100 ft. x 16 ft. 3 in. Measurements given in 1905 and 1931 refer to a smaller tree, and fit one nearby which is now 100 ft. x 14 feet. The next oldest is a huge tree at Fota, Co. Cork, planted in 1847. It is 85 feet tall, and measured above an enormous branch which rests on the ground, was 19 ft. 11 in. round in 1966. One planted at Blandsfort, Co. Leix in 1851 has grown rather slowly. In 1931 it was 73 ft. x 11 ft. 8 in., and is now 73 ft. x 14 ft. 3 ins. Another dating from 1851 is at Coollattin, Co. Wicklow. It was 56 ft. x 9 ft. in 1891 and has now grown to 90 ft. x 16 ft. 9in., with a clear bole of 15 feet. Perhaps the finest specimen is a huge, mushroom-crowned tree at Derreen, which was 85 ft. x 20 ft. 7 in., even measured above a vast branch in 1966. The tallest is, however, easily one of three trees near the top of the grounds at Inistioge, Co.

Kilkenny. This was 125 ft. x 18 ft. 1 in. in 1966, and the others were 110 ft. x 15 ft. 4 in. and 100 ft. x 17 ft. 2 in. One planted at Powerscourt in 1859 was 103 ft. x 15 ft. 9 in., and a splendid tree near the house at Headfort, Co. Meath, was 65 ft. x 20 ft 6 in., both in 1966. At Ashford Castle, two near the castle are 96 ft. x 15 ft. 6 in. (20 feet clear bole), and 105 ft. x 15 ft. 7 in., while a third, down by a group of Araucarias is 118 ft. x 15 ft. 6 in. An old tree beside Muckross House is 90 ft. x 17 ft. 10 in., and in the garden, down in the woods, a younger tree has the finest bole of any of this species we have seen. It measures 95 ft. x 14 ft. 11 in., and is almost cylindrical and quite clean for exactly 50 feet. A smaller, similar tree beside a gate to a private road out of Killarney House is 90 ft. x 11 ft. 5 in. and clean for 38 feet.

The Bishop Pine, Pinus muricata

This is also found a little beyond the Monterey area, but is a typical Monterey tree. It was introduced by Hartweg in 1846 and grows very fast, but has never been planted on the scale of the two species preceding, and remains a rare tree found in a few gardens and collections.

The planting which is outstanding above all in these islands is a line beside the drive into Muckross House. There are some 50 trees in about 100 yards, largely along the top of a wall. They are probably about 50 years old at the most, possibly barely forty and are of the tall, narrow type with dark bluish green needles, which is the form from the two most northerly areas of the range. They have straight boles and conic tops and are still growing fast. There is little variation in size among the best thirty or so which range from 90 to 95 feet in height, and from 6 feet to 7 ft. 6 in. in girth, except for an end tree of 8 ft. 3 in. A plot at Bedgebury Pinetum, in Kent, was planted with trees raised from seed from this line, and despite the very poor soil there, they are growing at 6 and 7 feet a year, and now it can be seen why. In the gardens below the house are two trees, perhaps a little older. One is a fine tree of 95 ft. x 8 ft. 6 in. At Ashford Castle, many Bishop pines were planted with Monterey pines, probably in the 1850s, in an avenue. The hurricane "Debbie" has destroyed nearly all these, but one remaining, although its top was badly damaged, is still a fine old veteran, and, measuring 80 ft. x 12 ft. 6 in. it has the distinction of being the largest known in these islands. At Dunloe Castle, Co. Kerry, there is a small group of young trees, about 35 years old, and the larger of two of almost the same size is 64 ft. x 5 ft. 5 in. At Birr Castle, there is one of 59 ft. x 6 ft. 3 in.

All the larger trees mentioned are substantially bigger than any known in Monterey. The cypress there requires 85 years to reach a girth of 6 feet.

Society Activities.

Minutes of 26th Annual General Meeting

2nd March, 1968 in Shelbourne Hotel

The President, Professor Clear, opened the meeting, and welcomed those present. The minutes of the 25th A.G.M. were taken as read. The Council's report for 1967 was read and passed.

ABSTRACT OF ACCOUNTS :

The Treasurer said that this could not have been sent out at the usual time due to circumstances beyond his control, but hoped that everyone had received it by the time of the meeting.

The Society now had 401 members, of whom 330, or 82%, were paid up to 31st December last. Of the remaining 18%, many were newer members. He hoped that all would be prompt in payment of subscriptions, as this was the main source of income.

The journal as a source of income, showed a loss of £50, although some of this had been recovered (advertising,etc.) since the end of the year.

There had also been a loss in exam revenue.

Revenue from "The Forests of Ireland" was favourable, but not as good as the previous year.

There then followed a discussion on the Northern Region, especially in regard to communication between the Council and Regional Council. The method of election of a Regional representative to the Council was questioned, and it was stated that this should be in the constitution. Mr. McEvoy suggested that a general meeting should be held, and a system adopted, provision having been made already to supply a seat on the Council for a region. The Chairman then suggested that the constitution should be kept up to date, reprinted, and circulated to members. The summary supplied at the meeting was inadequate (although this, in fact, was merely to cover the amendments to the constitution over the past year). Following this, Mr. Kilpatrick suggested that there should be no regional representative this year, but that one should be constitutionally elected next year; this was approved.

The discussion then returned to the financial standing of the Society with regard to the Book and the Journal. The Treasurer said that 461 copies of the book were sold in 1966, revenue being £552 19s. 8d., and £102 in donations, but sales had fallen in 1967. The journal was more complicated, especially the second issue, as receipts carried over to the following year. These at present amounted to £77 0s. 11d. and although the exact figure was less, back issues added to the latter. Revenue from advertisements was £147, and of £100 due, £50 had been recovered. Average income per annum from advertising was £100, but although there might appear to be a profit, the book, in fact, was upkeeping the Society. Mr. McEvoy

then congratulated the Treasurer on an excellent breakdown of the financial situation.

The only successful candidate for the Foresters certificate was Mr. Neilan, and he was unable to be present at the meeting.

In his address, the President discussed European Forestry in the present day.

The results of the 1968 Council elections were:— President: Prof. T. Clear; Vice-President: M. McNamara; Secretary: C. Kelly; Treasurer: T. Moloney; Editor: M. Swan; Bus.-Editor: J. Durand; Hon. Auditor: D. M. Craig. Councillors: Grade I, D. Mangan, B. Wilson; Grade II, J. J. Prior; Associate: Miss E. Furlong.

Mr. Barry introducing the motion: "That Technical Membership should be of one category", felt that the present system cut across the whole purpose of the Society, and that foresters played a major part in maintaining its objectives. He suggested there was no need for two grades of councillors, and that the word: "Technical" being left out, the simple term: "Member", could be used. There should still be: honorary, associate, and student members. Mr. Swan seconded the motion.

In the discussion that followed, it was suggested there was no evidence of advantage to be gained from a change, and that it appeared to be a purely personal idea, without apparent group support. It was also mentioned that every profession had its grades, and that every grade should be represented fully. However, grading could be a reason for poor membership, and although in the earlier days of the Society the grading was mainly financial, to attract new members, today this no longer applied.

At this point, the question of increasing the income of the Society was raised. The Chairman replied that the Auditor had suggested three courses of action :

(i) Subscriptions raised by at least 5/-;
(ii) The Journal reduced to one issue per year ;
(iii) Donations made by members.

With regard to the question of categories, it was mentioned that differences in subscription rates were inconsequent, and that the objects of the Society should cater for members, not groups. The motion was put to the meeting, but was rejected, as with 19 votes for, and 13 against, it failed to attain the required majority.

The motion: "That the Council year correspond to the calendar year", proposed by the 1967 Council, was then discussed. Although the Council found the transition period difficult, it was felt that a decision at this time might be premature. When put to the vote, with 15 for, and 13 against, the motion was defeated.

The President then informed the meeting of a Symposium on Peatland Forestry to be held in Edinburgh in September, 1968. As there was no more business, he then brought the meeting to a close.

C. KELLY, (Hon. Sec.).

Council's Report For 1967

In the year under review no new ventures were undertaken by the Council. It could be classified as a year of consolidation in which earlier plans were pushed forward to completion. One event of note was the length of the current Council's year. It lasted three months longer than was customary to date. This change was brought about by the revision in the constitution passed at the 25th A.G.M. Though nothing spectacular may have been achieved all Council members were active in furthering the aims of the Society. A good attendance was maintained at all the nine Council meetings. The attendance was—Prof. T. Clear and M. Swan (9); J. O'Driscoll, D. McGuire (8); T. Moloney, D. McGlynn, L.Condon, W. Luddy, Miss E. Furlong (7); A. M. S. Hanan, D. O'Sullivan (6); J. D'Arcy (5); J. D. Robinson and S. Galvin (1).

