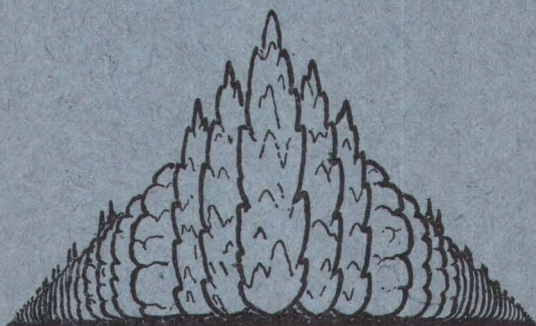


Irish Forestry

The Official Publication of the
Society of Irish Foresters.



price to non-members
five shillings

IRISH FORESTRY

CONTENTS

	Page
List of Present Officers, Council and Foundation Members	... 2
Editorial Comment	... 3
Articles.	
Some early economic and other developments in Eire, and their effect on Forestry conditions. A. C. Forbes	... 6
A plea for shelter-belts of broad-leaved trees. S. M. Petrie	... 16
Handling native timber. J.A.K.M.	... 20
Thinning of young conifer stands. T. Clear	... 24
Summer Meeting—Clonmel. Account by T. McEvoy.	... 28
Obituary Notice.	
Mr. Daniel McCaw	... 36
Annual General Meeting, 1943 and Statement of Accounts	... 37
Review.	
Forestry Position in Denmark. M.L.A.	... 42
Notes.	
Arbutus unedo (Linnaeus). Mrs. A. Henry.	... 44
Corsican Pine in Glenmalure. T. McEvoy.	... 46
Planting of forest trees. G. McCool	... 47

The Editor wishes to acknowledge other contributions from our members, which have unavoidably been held over on account of lack of space.

Society of Irish Foresters.

PATRON.

Mr. Thomas Derrig, Minister for Education.

PRESIDENT.

Dr. M. L. Anderson.

VICE-PRESIDENT.

Mr. F. McMahon.

EDITOR.

J. A. K. Meldrum.

BUSINESS EDITOR.

Mr. M. Swords.

AUDITOR.

Mr. D. M. Craig.

SECRETARY AND TREASURER.

Mr. T. Clear.

COUNCIL.

Mr. P. Barry,

Mr. P. Delaney,

Mr. M. O'Beirne,

Mr. S. M. O'Sullivan,

Mr. S. M. Petrie,

Mr. P. Verling

FOUNDATION MEMBERS.

M. L. Anderson, T. Donovan,

P. Barry, J. P. Dowds,

T. J. Briody, H. M. Fitzpatrick,

W. J. Chisholm, D. G. Hayes,

T. Clear, F. McMahon,

R. J. Crerand, T. Moloney,

M. Dalton, O. V. Mooney,

P. Delaney, G. Muir,

F. J. Murphy,

J. McCarthy,

M. McCarthy,

T. McCarthy,

D. McCaw,

D. McGlynn,

S. McMenamin,

M. O'-Beirne,

J. O'Leary,

S. M. O'Sullivan

S. M. Petrie,

D. A. Quirke

M. Swan,

M. Swords,

P. Verling

IRISH FORESTRY

Volume 1.

Number 1

NOVEMBER, 1943.

Editorial Comment.

The Society of Irish Foresters has been founded with the prime object of promoting technical forestry, and inculcating in our people at large an appreciation of the important bearing on the national well-being of adequate reserves of timber in our woods and plantations. Admirable work in this respect has been done in Great Britain by the English and Scottish Societies, but they are naturally concerned with the many problems which they encounter in their own territories. It was considered that there was a need for a similar body in Eire, and that some medium was required through which information could be exchanged, and individual views expressed. It was, therefore, decided to publish this journal under the title of Irish Forestry, so that all who had anything to communicate which would be of benefit to forestry in general or in Eire, in particular, would have a means of making it known.

We are fortunate in having as our first patron, Mr. Thomas Derrig, who was, until recently, Minister for Lands and Forestry. Mr. Derrig has always taken a keen personal interest in the State afforestation scheme, for which he was responsible as Minister, and considerable progress was accomplished during his period of office, in spite of the restrictions imposed on normal activities by the outbreak of world war number two. It is gratifying to record that, although he has now relinquished the responsibility for the State afforestation scheme, and is now devoting his energies to the Ministry of Education, his enthusiasm has not diminished on that account.

As our first Honorary Member we are proud to welcome Mr. A. C. Forbes, whose name has long been synonymous with forestry in Ireland. He needs no introduction to our readers, and his name is well-known in the forestry world far beyond our borders. He is fully alive to our present problems in Eire, and his address at the first General Meeting, published elsewhere in this issue, demonstrates in no uncertain fashion that he is also cognisant of the conditions and developments which led up to them.

While it was generally agreed that the publication of a journal would be helpful in furthering the objects of the Society of Irish Foresters, it was felt that something more was necessary. Forestry practices and problems may be clearly stated and discussed on paper, but the acid test of all theories and methods is what can be shewn on the ground as a result of their application. Forestry is no different from any other form of human activity in that it must stand or fall by its results. Accordingly, it was decided to hold an out-door meeting in the Suir valley area. Mr. S. M. Petrie was charged with making all necessary arrangements, and a very interesting excursion was held during the early part of last June. Two of the State forests, Carrick-on-Suir and Clonmel were visited, and two private estates, Marlfield and Cahir Park, by the kind permission of the respective owners, Mr. J. Bagwell and Lt.-Col. R. B. Charteris. The programme was exceedingly varied, and ranged through the planting of different species on a wide variation of soils, practical demonstrations of thinning in young larch plantations, conversion of former oak scrub land into coniferous forest, management of woodlands formerly in private ownership, forest road making, and the inspection of ornamental woods and plantations.

It would not have been possible to examine in detail these two forests, which cover some 6,325 acres, in the short time available, and the convener might have been pardoned had he confined the itinerary to

those parts where results had been most favourable. Such a course of window dressing would have been easily possible, but would have created too optimistic an impression as to what may be expected from forestry. The wet ground in Coolishal, the upper slopes in Derrinlaur, and the impoverished and exposed sites in Kilnamack and Russelstown provided useful correctives. If for nothing else the visit to those parts was of great value in demonstrating the many perplexities the forester encounters, and how he tries to solve them, in the planting of difficult soils. It was evident that uniform success had not been attained on the poorer types, but there was much to shew what might be done, and what should be avoided. Foresters who are charged with the task of bringing the maximum amount of ground under timber bearing are bound to achieve only partial success, or even meet with failure at times. It would have been a useful object lesson, could they have been present, to those enthusiasts who advocate the acquisition of large tracts of such types of waste land for afforestation. It does not follow that, because land is practically waste in that it is of little value for anything else, it must, therefore, be capable of growing trees. It can not be denied that enthusiasm is something to be admired, and even encouraged, but it does require the counterpoise of both knowledge and experience.

The question "Why grow timber?" has frequently been asked by those who are disposed to be critical of large-scale afforestation schemes. A comprehensive answer would be far beyond the scope of a short article on the subject, and it is best approached by considering to what extent timber and its derivatives enter into our daily lives, and how far they could be done without. Furthermore, if they were not available, would it be possible to find satisfactory substitutes?

If it were asked how many of us have given a moment's thought as to how our present complex civilisation had been built up, the answer would be chastening when it was realised how few of us really do. We are all too much inclined to take things as we find them without any enquiry as to their origin, in short, to take them for granted. Yet, if any thought were given to the matter, it would be realised that man's slow development from the primeval state has been largely due to his gradual extension of his range of raw materials, and finding increased uses for each. The whole course of human development and progress, and the ultimate extinction of those peoples which lagged behind can be traced in this way.

There is no record as to which was the first raw material adapted by man to his use, but probably his first weapon was a wooden club with which to kill his prey and defend himself against his enemies. Those who fought with clubs were speedily ousted by those who armed themselves with axe, arrow and spearheads of flint, and they in turn fell before the men with weapons of bronze. The discovery of iron, and later of steel, marked further steps forward, and so the process will continue.