The year commenced with rather a bleak outlook as regards finances. However, as it progressed and the sales of the book mounted the picture improved. By the end of the year only 214 books of the original 1,000 remained unsold. Since then there has been a steady trickle of sales. The question is now posed of a second edition. Though the book has shown a handsome profit, other Society activities have tended to be run at a loss. This is particularly so for the journal. Though advertising revenue has increased, it proved extremely difficult for the Business Editor to obtain three sets of advertisements for the three journals published in 1967. The result of this is that some of the profits of the book have had to be used to keep the Society solvent. The cost of the running of the Society has also increased Last year it cost approximately £360. There appears to be a need for a revision of the subscription rates to make the Society self sufficient.

As mentioned three journals were published, one of which was a carry-over from 1966. The Editor is to be congratulated in getting the '67 Journals out to schedule.

On the activity front three summer meetings were held as well as the Annual Study Tour. Attendance at some of the day excursions was rather disappointing considering the amount of effort the various leaders had put into them. The Council discussed ways of encouraging greater attendance but as yet were unable to implement any of the suggestions. The Study Tour to Cahir, attended by over 40 members, proved very enjoyable

The Annual General Meeting was held in March at which Prof. T. Black of Edinburgh University read a paper entitled "The Role of the Forester in a Changing World." A large attendance heard Prof. Black explain his *avant garde* views on what role the forester should play in an everchanging world.

The Society again held its examinations for both Woodmans and Foresters Certificates. Of the candidates for the Woodmans four were

successful while one of the two who sat for the Foresters was successful.

Regionalisation was finally launched in the Autumn when the foundation meeting of the Northern region was held in Strabane. It is hoped that this will stimulate interest in the Society. To tie-in with this the Constitutional sub-committee have been drafting the revised constitution. It is hoped to have the completed article available in the near future.

J. O'DRISCOLL, (Hon. Sec.).

President's Address

Before going on to review progress here at home, I feel it would be useful to look at the state of Forestry in other parts of the world.

Continental Europe has for centuries set the lead in forestry — particularly in the field of silviculture and one naturally looks for trends there.

It is disturbing therefore, to learn from the reports of the various countries submitted to the Meeting of the European Forestry Commission held in Rome from the 15th - 19th May, 1967, that the economics of European forestry have become a matter of growing concern. With wood prices remaining stable and forest costs rising — the profit margin in many European countries has narrowed. Indeed net losses are being reported in a growing number of forest enterprises.

On the other hand Europe's foreign trade in wood and wood products shows a widening gap in both quantities and values. One would assume that the home producers would take advantage of this increasing home demand, but the problems of European forestry are compounded by traditional adherence to a costly and labour intensive form of silviculture — an expensive and highly destructive game population — slow growing and slow maturing species and top heavy administration.

The growing imports of forest products influence European timber market prices. It is not thought desirable to control imports so as to give the home grower an advantage. An improvement in the economics of European forest enterprises has to be sought through lowering production costs rather than increasing the prices for standing timber.

The greatest impact on future production costs, we are told, will be achieved through further mechanisation in felling and extraction — in mechanisation of planting — in concentration on high yielding conifers on high yielding land, in rationalisation of tending tree crops,

from grass cleaning to pruning and thinning; concentration of thinnings; concentration of final fellings — including clear cutting on larger areas; wider spacing in plantations, consolidation and concentration of forest areas.

That there is a real threat to European forestry, as present practised, can be judged from the reports of overcutting in order to make ends meet — of wholesale sales of small private forests as development sites, of lack of interest in private forestry and so on.

The professional foresters who have been examining the problems of European forestry have diagnosed the main troubles and are prescribing remedies.

It appears that more than ever before, forestry practices are being affected by :

1. The rapid upsurge of technology, the growing fund of scientific knowledge and the increasing developments in allied fields such as agriculture and the biological sciences.
2. The development of the economy and the changed or changing position of wood as a raw material.
3. The flight from the less developed and rural areas and the changes in social conditions.

The fundamental changes in forestry that were ushered in around 1948, some twenty years ago, are now beginning to make an increasing impact, notably the success of man made forests in New Zealand, South Africa and the tree farming movement in the U.S.A., and the remarkable studies in research on tree physiology — tree genetics, tree nutrition — soil science, particularly in the U.S., Japan and Europe. The unravelling of the mechanism of photosynthesis, the uptake of soil nutrients, the role of microorganisms and enzymes in tree nutrition, are leading to a clearer understanding of the relationship between the soil and the plant.

The time is passed when all that is needed to make a selection of species is the naming of a few indicator plants and a glance at a soil profile. The forester must recognise that more than one-half of the production increase in European agriculture is due to the use of fertilizers and one quarter each to soil preparation and plant breeding. Foresters have only begun to use fertilizers and selected plant material and to prepare the soil.

Silviculturalists visualise that before long, man-made plantations, with high yielding tree strains — probably clonal material set out at final espacement like poplars will be the rule rather than the exception. These orchard like stands will be kept weed free and will be fertilized and sprayed with insecticides and fungicides as required by machines. The optimum date and type of cutting will be precisely determined by field probes — just as is done today with most field crops from corn to grassmeal. Finally the production potential of the

trees and the site will be known and will be kept at peak level by an accurately calculated application of plant nutrients in an acceptable form.

If these orchard like forests are to serve the needs of wood based industries they have to be large enough, high yielding and concentrated so that the scale of the industries can be large enough to be economic. The policy must be to concentrate efforts where they will give the best returns.

The growing population and the increasing prosperity in the cities and towns give more people more leisure time and opportunity to get out into the country. Tourism has become a major source of income for this country as it has for many European countries.

Foresters must take opportune measures to ensure that enough of our suitably located woodlands are designed and maintained to satisfy the growing demand for recreational facilities. It appears that the type of silviculture in recreation areas must be along very traditional lines, with natural regeneration, long rotations and indigenous or native looking species. This type of forestry may well be handled to cater for the requirements of high class decorative wood trades which are bound to flourish in affluent societies. It would be most unwise for forestry to ignore the trends and possibilities.

The rapid changes referred to have led to many changes and amendments in forest policy and forest legislation in Europe. The serious situation of private forestry is recognised and massive aid is available in most countries. In Denmark, planting grants, now cover half the afforestation costs and new plantations on waste land are exempted from rates and taxes for 60 years. In the Netherlands subsidies for afforestation cover up to 80% of the total costs and 5% of the budget of the State Forest Service has been set aside for subsidies for associations interested in purchasing and restoring forests. Since 1966 The Dutch State Forestry Service has been charged with responsibility for Silviculture and Landscape Architecture. It is also increasingly involved with the authorities concerned with the management of nature reserves, town and country planning and recreation. The increased demand for recreational facilities has made it desirable to involve private woodlands to an increasing extent and the State now offers grants of up to £2 per acre per annum to woodland owners who are prepared to keep their woods in an attractive state and open them to visitors.

The wood processing industry in the Netherlands is concerned about the future home supply of industrial wood. It has now established the Industrial Wood Foundation which will keep the whole question of industrial wood supplies under review and has the special task of promoting and subsidising the planting of quick growing species by land owners of all kinds.

Coming nearer home the General Review in the Annual Report of the British Forestry Commission for 1966- reveals that the respon-

sibility for forestry in England was to be transferred from the Minister of Land and Natural Resources to the Minister of Agriculture, Fisheries and Food as from 16th February, 1967.

In June 1966 about half the Headquarters Staff were transferred to a new office in Basingstoke under the Government's decentralisation scheme. However, most of the senior officers have remained in London which is still the centre of administration.

The report shows that afforestation in Britain is running at around 54,000 acres of State planting and 32,00 acres planted by private owners.

1968 Study Tour
County Donegal

COUNTY DONEGAL

Co. Dun na nGall ("Fort of the Stranger")

AREA: 1,193,000 acres.

ENCLOSED FARMLAND: 390,000 acres.

Mountain, Moorland, Rough Pasture: 800,000 acres (Highest proportion in Ireland).

AGRICULTURE

20,000 holdings owned by 15,000 farmers, 75% having less than 50 acres.

SIZES OF HOLDINGS (1965)

1-15 acs.	15-30	30-50	50-100	100-200	200 and Over
8,270	4,565	3,027	2,715	1,208	469
41%	23%	15%	13%	6%	2%

TILLAGE: 66,400 acs. (17%)

Barley	Oats	Wheat	Potatoes
7,500 acs.	36,000	900	22,000

POPULATION

Total: 108,486 (1966 census) (36.5% of the total resident in the county in 1841).

Emigration rate 1961-66: 1.5% per annum (over twice Republic average).

Between 1951 and 1961 almost 40% of the 15—24 age group emigrated from the rural areas.

TOTAL WORK FORCE: 40,700 (1961)

Agricultural Occupations: (1961) 22,800 (53% from 1926).
Agricultural Occupations: (1926) 48,800.

FORESTRY:

Total Acreage: 50,000 acs. approx.
Productive Acreage: 40,000 acs. approx.
Planted to date: 35,000 acs. approx.
Potential of forest land in county: 250,000 acs.
Districts: 2
Forests: 19
Labour Staff: 360

GAELTACHT

Covers one-third area of county but only contains 15% of population.

First Day June 11th.

Mr. O'Donovan, District Inspector, welcomed the bus party to Donegal as we travelled to our first stop at Raphoe Forest. Professor Clear welcomed members on arrival at Mongorry Property, where the tour leader, Mr. Johnston, introduced the forester in charge, Mr. Seamus O Domhnaill, a chuir chead mile failte romhainn go Dun na nGall agus da foraois fein go h-airithe.

The sun shone and the extending shoots of the young *Pinus contorta* plantations all around us, with their bright brown clusters of male flowers, all and each proclaimed high summer.

The existence of a block of almost 1,400 acres of plantations, all aged under 15 years, pointed up the scale of planting in such areas where convenient acquisition offered. Only in later years had Clarke ploughing become available to break the iron pan over underlying quartize.

These upland properties of Mongorry and Dooish overlooked the valley of the Swilly with Muckish mountain rising as a dramatic back-drop. In the valley is some extremely fertile farmland, affording contrast with the upland grazing areas and forest plantations.

Our second visit was to a 25 year old Sitka spruce stand in check at the small timber category stage. This was in Corravaddy Property of Letterkenny Forest, Compts. 1, 2, 3. An arithmetical rate of decerase in width of annual rings in recent years had caused investigation and various fertiliper rates and types were being employed experimentally.

The absence of precise soil data for such conditions was regretted, due to the likely inter-action between any added P and the existing iron pan. The stand's condition called forth many points of view, including Professor Clear's ready comment that such sites of 200 yield class would repay a better return on the nation's investment in fertilizer than would be possible from pasture. He alluded to current Finnish

practice, where he had recently visited, and the Finnish method of hand distribution of urea—rather than of phosphate. Costs for labour and material are not likely to exceed £1 per acre. Mr. Kilpatrick told of recent purchase by N.I. Ministry of blowers to give coverage of up to 2 chains wide.

In view of exposure in Donegal—which was to be impressed on us again and again, no doubt to prevent us from being deluded by the balmy weather we enjoyed—the point was made that a check at such an age might suggest that short rotations might be the basis of management in general, and that manuring would likely have a part to play in advancement of saw log sizes where the investment of fertilizer would be quickly realised in the more sheltered and productive areas.

J.F.D.

AFTERNOON JUNE 11th.

GLENVEIGH

"This castle hath a pleasant seat, the air nimbly and sweetly recommends itself unto our gentle senses".

Macbeth Act 1, Scene 6.

Even those in the party who were accustomed to beauties and contrasts of our Irish countryside were moved by the strange grandeur of this remote corner of Co. Donegal. Here some 17 miles north west of Letterkenny, lies this haven of enchantment, Glenveigh Castle.

We were welcomed by Philadelphia born owner, Mr. Henry McElhenny and his agent, Mr. Julian Burkitt, who treated us to a brief outline of Glenveigh's history. The present estate, around 30,000 acres in extent, was first owned by a Mr. John Adaire from Ferbane, Co. Offaly.

The castle, an impressive building overlooking Glenveigh lake, was built between 1863 and 1873. It is now believed that the money for the building of the castle and "buying out" about 250 small holders was provided by John Adaire's wife, an American-born heiress. The local tradition is that some "persuasions" and an appropriate amount of cash was supplied to facilitate the emigration of the dispossessed smallholders to Australia and that most of them settled in Victoria.

The mountains of Derryveigh contained, at that time, the already dwindling remnants of some native red deer *(Cervus Elphus)*. These deer were enclosed about 1880 by a 28 mile long deer fence and new blood was introduced from Scotland to strengthen and improve the stock.

Primarily run as a deer forest of 28,000 acres, the estate was then and still is, the only one of its kind in Ireland.

By 1890, when John Adaire died, the stock had increased to around 1,100 head. His widow continued to maintain the deer forest until her death in 1922 preserving the deer fence and winter-feeding the stock. After her death considerable local pressure was brought to bear on the authorities to divide the estate but without success. While the agitaion was proceeding the deer forest was virtually derelict. The present day stock at Dunlewey and Meeniroy is thought to date from that time.

The estate remained in this condition until 1930 when an American, Prof Kingsley Porter, when on a visit to the area succumbed to its charm and offered to buy the entire estate if the deer fence was restored. The purchase price was eventually agreed on and this 30,000 acre state with its castle, deer forest — the deer fence restored—and a herd of deer was acquired for a sum which we were told, would not now purchase an average size suburban house. The professor introduced new stocks of deer from Scotland and for a few short years enjoyed deer stalking in the best Scottish tradition. In 1937 Professor Porter disappeared tragically off the coast of Innisboffin and the estate was again on the market.

In 1938, the present owner, whose great grandfather came from Milford, purchased the estate and at once started the mammoth task of making the now internationally famous gardens of Glenveigh. Plants and shrubs were brought from at least four continents.

The gardens are about 10 acres in extent and the formal layout usually associated with gardens of a former age is nowhere apparent. The mass of colour provided by the quite extraordinary variety of rhododendrons and azaleas was in striking contrast to the austere wilderness of the adjacent mountains and lake.

Under the expert guidance of both Mr. McElhinney and Mr. Burkitt the party had the fascinating experience of a journey through what might well be described as a botanist's paradise.

Quite apart from the botanical significance of the Glenveigh gardens, there are other interesting features in this unique estate. A the southern end of the lake, which is 2½ miles long, lies some 200 acres of natural oak, holly, birch forest. *Rhododendron ponticum* is presently threatening the natural regeneration process of the oak and plans are afoot to clear the dense understore to encourage the natural regeneration. The importance of this work of conservation was, of course, of particular interest to foresters and encouraged a lively discussion on chemical methods of eradicating the rhododendrons. These methods, while successful, were subject to the limiting factor of cost, which even for a wealthy owner was an important consideration.

Another important aspect of conservation at Glenveigh was the red deer herd. Standing as it does at approximately 800 head, it represents about 75% of Ireland's red deer population. Three or four hinds obligingly showed themselves to us during our visit.

Poverty of natural feed and the expense of deer fence main-

tenance makes the conservation of this, the largest wild animal in Ireland a gargantuan task.

Mr. McElhenny is to be commended for the substantial contribution he is making in preserving a remarkable Irish heritage.

Our President, Prof. Clear closed the afternoon's visit to Glenveigh by expressing to Mr. McElhenny the thanks of all present for the pleasure of allowing the party to visit the estate and for the time both he and Mr. Burkitt gave to make this visit so memorable.

We returned to Lifford at dusk via the scenic route of Bunbeg, Bloody Foreland and Gortahork.

F.M.