There is neither space nor time to concern ourselves with the immense diversity of raw materials at our disposal, but it should be noted that there is no record of any known raw material ever becoming obsolete. In fact, all records point the other way, and the tendency has been to multiply the uses to which they may be put. So it has been with wood, and few of us are aware as to how much it has permeated our daily lives. If for some cause or other we were to be suddenly deprived of all our timber stocks, the result would be catastrophic, and our present mode of life would speedily collapse. No coal or iron could be mined, as these require wooden props for their extraction. Mechanical transport, which has sometimes been described as the life blood of a modern community, would eventually cease, and our cities cease to function as centres of population. How far the clock of human progress would be set back it is impossible to say, but there is no doubt that considerable re-adjustment would be necessary. The question of

providing adequate substitutes would immediately arise, and the problem would not be completely solved, as there are many functions for which timber may be regarded as irreplaceable. Even if it were possible to fabricate materials to take its place, such an inordinate proportion of human energy would have to be devoted to providing them, that other activities would be bound to diminish. Our present standard of life would have to go by the board, and a much simpler take its place.

Warnings have been uttered from time to time that world consumption of timber greatly exceeds total production, and that in future years, if not in the lifetime of some of us, the peoples of the earth will be faced with an acute timber shortage or even famine. Not all utterances on this subject have been unanimous, yet, nevertheless, such warnings should not be entirely disregarded, and those nations which do not meet their timber requirements from within their own borders, and have to depend to a large extent upon imports, would do well to set their house in order in that respect.

Much has been heard of the new world which is to emerge after the present conflict has been decided. At the risk of appearing cynical it must be remarked that similar hopes were expressed a quarter of a century ago, and how far they fell short of realisation is dismal history. Human nature changes slowly, and it would be unwise to discount the probability of future world wars. In their Report on Post-war Forest Policy by H.M. Forestry Commissioners, no such facile optimism is expressed, when it is assumed "that with the development of aerial warfare it will become increasingly inconvenient in future emergencies to have to transport timber by sea."

Should such prove to be the case, and at present there is no reason to doubt it, there would appear to be very cogent reasons why the timber importing nations should take all possible steps to secure adequate growing timber reserves within their own borders. It may be said that such is a matter for their Governments to decide, but no government can lay down a long term policy unless it has public opinion behind it. The people themselves must have an acute realisation of the important bearing which woods and forests have upon the national well-being. In other words, the man in the street must have a forest sense. That this sense is lacking, owing to a variety of causes, cannot be denied, and the fits and starts to which the Forestry Commissioners' activities were subjected during their earlier years of existence are ample proof of its absence in Great Britain.

Our own people are very little better in this respect, although there have been in recent years encouraging signs of an awakening forest sense. The Society of Irish Foresters must do all it can to stimulate an interest in forestry, and to develop an appreciation of its importance in the minds of our citizens. Although it has been formed around a small nucleus of professional foresters, as Technical members, there is no desire to create the impression that it exists for them alone. They merely provide an essential foundation upon which to build. Associate membership is open to all who have an interest in the possession or cultivation of trees, or who merely love trees for their own sake.

Naturally, the forester, who is a silviculturalist, or one who grows trees as a crop, is preoccupied with what he may expect will go on the saw-bench at the end of the rotation, but the lighter graces of arboriculture, or growing trees for their own sake, must not be neglected. The Arbutus, to which Mrs. Henry refers in her extracts from *Trees of Great Britain and Ireland* (Elwes and Henry), is not a timber tree, but would anyone willingly agree to its extinction on that account? Other species of low commercial value grace our country-side, but their perpetuation should not be governed by financial considerations. In an agricultural community, trees have other parts to play beyond the mere provision of saw-timber. Conservation of moisture, prevention of soil erosion, wind shelter, and aid to rural beauty are benefits which can hardly be expressed in commercial terms, but they possess values which are nevertheless real and indispensable.

Some Early Economic and other Developments in Eire, and their Effect on Forestry Conditions.

Two assertions are frequently made regarding the extent of Irish forests in the past and present respectively. One is that the entire country was at one time covered with trees, apart from mountain tops, and similar unpromising sites. The other assertion is that the present area under woods is lower, calculated on a percentage basis, than in any part of Europe other than Ireland. There is no reason to doubt these statements as founded on fact, but the interval of time which elapsed between the two extremes is almost invariably overlooked. This interval must be calculated in thousands of years, and not in three or four hundred as is often done, and the omission to do this throws the whole question out of perspective.

Ireland's forestal condition did not differ greatly from that of the whole of Western-Europe, which possessed and possesses a somewhat similar climate, and the original forest area would have persisted to this day had man not intervened, and substituted artificial for natural conditions. But the change over from a forested to a non-forested condition was brought about in Eire by several factors which are not common to the remainder of Europe, although they closely approach them in many respects. Climatic and physiographical features in one direction, and economic developments in another have set up various processes which have tended to destroy the balance between agriculture, stock-rearing, and timber production, which economists, taking a broad view of the situation, consider should have been maintained. It is with the object of briefly noticing the main local causes which have contributed to this state of affairs, that this paper is being put before your Society, although the gaps are so numerous that no claim can be made for any great accuracy, or the presentation of a complete record.

Take, to begin with, the question of climate, which may be considered a primary factor in any industry in which vegetation plays a prominent part. Ireland, as everyone knows, stands as a kind of advance post on the Atlantic front of Europe, and possesses a climate of an extremely insular character. This is an advantage in some respects, and particularly in connection with cattle rearing, as it enables live-stock to be fed through mild winters and cool damp summers with the minimum of expense, and this in itself has put many millions into the pockets of the rural population.

Between sea level and 1,000 to 2,000 feet or more above it, grass grows for ten months or more out of the twelve sufficiently fast to keep store cattle alive without artificial feeding, or the necessity for housing. No other country in Europe, and only a certain proportion of the British Isles enjoys this advantage, and to it can be traced certain features of Irish rural economy and customs which have reacted upon the forest area of the country from prehistoric times, and will be referred to later on. But where the cultivation of corn, or any crop requiring much summer heat is concerned, the insularity of the climate has its drawbacks when once the plains and low level regions are left behind. This is due to the rapid fall in summer temperatures at every 200 to 300 feet in altitude. Theoretically this should only be 1 degree F., but actually wind creates such a cooling effect on Irish hillsides, that a mean July temperature of 60 degree F. at sea level is reduced to 53 or 54 degrees at 1,000 to 1,200 feet, or below the minimum requirements of average forest crops. If, for instance, the surface of the country is separated into three zones of altitudes, one between sea level and 600 feet above it, another between 600 and 1,200 feet, and a third between the latter and the highest hill tops, it can be shown in a general way that tillage or crop growing, as distinct from grazing, is only successful in the first of these zones, partly owing to more favourable soil, partly to higher summer temperatures, and in-

cidentally to a class of farmer with sufficient capital to maintain a high standard of cultivation. Between 600 and 1,200 feet, farms are on poorer soils, less highly or intensively cultivated, and possess a larger proportion of grazing land. Above 1,200 feet or so, tillage and meadow land, for all practical purposes, may be said to cease altogether, and rough grazing is the only form of agricultural enterprise possible, while successful or economic forest crops are inhibited by low temperatures. These, of course, are very rough generalisations, and exceptions are frequently being met with. But it is not far from the truth to say that the whole agricultural land of Ireland, together with towns, villages, demesnes, water, roads, etc., must be accommodated within 1,200 feet of sea level, and that whatever woodland the country contains, or may make, must find space for itself at the same levels. The general result is that agricultural holdings, demesnes, and woods have been scattered promiscuously over the surface, and no obvious reason can be found, in the vast majority of cases, for any particular piece of ground having been devoted to one purpose or the other.

If a comparison is made with some mountain region in Central Europe, with the highest points rising from 3,000 to 5,000 feet, the proportion of forest land will often amount to 40 or 50 % of the total surface. This will usually be found due to the concentration of all industrial and agricultural activities in the valleys and lower ground, while almost the entire surface above 2,000 feet or so is given up to forest. This is not a matter altogether of deliberate policy, but chiefly to the fact that both climate, configuration of the ground, and surface conditions preclude agriculture, render grazing difficult or impossible, and are unfavourable for settlement or industries. Heavy snow falls during three to four months of the winter, short summer seasons, steep slopes, difficult access, etc., all played their parts in impeding or discouraging forest clearing to any appreciable extent down to the last two or three hundred years, and since then forest laws and regulations have been in operation to ensure the retention of the forest on a permanent basis. On the flat lands to the north of the Central European mountain masses, general configuration does not play a big part, but the long winters prevent cattle being kept in the open, induce the rural population to congregate in villages, and confine intensive methods of cultivation to definite areas of the better land. Much of the poorer soil has been left under forest from the earliest times, and this is being retained as a matter of policy.