Second Day

Our second day of the tour commenced with a visit to Killygordan State nursery, where we were introduced to the Forester-in-charge, Mr. J. Darcy, and his two assistants, Messrs. D. McBride and F. Tormey. The nursery, first opened in 1963, overlooks the Finn valley, elevations varying from 107 to 207 feet O.D. The soils, developed from glacial drift which is composed mainly of mica schist and gneiss with some granite, vary from acid Brown Earths at the lower levels to Brown Podzolics at the higher elevations. Their favourable textural, structural and physiographic features are conducive to good drainage conditions. Chemical analyses carried out in 1965 showed pH levels to be strongly acid while phosphorus and potasium levels were low and moderately low respectively. The nursery occupies a total area of 56 acres and is highly mechanised and intensively managed. Before proceeding on a tour of the area Mr. O.V. Mooney provided us with some interesting general information about nursery production in the State Forestry Service. The Forestry Division now own twenty nurseries amounting to 787 acres. All are located on mineral soils. A breakdown of these figures shows that twelve of the nurseries, amounting to 677 acres, are now largely mechanically operated, six of the smaller ones, amounting to 64 acres are hand operated, while the remaining two, accounting for 46 acres could be classified as being semi-mechanical. The production target is to supply adequate plants for the 25,000 acre annual planting programme. In the 1967-68 season thirty seven million plants were produced, while a total of 1,455 pounds of conifer seeds and 8,625 pounds of hardwood seeds were sown. These figures for pounds of seeds sown are a reduction on previous years due to improvements that have come about in the field of seed germination. For example, seedling production from 1lb of *Pinus contorta* seed has been increased from 25,000 to about 90,000 but may be much higher, production at Killygordon has reached 134,000 seedlings per pound of seed. The same trend holds for Sitka spruce where figures have risen from 30,000 to an average of about 80,000 and at Killygordon have reached 110,000. These figures coupled with great progress in chemical weed control and general mechanisation have reduced costs of production

considerably despite rising labour costs. It is being planned currently to put a pilot Nursery Center Building at Killygordon which will provide office accommodation for the forester together with canteen and toilet facilities for the staff. Space for a workshop and storage for machinery will also be provided.

After Mr. Mooney's talk, Mr. Darcy gave us a comprehensive outline of the nursery stocking and the fertilisation, mechanisation and weed control methods used at Killygordon. The stocking for the 1968 season was as follows:

1 year seed beds	5.0 acres
2 year seed beds	4.5 ,,
Seedlings lined out ...	16.5 ,,
Transplants	7.0 ,,
Green crop	9.0 ,,
Fallow	6.5 ,,
Productive nursery area ...	48.5 ,,
Unproductive, Roods, etc. ...	4.68 ,,
	53.18 ,,

Manurial Treatment :

Transplant lines : 4 cwt. per acre of 0.10.20 at lining out.

Seed beds 4 cwt. per acre 0.10.20 to all species except *Pinus contorta.* The latter receives 14 lbs. per 100 yards of effective bed of 0.10.20. This helps to produce a strong 1+1 plant.

Green crop : 3 cwts. 10.10.20 per acre to green crop sown in May.

Weed Control :

Transplant lines : 4 lbs. Simazine per acre in 120 gals. water applied with knapsack sprayer. The rate is reduced to 2lbs. per acre for *Pinus contorta* and Japanese larch.

Seed beds : Pre-emergence spraying : 1 pint Grammoxone W. per acre.

The various machines attached to the nursery were then demonstrated to us. The immediate impression to be obtained was the high degree to which all nursery work has been mechanised. The loading of the sander from a tipping trailer and the attachment of discs to the plant lifter for the purpose of isolating the lines of plants, were typical examples. While a demonstration of the rapidity with which seed beds can be sown, and covered with sand, was in progress, Mr. M. McNamara expressed the view that too much grit and too little humus was being added to cover seed beds and that soil exhaustion could come sooner than expected. Mr. Darcey argued that fallowing and green cropping would prevent this happening, while Mr. Ryan felt it might be better to use peat moss for this purpose. Mr. O'Driscoll claimed that the use of grit in recent years had been mainly responsible for the improvements in seed germination. On the other hand it was stated that very encouraging germination

figures had been obtained in a small experiment at the Agricultural Institute's Peatland Experimental Station, Lullymore, Co. Kildare on milled peat. Some peat soils would be highly suited to nursery work and Bord na Mona should be made aware of this potential.

As we walked through the nursery we were impressed by the long weed free rows of healthy plants. However, losses were observed in some lined out *Abies nobilis*. Mr. Cosgrave thought that exposure might be the causal factor while Mr. Donovan suggested damping off as a possibility. Mr. Mooney informed us that such high losses were widespread with *Abies nobilis* generally and that so far no explanation had been found.

The outstanding feature of Killygordon nursery is the high quality of plants produced. Bearing in mind that the nursery is only five years in existence, and that the staff are all young, great credit is due to all concerned for a job well done.

2nd Stop :

Our second stop for the day was at Monellan Property, part of Killygordon Forest. This property, containing 130 acres, was formerly the demense land of the Delap estate. The acid soil, derived from glacial drift of predominantly gneiss and schist composition, can be described as a Brown Podzolic. Texture varies from sandy loam to loam.

In 1928 it was purchased by Henry Myers and Sons, who cut, converted and sold its stock of timber. At that time the wood contained an assortment of hardwoods, a block of Norway Spruce on the western side, some Scots Pine and European larch. The block of Norway Spruce was completely uprooted by a storm in 1930, by which time it had attained a height of about 100 ft. The Beech was exported to England for furniture making and most of the Oak was sold to the Northern Ireland and Donegal Railway Companies for sleepers. The Larch was used for boatyard material at Killybegs and the Norway Spruce for roofing material. It took ten years to complete the cutting and removal of the timber.

In 1939 the area was acquired by the Forestry Division. Laurel and rhododendron which were then in abundance were cut and either sold for firewood or burned, to facilitate planting.

Main species used were Sitka and Norway Spruce, pit planted at 5 ft. apart. Beech was planted in rows along the existing roads and a small group of Oak and Ash in an alluvial area.

Frost retarded growth in part of the area in the earlier years.

Mr. S. McNamara supplied us with figures obtained from sample plots taken in the area and told us that we were seeing probably the best stands of spruce in Donegal.

SAMPLE PLOTS

PLOT 1 *Compt.* 7 *S.S.*

	Age	S.P.A.	Top Height	Mean B.H.Q.G.	Basal Volume	Standing Area
PLOT	28	480	64	$7\frac{1}{4}$	179	5480
Y/C 260	30	249	70	$7\frac{3}{4}$	106	3440

	Age	S.P.A.	Top Height	Mean B.H.Q.G.	Basal Area	Standing Volume
PLOT	28	680	48	$5\frac{3}{4}$	153	3460
Y/C 220	30	390	$55\frac{1}{2}$	6	96	2285

Comparison of these figures with the Management Tables show both stands to be very overstocked. The main feature of the figures, however, is the greater volume production from the Sitka spruce. The production figures for both species are also a reflection of the high suitability of the site for timber production.

Professor Clear made a case for extending Sitka spruce onto better land while Mr. Mulloy supported him and criticised the many marginal subsidy schemes being given to farmers in possession of what were inherently poor agricultuaral, but highly productive forest soils. Leitrim and Cavan were two counties where large areas of such land existed. It was pointed out that the Forestry profession have failed in their duty to produce sound and understandable production figures for such, or indeed any, sites. We must go further than Yield Class to convince economists of the untapped potential. Much remains to be done.

M.L.C.

WEDNESDAY AFTERNOON

Following lunch at Stranorlar the party continued to Ballybofey forest where Mr. J. P. Dowds, head forester and his asistants Mr. J. J. Galvin and Mr. J. Fogarty were introduced.

The area of Stranorler Forest is 6722 acres of which 4832 acres are considered plantable. To date 4400 acres have ben planted leaving a reserve of 432 acres. The planting programme for the coming season is 250 acres. This forest has a labour staff of 45 men.

Stop 1 :

The first stop was at compts 43-48 which had been planted in 1960 with contorta pine. The adjoining plantation across the border was of Sitka spruce.

Croghonagh property of Ballybofey forest was planted between 1951 and 1962 with contorta pine of the Lulu Island provenance on both double and single mouldboard ploughing and with 3½ cwts per acre of G.M.P. spot applied after planting. Compts 32 and 37 which were planted in 1957 showed a yield class of 60 when they were assessed in 1966. Across the border in Co. Tyrone an area of similar type peat under the control of the Northern Ireland Forestry Division had been treated in a different way. Here the area was treated with 1½ cwts of G.M.P. per acre broadcast by machine before ploughing. During ploughing racks were left at 1 chain intervals, for access by machines for transport of men and materials and for ease of extraction later. The area was planted with S.S. in 1967. A complete change in vegetation followed this treatment. The original vegetation was scirpus calluna but it is now lush molinia with the S.S. looking promising at this stage. The merits of this system were discussed at length and it was felt that the absence of main drains may produce problems in the future. The adventurous nature of the ideas adopted by the Northern Ireland service was applauded especially their extensive use of machines where possible.

Mr. Marin, the Northern Ireland forester demonstrated the use of the Snowtrack and Muskeg machines.

Stop 2 : Meencaragh property Compts. 1—12.

The original acquisition was 320 acres all of which have now been planted. Planting was carried was carried out in 1941-2 and was among the earliest ventures in moorland planting in the Northwest. Mounding and drainage were caried out manually.

Figures for two sample plots taken were—

Plot 1—Jap Larch

Plot	age	s.p.a.	Top Ht.	Mean 13HDG.	13.A.	Volume
Yl. Cl 240	27	370	50	6¼	103	2730
	25	283	48	5½	62	1410
			Plot 2—Sitka Spruce			
Plot	27	405	57	6	100	2635
Yl. Cl 120	25	400	54	5¾	93	2200

The soil was Brown podsolics and acid Brown earths on mixed predominantly mica schist and gneiss materials.

Following an interesting discussion on the S.S. sample plot the party returned to Lifford.

B.O'R

Morning of Thursday, 13th., June

Stop 1 :

The first stop of the day was made at the Franciscan Capucin Friary at Ards House. Here members of the group were able to attend Mass, After admiring the splendid view of this part of the Sheep Haven, the tour proceeded to its next halt.

Stop 2

This was at the Irish National Veneer Industries factory at the edge of Ards forest. The party was welcomed by Mr. Valkenborgh, the Managing Director, and proceeded to see the method of veneer production.

Logs are first of all squared or quartered, depending on size. These sections are then steamed in special cellars for 65 to 70 hours, and then pass to the veneering machines. Here, veneers are sliced off the log portions in flat sheets, are stacked, and pass to a packaging bay, prior to export.

The group saw a band-saw being mounted and a three foot diameter log being quartered. A variety of imported and home grown timber was being used, and one particular Sapele log weighed about 12 tons. The interior of one of the steam chambers was open to view. There were two veneering machines, one of which, a newer type, was fully automated. The latter was shown operating at different speeds, with two men handling the veneers; these were then stacked, before being dried artificialy. This was followed by trimming to standard sizes, with a guillotine. bfore finally packing.

Stop 3 :

After driving a short distance through the forest towards the shore, the party left the bus and walked up a side road to a vantage point, affording a panoramic view of the immediate coastline and surrounding forest. Prior to this, Mr. Johnston had introduced Mr. Farrelly, the Forester-in-Charge, and Mr. Boyle, his assistant. He now opened a discussion on amenity and the possibility of a National Forest Park in the area. Mr. Durand mentioned that "Forest" should be emphasised in this title, as active forest development would still take place in such a region. If there were to be recreational development, local opinion, including County Council would have to be consulted. Sheltered sites for cars, caravans, etc., might have to be provided, as well as road improvements. Overnight accomodation could be arranged in surrounding towns, such as Dunfanaghy, and visitors could be drawn from further afield—from Strabane, Lifford, or Derry. It was too early to define the exact area of such a Forest Park.

Mr. Johnston described the location of the area concerned. It was near the end of a peninsula, with quite an amount of scrub, and an element of conservation might be introduced. A caravan park could be positioned near the sand-hills, less than a mile from good strands.

There was a great variety of flora in the forest, and nature study could be an important introduction.

It was also suggested that specific route-walks could be planned, and road-maps prepared of the area, which was already well roaded. Pony-trekking might be introduced, but apart from the main access road, cars should be discouraged. Two caravan sites might be prepared. Some felt that grants could be supplied to encourage private enterprise to provide overnight accomodation, but this might harm local interests.

A caravan park providing forty caravans and services, would cost a minimum of £40,000, and would have to be of the best. A Forest Park should be under Amenity Section, and not controlled by a combination of interested bodies. One function of the forester could be to give short instructive talks, and with the introduction of people to the forest, a new aspect would be given to his life.

This completed the morning's programme, and the tour moved on to lunch in Dunfanaghy. C.K.

13/6/'68. Afternoon

From Dunfanaghy we entered the country of McSwiney and Mr. Johnston showed us Doe Castle their fortress. They were gallowglasses to O'Donnell. We proceeded to Carrigart, and thence by the Ocean Drive of Paul Henry fame past Tra na Rossan and Downings to Mulroy House.

The Countess of Leitrim introduced us to her propagation centre for rhododendrons, which is run by Mr. Bergstrom. Many are raised from seed and 80-100% germination is normal. In all, 147 species have been grown and different kinds of compost are used for many species. Labour content of grafting is too high to allow it as an economic method. Cuttings in September will be rooted in March under plain glass. The names of varieties often become mixed, but Mr. Bergstrom was not worried by this. Dwarf rhododendrons retail at 10/- to £1 each. Mr. Ryan said that Wicklow was more suitable as the Mulroy climate was too damp.

We were then shown into the Rose garden. All roses were imported from Germany and have the advantage over Irish roses that they flower from June to October. The Countess asked about shelter trees and Sitka spruce and Cupressus macrocarpa were recommended. Prof. T. Clear suggested she use 'Renadin' mixed with cowdung as a repellant for rabbits. Our afternoon drawing to a close, Prof. Clear expressed the thanks of the Society on behalf of all present.

On our departure, we drove beside Mulroy Bay towards Milford and some islands planted with Sitka spruce were pointed out to us. Mr. Johnston said that the Department hoped to gain possession of the rocky headlands along the shore of the bay. The spot where Lord Leitrim was assassinated by the Fanad men was shown to us on our journey to Lifford via Letterkenny. R. O C.

Visit to the John Fitzgerald Kennedy Park 7th July, 1968.

Mr. A. M. S. Hanan received the party on behalf of the Minister for Lands. Professor Clear, President of the Society, expressed appreciation on having the honour of signing the visitors book immediately following the notable entries of May 29th. This was the first official visit to the J.F.K. Park since the opening day 29th May.

Mr. Hanan gave a brief account of the background.

Shortly after the tragic death of the late President of the United States of America in 1963, it was decided to provide a fitting memorial in Ireland in the form of an arboretum and forest garden. This project was financed jointly by Irish American contributions and the Irish Government and is administered by an Inter-departmental committee consisting of representatives of the Forestry Division of the Department of Lands and the Department of Agriculture. The Office of Public Works undertook the design and erection of buildings, the construction of roads and responsibility for the provision of water supplies.

The site chosen was at the foot of Slieve Coillte—a commanding hill rising above the Kennedy ancestral home at Dunganstown, Co. Wexford, and 7½ miles south of New Ross. The terrain is slightly sloping to the S.W. between 120 ft. and 600 ft. above sea level. An intensive soil survey found the site to be suitable for tree growth. It is a deep brown earth with a pH of about 6.2. The underlying rock is ordovician schist.

The climate also is considered favourable and the average rainfall is 40 inches per annum. The region is situated in an area noted for its high annual sun duration.

Objectives

1. The provision of a comprehensive, scientifically laid out and fully documented arboretum.

2. The establishment of a series of forest plots to provide a silvicultural knowledge of a wide range of species.

3. To mould these two objectives into an amenity park which will not only provide a place to enjoy leisure in beautiful surroundings but also serve to stimulate interest in the more enlightened use of woody plants.

Historical Background

Historical records support the belief that the hill derives its name Slieve Coiltia, The Mountain of Woods, from the fact that it was densely wooded in ancient times. Its main claim to more recent fame

is, however, its association with the Rising of 1798. It is commemorated in the words of the old song "Boolavogue".

"We took Camolin, Enniscorthy
and Wexford storming drove out our foes
'Twas at Slieve Coiltia our pikes were reeking
with the crimson stream of the foes."

Acquisition :

The Minister for Lands took formal possession on the 22nd. July, 1964, of an area of almost 390 acs. which forms the main block of the park. A further area of 70 acs. was acquired subsequently.

Visit of Study Group to America

A group of officials including experts on afforestation and botany travelled to America in May and June of 1964 to see at first hand Arboreta and Botanical gardens in that country. The group visited the Arnold Arboretum, Mass., Brooklyn Botanical Gardens, The New York Botanical Gardens, Longwood Gardens, Pennsylvania, National Arboretum, Washington D.C., the Morton Arboretum, Chigago, and University of Washington Arboretum, Seattle. The party were most appreciative of their reception in America and of the very valuable assistance they got from all with whom they came in contact.

Contributions by Governments, Arboreta and Institutions

Co-operation has been received from many Governments in the development of the Park. Already 20 countries with whom Ireland has diplomatic relations have either sent plant contributions or indicated their intention of doing so as soon as conditions are suitable.

Great assistance has been received from the Northern Ireland Ministry of Agriculture.