While, therefore, the early forest growth of Eire has been replaced by crops and grass, and the population has gradually spread itself over the surface, most of the Continental forest areas, which are pointed to as a reproach to this country, remain chiefly because there have been few inducements to change them for the benefit of some other form of utilisation.

But what the forest area gains under these conditions, the cattle stocks of the countries concerned lose. For instance, Eire with the lowest forest area, has the highest number of cattle per square mile, while Sweden with almost the highest forest area in Europe, has the lowest head of stock. This compensating factor should be borne in mind by those advocating relatively vast schemes of afforestation. Stock cannot be fed in any closely cropped woodland, and economic forestry does not admit grazing as a legitimate method of using its soil. Rough grazing on mountain areas is not such a casual asset to the Irish farmer as is usually supposed, and while the reduction in forest, due to this practice has reached the economic limit, the process cannot be reversed too rapidly. These differences in climate, physiography and rural economy are usually lost sight of, and we often find the forest areas of Eire contrasted with that of countries like Germany, Sweden, or even Russia. This rather resembles a comparison between the hare and the tortoise, without the moral usually attached to it.

These preliminary considerations are necessary to show the peculiar, and in some respects exceptional, conditions of climate and land utilisation in this country. Agricultural methods and customs are fairly old, and the rearing of cattle can be traced back to pre-historic times. The various legends which are so freely interwoven with Irish history, continually refer to cattle in the form of gifts or payments, causes of raids and intertribal wars, and as the ordinary currency of the country. These features in the life of the nation are clearly responsible for the gradual clearing of the primeval forests which once covered the land. The influence of continuous cattle grazing on natural woodland may have been very slight for hundreds or even thousands of years. As long as those animals had a wide range, and change of pasture was continually being sought by their nomadic owners, the country as a whole probably showed little change. Cattle are not so destructive to seedling trees as are sheep, horses or goats, and these animals at any rate were not indigenous, and only gradually exerted their influence as destructive agents. Until the growing of corn crops became general amongst the Irish communities, therefore, the forest would remain more or less intact in its main features, but possibly becoming thinner and more open with each century.

When the actual clearing of the forest area attained appreciable significance, no one can say. Prof. McNeill supposes that most of the land was enclosed during the 7th and 8th centuries, when the present townland divisions of the country may have been initiated as allotments of the common land amongst family groups. O'Curry in "Manners and Customs of the Ancient Irish," believed that 8,000,000 Irish, or 12,000,000 statute acres were in cultivation in the 5th and 6th centuries, and that the population at that time numbered about 3,000,000, or about the same as in the 17th century.

These townlands correspond to the more ancient ploughlands, and their boundaries were clearly and permanently defined when the first Ordnance Survey was carried out in the years 1835-40. This fact alone proves that their existence is due to some well recognised tribal laws, which admitted all members of a sept or clan to a share of the land of the country, and was not due to haphazard squatting of landless men, such as may occasionally be seen here and there to-day.

The average size of the townland is about 300 acres, and it is assumed that this varied with the quality of the land. The underlying idea seemed to be that of giving an equal share of productive and tillage land to each, while an area of mountain, wood, or rough grazing was included within the boundaries wherever these existed. How the boundaries were fixed in the first instance no authority appears capable of explaining, but such an extensive and widespread system must have been administered by a central authority, and could scarcely have been due to customs varying with each sept, or with different chiefs or rulers. But in any case this universal land division resulted in an agricultural population settling itself in every corner of the country, and over bogs, mountains and woodland; and its descendants have retained possession of the land from a very early period down to the present day in spite of wars, revolutions, rebellions, and all the disturbing influences of questionable land systems, and political upheavals.