Arboreta and similar institutions in many parts of the world have also taken a practical interest in the project and have offered plants.

Amenity and Recreation

While the main aim of the Park is educational and scientific the park is also being designed to provide for amenity and recreation.

A network of roads and footpaths will afford a wide variety of walks in pleasant parkland settings with convenient shelters and resting points.

A picnic area with tables and water supply is situated within 100 yds. of the main reception centre.

A spacious car park is provided. Cars will not be allowed beyond the car park in the main park area.

There is however a special motor road giving access to a viewing point at 630 ft. above sea level with a panoramic view of Counties Wexford and Waterford including the Saltee Islands, the confluence of the Rivers Suir, Nore and Barrow and the Comeragh Mountains.

Buildings

The Reception centre constructed in Liscannor stone and western cedar is roofed with copper.

The building provides office accomodation and fully equipped lecture room and a large lobby. In the latter are sited display panels including the plan of the John F. Kennedy Park, a map showing arboreta and gardens in Ireland and a world map showing vegetation zones contributing to the arboretum.

Here are artists' impressions showing Plant Evolution and the Flant Kingdom. There is also a model of the Park.

The buildings are laid around an extensive terrace paved in Liscannor stone.

The Kennedy Connotation

John Fitzgerald Kennedy is specially commemorated by a Memorial Plaque in limestone on a granite background situated at the entrance to the building which reads :—

This Park is dedicated to the memory of John Fitzgerald Kennedy, President of the United States of America from 20th January, 1961 to 22nd November, 1963. It is a tribute to the life and work of President Kennedy from United States citizens of Irish origin, organised by the combined efforts of Irish American societies and executed through the co-operation of the Irish Government.

On the terrace is a commemorative fountain hewn from a single block of granite and weighing over ten tons.

The fountain bears the words :

"Ask not what your country can do for you, ...
Ask what you can do for your country."

and the Irish translation :

Ná fiafrigh ce'n mhaith duit do thír,
fiafrigh ce'n mhaith don tír tú féin."

Stop No. 1. International Phenological Garden.

Mr. Hanan described the International Phenological garden scheme which is administered from Offenbach in Germany. It is one of many similar gardens planted in 32 different countries. The plants in all the Phenological gardens are genetically similar being grafted from the same parent plants in Germany. Theoretically the only element affecting the timing of the various phenological phases (conspicuous phenomena of growth) is climate.

Averages of the recorded dates of the phenological phases are obtained for each group of three specimens and the results recorded for comparison with national and international phenological gardens. In this way valuable information on climate trends will be compiled.

The grid system and specimen planting in the arboretum was then explained by Mr. Shekleton.

About 270 acres have been dedicated to the arboretum proper, most of this land is bare pasture but some existing old woodland has been included.

Plant Arrangement

The arrangement of the plants is being determined by Taxonomic classification, the full range being covered in two circuits of the arboretum; one circuit covers the gymnospermae and the other the angiospermae. These two are at times interspersed to improve the overall appearance of the arboretum. The classification being used is broadly that of Englir and Prantl. Three plants of each species are being used, due regard being paid to colour, size and shape for optimum placing.

While recognising that trees are the major objective of the arboretum it is hoped nevertheless to include a wide variety of shrubs capable of growing in this climate. It is estimated that the collection when complete may include up to 6,000 species.

Planting started in 1967. Boundary and internal shelter has been provided using a wide variety of evergreen and deciduous trees. Further amenities include ornamental streams, a small lake and a series of interesting vistas.

Reference Grid

For ease of plotting and indexing a system of numbered grid points was laid out, each point being at the corner of one acre squares. The markers consist of sunken concrete blocks numbered and set to the cardinal points of the compass.

2nd. Stop

A discussion on the treatment and amenity value of existing woodland was held. Mr. Hanan indicated the treatment already undertaken in drainage and the removal of undesirable scrub. The woodland consists of Ash, Oak, Scots pine, Cherry, Beech, Alder, Elm and Sycamore with an understorey of hazel and holly. The ground vegetation was characteristic of mixed old woodland being mainly blue bell, lesser celandine, wood sorrel, ivy and woodbine. It was agreed that the woodlands be left in their natural state.

A short acount of the Park fauna was given. About sixty species of birds have been observed in the Park as well as foxes, badgers, hedge hogs, stoats, rats, field mice, hares and rabbits and various species of bats.

Worthy of note was the prevalence of field mice in conjunction with the appearance of the short eared owl in 1966 and the reappearance of the Hen Harrier after many years of absence. The presence of a number of predators such as Blue Jay, Grey Crow, Sparrow hawk and Kestrel resting in close proximity to game birds like the partridge and pheasant is also worthy of note. It was accepted that efforts to eliminate the Grey Crow should be undertaken.

Following a pleasant walk through the woodland path the party assembled on the lakeside beside shelter No. 3. The treatment of a 6 acre block which was sprayed with gramoxone and planted with various hardwoods and conifers was discussed. The amenity value of the prolific bloom of wild flowers was noted. Mr. Hanan pointed out the extent of the Park, the boundaries of which could be observed clearly from that point. A 1¼ acre lake recently constructed was discussed.

Stop No. 4.

At the chamaecyparis area Mr. Hanan gave an account of the external shelter belts which consist mainly of large mixed hardwood and conifers. The internal shelter belts were then discussed. In view of the apparent exposure to the South-West a system of curved shelter belts was laid out throughout most of the arboretum across the prevailing wind and at intervals of 38 yards. This shelter is intended for the permanent specimen trees and will be removed gradually following establishment of the specimen collections.

Mr. C. McGill, assistant forester, discussed the Meteorological Station attached to the Park.

1. Standard pattern sunshine recorder.
2. Tilting siphon air recorder.
3. Standard rain gauge.
4. Class A pan.
5. Stevensons screen with dry, wet, max. min. thermometers.
6. Thermometers at 2", 4", 8", under soil surface.
7. Grass min. thermometers.
8. Bare soil patch.
9. Cup counter anemometer mk. II.

Observations are recorded daily at 09.00 G.M.T. and include cloud amount, present weather, wind speed and direction, and a coded weather diary covering the previous 24 hours.

Stop No. 5.

Mr. Shekleton gave a brief talk on the newly established clonal collection from the Shelton populetum. There will be approx. 100 individual trees with provision for expansion.

A short description was given of the forest garden and it layout. The area is divided into one acre squares leaving adequate rides and roads between plots.

About 140 acs. were set aside to establish plots of all trees which were thought likely to form a forest crop on this site. The number of species likely to be used is about 250 and plot size will vary from 1 acre to ¼ acre.

It was decided to use a geographical classification in the forest garden by allocating areas to each of the five continents.

To date 56 species, mostly of North American and European origin have been planted covering 40 acres.

Review.

The Management of Forests.

by E. C. Osmaston; Published by George Allen and Unwin Ltd., London.

" In comparison with other uses of land forests are large, sometimes very large covering hundreds of square miles, often scattered in many pieces so that one forest may be used for a variety of purposes and worked in several different ways on separate time tables of work and with separate units of manpower."

Consider with this quotation from the work under review the fact that the production processes involved together with the interaction of factors which effects that process take place over a a period of fifty years or more and one is presented with a very close appreciation of the complexities of the forest maanagement field. The process of management has been defined as the dynamic factor which provides cohesion and purpose to the various activities of people working in co-operation with each other towards a common objective.

This envisages an application and appreciation of management elements under the headings of planning, co-ordination, leadership and controls in the efficient working of the process. The interpretation of these basic principles in the context of a forest management process is because of the factors mentioned above an extremely difficult task. It requires a cohesive presentation of interacting precepts relative to various sciences, viz., economics, silviculture, mensuration, pedalogy, hydrology etc., in the light of their impact on the process of achievement of forest objectives, a truly herculean undertaking.

"The Management of Forests" achieves this in a most creditable manner. At the outset the basic scope of the forest management process is outlined in a manner which places in perspective all the interacting factors which are going to influence the process. It defines the objects of forest management in the most modern interpretation of what these objects are. It stresses the multiple land use aspects of forestry enterprises. The service and social functions of the forest in modern society are not overlooked.

The most up to date statistical analyses of the trends of world and national demands for forest produce are made available for study and interpretation.

This creates the setting for a presentation of the ideal — the normal Forest and a policy of sustained yield. Mr. Osmaston here however shows a very keen appreciation of realities when he refers to the necessity for flexibility in striving for perfection and emphasises the achievement of what is "practically attainable" rather than the rigid pursuance of an ideal. "The forester always has to deal with the growing stock and land in his charge as they actually are. It is

their present condition tempered by their potential productive productive capacity in relation to current and expected future markets that influences all planning and action."

This concept inevitably leads to consideration of the Growing Stock and its Increment and their impact on Yield Regulation. This indeed is the most significant sector in any work on Forest Management. The business of Forest Management is basically a process of control and/or manipulation of Growing Stock to meet predetermined yield objectives. This is dealt with in a most comprehensive style. To assist towards a clearer understanding of the principles inherent in various methods of regulation the well worked out hypothetical examples are extremely helpful. The whole purpose is summed up in the following extracts.

"The several methods of yield regulation that have been described demonstrate methods that have been devised to satisfy the principles that effect yield regulation. The basic principle is to prescribe a cut which guides the existing growing stock closer to that state which best satisfies the objects of management."

And in the context of our own (Irish) particular state of development . . .

"Yield regulation then becomes in reality a matter of combining the utmost use of what is available with the wise conservation of growth potential until more precision of purpose and method can be attained."

Having developed the principles applicable and the methods to be adopted in their application the vehicle of implementation must then be considered. Thus quite logically one is led to an analysis of the preparation and implementation of working plans. Again the presentation here is eminently practical and takes cognisance of an existing state of development with a phased approach which must necessarily be flexible towards the attainment of ultimate and evolving planning objectives. Well documented examples again facilitate understanding.

A most interesting and enlightening chapter is that devoted to an outline of the development of forest management from the earliest times. For any student of management or indeed for any manager a knowledge of the background from which the present science has evolved is very neccessery to a true and proper appreciation that science. Mr. Osmaston has traced the development of forest management form the very earliest references of Biblical origin through the eras of the Roman Empire, Charlemagne, William the Conqueror, right through to the present day. He outlines developments in particular countries, Britain, France, Germany. He concludes with a resumé of the factors which have resulted in the complex management process which is forest management as we know it to-day. The scope of the proces is enlarged out of all recognition to what it formerly was. Nevertheles development of new techniques involving use of specialist personnel, in the fields of O. and M., computerisation

of field data, photogrammetry as an aid to survey and assessment, have resulted in a more efficient implementation of the process. Finally the importance of an integrated organisation structure to ensure co-ordination of effort of all the varied interests involved is stressed. This is the framework within which the dynamic influence is exercised in the process so that decisions are taken which lead to action. In the long run success in this field will depend on human activity. "The human factor of a man being able to cope with a mass of varied activities, assess their relative values and make sound decisions remains and will always remain the prime influence on success or failure."

Mr. Osmaston's work, "The Management of Forests" can be recommended to any student of forest management. In particular it will be of value to any working managers at any level insofar as it presents a balanced and assimilable picture of management in action in the most up to date context. The profession should benefit from its perusal and study.

L.C.

Recent publications by Forest Product Research Laboratory, Princes Risborough

REPRINTS AVAILABLE

The following is a list of papers published by the Forest Products Research Laboratory which are available in limited quantities as reprints or Laboratory reports.

Copies can be obtained, so far as stocks permit, on application to The Director, Forest Products Research Laboratory, Princes Risborough, Aylesbury, Bucks. It is sufficient to quote the reference number preceding each title.

89P *Timb. Trades J.* 1968, 265, (4778), Suppl., 27-29.

Trials on home-grown timbers for wood wool/cement building slabs.

L. C. Pinion

This paper gives the results of a study on the suitability of home-grown softwoods and hardwoods for the production of wood wool/cement building slabs.

Misc 235 August 1964

Grading of British round timbers—*Log grades for softwoods.* Anon.

The grading rules make provision for three log grades. The more important factors affecting out-turn, namely top diameter and sweep and also the characteristics influencing its quality, knots, knot whorls, clusters, scars and decay, are considered. Slopes of grain and rate of

growth have not been taken into account. Knots are permitted in each grade to a maximum diameter according to a range of log diameters.

Misc 264 September 1967
Grading of British round timbers—*Log grades for hardwoods.*
Anon.

The grading rules and definitions for grading round hardwoods are listed together with a table of grades applicable to logs with a minimum top diameter of 8 inches under bark.

T.N.27 *Technical Note* No. 27, May 1968
Sawn softwood grading system.
Anon.

The grading rules which concern users of sawn material in the United Kingdom are discussed and compared with those of other softwood producing countries, namely Norway, Finland, Sweden, Poland, USSR, East Canada, Brazil and the Pacific Coast of North America.

99 SC *Wood,* 1967, 32, (9), 35-37, (10), 37-10; (11), 29-31.
The remedial treatment of telephone and electric transmission poles.
Parts I to III
D. N. Smith and R. Cockcroft

The first part of this paper deals with the cause of external decay in creosoted poles and its remedial treatment by creosote emulsion type bandage. The second part is concerned with internal decay and its remedial treatment by injection of a preservative paste based on sodium fluoride, as operated by the Cobra Co.

96 SC *Electl. Rev.,* 1967, 181, (20), 726-728.
Remedial treatment of wood poles for overhead lines.
D. N. Smith and R. Cockcroft

This paper is a summary of 99 SC listed above.

92 T *Building,* 1968, 214, (6516), 135-136.
The moisture content of window joinery in service.
C. H. Tack

The results of a survey carried out to determine the moisture contents of over 137 windows point to the existence of design faults in modern window joinery. Another significant conclusion reached is that internal condensation may play a larger part in the wetting of window joinery than has been previously recognised.

86 W *J. Instn. Munic. Engrs.,* 1968, 95, (7), 212-215.
The inspection and treatment of houses for damage by wood-boring insects.

M. G. White

This article describes how to survey the timbers of a house, and how to recognise timber borer attack and identify the types requiring treatment. Suitable insecticide formulations and methods of application are described.

T.N. 23 *Technical Note* No. 23, June 1967.
The preservation of farm timbers.
Anon.

This note shows how effective preservative treatment ensures that timber on the farm will last indefinitely with little or no maintenance and that the cost of preservative treatment is comparatively small. Types of preservative, preparation of timber, treatment and choice of treatment are considered.

T.N. 24 *Technical Note* No. 24, August 1967.
Preservative treatments for external joinery timber.
Anon.

A description is given of the various preservative treatments for new external joinery which are considered to be satisfactory in this country, namely vacuum pressure impregnation, vacuum impregnation diffusion treatment and immersion treatment.

T.N. 28 *Technical Note* No. 28, January 1968.
Manitenance and repair of window joinery.
Anon.

This note states the causes of decay in window joinery and the moisture penetration which leads to decay. An account is given of the remedial measures which may be followed by the householder to prevent moisture penetration and to deal with the early stages of decay. Measures for the repair of advanced decay are also given.

T.N. 29 *Technical Note* No. 29, May 1968.
Ensuring good service life for window joinery.
Anon.

The effect of design factors and choice of timber species on the avoidance of decay in new window joinery are discussed.

88 P *Q. Jl For.*, 1968, 62, (2), 137-144.
Pulping in Britain.
D. F. Packman

Manufacture of paper and board, though a major industry in Britain, is heavily dependent upon imported wood pulp for its raw material. Development of our home-based pulping industry is desirable, therefore, and the large predicted increase in softwood production from our plantation forest may well provide the means.

The Forest Products Research Laboratory has examined the pulping properties of our softwood species and the effects of wide variation in wood characteristics on pulp quality in the context of the various pulping processes which might be used.

102 P *Paper Technol.*, 1967, 8, (4), 339-340.
Pulping of British-grown softwoods.
D. F. Packman

Chip-refiner mechanical pulp was made in a laboratory scale from British-grown Sitka spruce, Scots pine, Douglas fir, grand fir, western hemlock and Japanese larch. Pulp suitable for the manufacture of high grade folding boxboard was produced from mixtures of these species : it was shown that considerable variation in composition of the mixture could be tolerated without substantial loss of quality in the product.

T.N. 32 *Technical Note* No 32, May 1968.
A small electrically-heated timber dryer.
Anon.

A description is given of this simple and cheaply constructed dryer which has been designed primarily to meet the needs of firms who use only comparatively small quantities of timber, have no existing steam supply from which they could operate steam-heated kilns, but require that the timber should be dried to a moisture content of 10-12 per cent for use in heated interior environments

T.N. 25 *Technical Note* No. 25, May 1968.
Stress grading of timber.
W. T. Curry

Although recent research has enabled a number of different machines to be constructed to stress-grade timber automatically, it seems that some time will elapse before these become generally available and until then stress grading will have to be done by visual inspection. A description is given of the principal visual characteristics which are known to influence the strength of timber.

T.N. 26, *Technical Note* No. 26, May 1968.
Stress grading machines.
W. T. Curry

Stress grading machines not only grade timber more rapidly than by visual methods, they also provide a more accurate assessment of performance because they test the inherent mechanical properties of the timber rather than relying on visual defects alone. Grading machines have been developed in the United States and in Australia and a brief description of these is given.

95 B *Forestry*, 1967, 40, (2), 117-128.

Timber improvement— a study of the variation in wood characteristics in young Sitka spruce..
J. D. Brazier

As part of a programme aimed at improving Sitka spruce timber, a study has been made of the variation in some wood characteristics when trees of outstanding form and vigour are selected. The results of this study are given in this paper.

80 B *Proc. Linn. Soc. Lond.*, 1968, 179, (2), 271-274.
The contribution of wood anatomy to taxonomy.
J. D. Brazier

This paper considers some of the factors which affect the use of wood structure in taxonomy and some examples are given to illustrate its use.

97 D *Nature* 1967, 216 (5117) 827-828

Recording the initiation and development of failure in timber.

J. M. Dinwoodie

A description is given of a method which is currently being used to study the changes in structure which occur in timber during compression stressing and failure.

85 P *J. Inst. Wood Sci.*, 1968, 4, (2), 64-66.

A further contribution to the comparison of X-ray and beta-ray techniques for measuring wood density.

E. W. J. Phillips

A description is given of the factors which need to be considered when comparing the X-ray and beta-ray techniques for measuring wood density, namely specimen thickness, speed of operation and quality of record.

90 M *Timb. Trades J. Ann.*, 1968, S/1-S/3, S/5.

Production rates of log bandsaws for small softwood logs.

An investigation to compare the production rates of two types of log bandsaw is described, and data for three types of circular log saw are given for comparison. Computer analysis of time study results is discussed, and production rate curves from hand and computer analyses are give nto illustrate the advantage of the latter method. Based on the computer calculation, some conclusions about the relative production rates of the different machines are given.

T.N. 30 *Technical Note* No. 30, May 1968.

The maintenance of saws for cutting wood.

Anon.

This note briefly describes the various factors that are inherent in the maintenance of circular and wide band saws.

82 G *J. Inst. Wood Sci.*, 1968, 4 (2), 3-18.

An appraisal of some aspects of timber research and their application.

E. J. Gibson

This paper considers the present state of knowledge about the structure and composition of wood, how this affects its behaviour and the manner in which it is currently processed and used.

103 OX *Advmt. Sci., Lond.*, 1967, (9), 77-82.

A scientific policy for the better use of wood.

T. A. Oxley

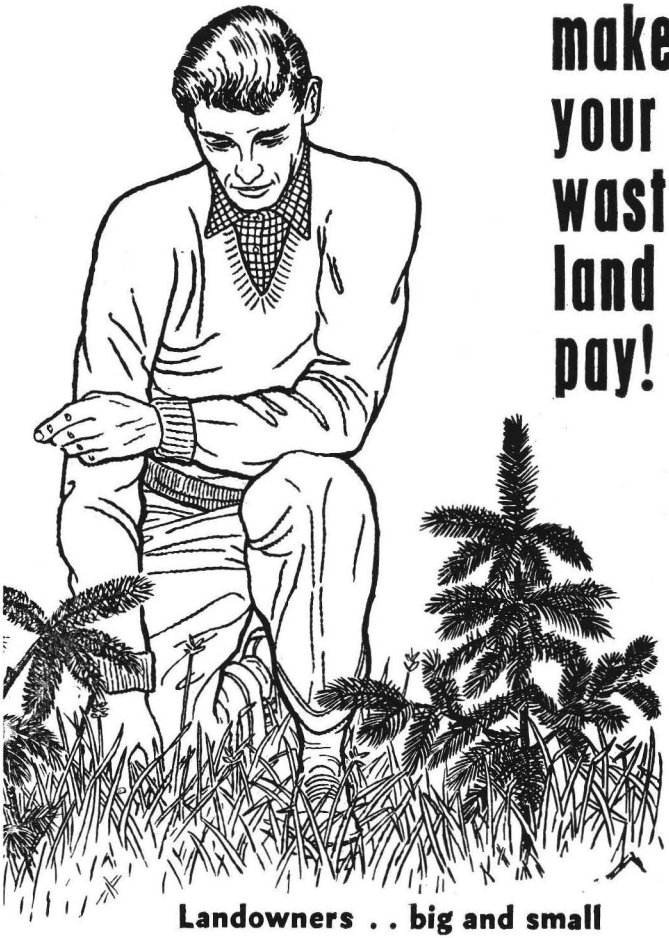
This paper considers the long-term future use of wood and wood products. The deficiencies of wood which scientific research may be able to ameliorate, namely waste, variability, durability and protection, are discussed.

Professor T. Clear

The best wishes of all our members go to Prof. T. Clear on his election as Dean of the Faculty of Agriculture in University College, Dublin.

Prof. Clear is himself a graduate of University College, Dublin where he took his degree in Forestry with First Class Honours. After graduation he continued his studies in forestry in Germany at the Forestry High School of Eberswalde and other forestry institutes. He also studied in Sweden before taking up the post of Lecturer in Forestry in U.C.D. In 1959 he was appointed to the Chair of Forestry which he still holds.

Prof. Clear's services to the Society have been equalled by none. For the first eighteen years of the Society's life he acted as its Honorary Secretary and except for a short period he also carried out the duties of Hon. Treasurer. He has served as President and is now completing his second term in this office.



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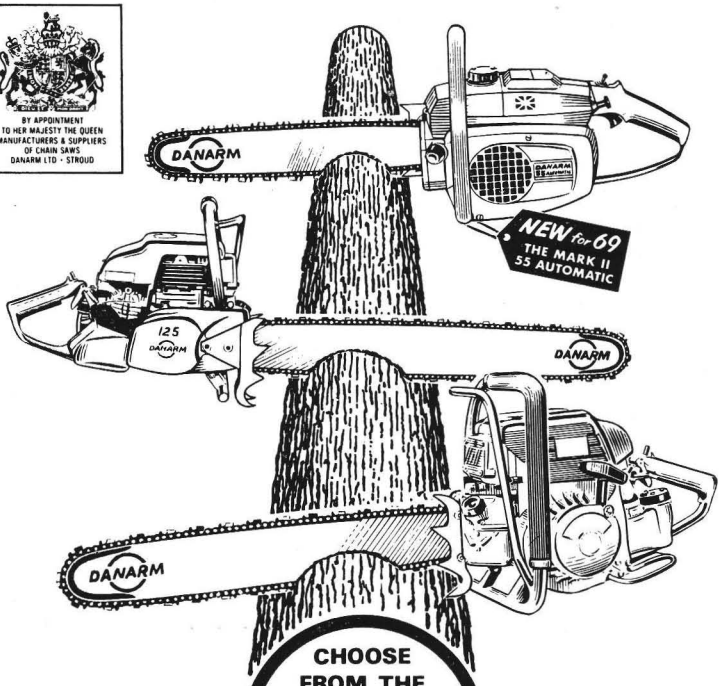

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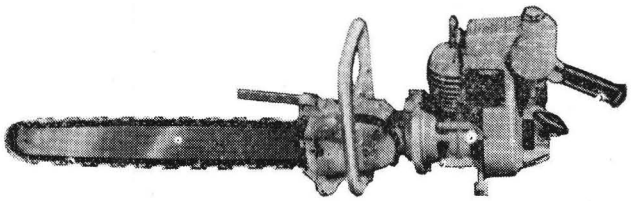

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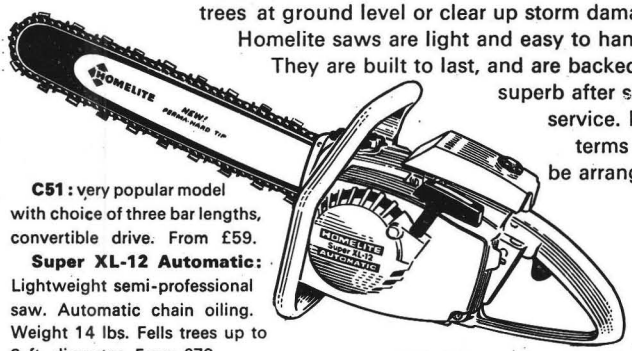

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