In the earlier estimates, wood, bog and unenclosed ground were left out of account, but if they are in any way accurate, it is obvious that the clearing of the forest had made considerable progress before this townland divisions of the country took place. Long before this would have been worth doing, or the population large enough to require it, century after century must have seen a steady diminution in the tree covered land, and an increase in rough pasture and tillage. We have not only to take into account the 2,000 years of the Christian era, but also the unknown length of the Neolithic and Bronze Ages, relics of which suggest types of civilisation of no mean order.

But when the townland settlements were well established it can easily be seen that the numerous patches of forest which were included

within their boundaries had a very precarious existence. Each townland group had the right to come down upon them for building timber, fuel, domestic articles, farm implements, etc., and the mere fact that the users had the material close at hand hastened the process considerably. Live stock, again, instead of roaming over the same ground at long intervals, had a restricted range, and kept down any seedlings or stool shoots necessary for regeneration of the mature trees, and the woodland which happened to be included within the boundaries of a townland would quickly disappear, and be reduced to scrub.

How far the Brehon Laws were applied to the native Irish woods is difficult to ascertain. They refer to certain "Chieftain trees," which were: Oak, Hazel, Holly, Yew, Ash, Pine and Apple. The mixed character of this list, as given by O'Donovan, suggests that more importance was attached to the use than to the size of the species enumerated. Hazel and Holly, for instance, have nothing to recommend them as timber trees. Mention is also made of "Co-occupancy" and "sacred" woods, which may have meant woods held in common, and in the hands of the Church respectively.

While the townland division of the country exercised its de-afforestation effect in one direction, it also resulted in a form of tenure which has had an extremely retarding influence on attempts to improve or turn to account large areas of hill land which were split up amongst numerous occupiers, or were held in common to avoid the trouble of keeping up divisional fences, or maintaining a large number of herds or shepherds. This has been especially obstructive to attempted afforestation in the last few years. To obtain 500 or 1,000 acres in one block, negotiations have often to be carried on with twenty or thirty individuals or joint owners, with the result that a scheme of acquisition has often to be abandoned, or brought to a conclusion in an unsatisfactory manner. Probably much the same difficulties occur in other countries, but are not quite so universal as in this.

It appears to be fairly clear that the early system of land tenure so far reviewed, persisted down to the Norman Invasion in the 12th Century. The change which then took place can be traced from State Papers and other written documents which began to appear from that time onward. Without any preliminaries, the Normans evidently regarded Ireland from the time of their arrival as under the Feudal System, but how far this was possible to put into practice is another question. The first visible result of the occupation was the erection of castles over most of the country, and the building of these was finally done in such a substantial style that a large number remain, so far as the outer walls are concerned, intact to this day. These castles must have consumed in their construction much of the finest oak timber in the districts in which they were erected, while the garrisons which occupied them doubtless commandeered, "*according to plan*," corn, cattle, fuel, etc., from the local inhabitants. The Irish chiefs either submitted gracefully to the intruders, effected compromises, or resisted at the point of the sword, and in the course of a century or so, Irish Chiefs and Norman Barons were found living side by side on terms which constantly fluctuated between peace and war. But the land, with which we alone are concerned, probably changed little as the result of the invasion.

When the Normans took possession of the territory of a native chief they called it a barony, the sub-division or ballybetaghs became something of the nature of manors, the ploughlands "*vills*" and so on. The cultivation of the land, and the rearing of stock probably went on much the same, whether under the old regime or the new. The waste or unoccupied land became the "*forest*," and was subject in theory, if not in practice, to the forest laws, but the effect of these laws, if any, cannot be traced. The "*forest of Ireland*," as it was termed in a State Paper, extended over the entire surface, but in only two instances is there any evidence that the Norman kings or their

representatives took any action in the matter. These two instances are Glendalough and Taghmon, near New Ross, and had it not been for the deafforestation of the areas concerned, probably nothing would have been heard about them, or the forest law in Ireland.

The Glendalough forest was the waste land of the See of that name. Taghmon was part of the territory first allotted to Strongbow by Henry II., and came later into the hands of his grandson. The deafforestation of the forest took place in 1229, during the reign of John, and that of the latter in 1234, and payments of 300 and 600 marks respectively were paid for the charters issued in these connections. Full particulars of these incidents are given in a paper I read before the Royal Irish Academy, in 1932. The short period which elapsed between 1172 and 1229—about 57 years—does not suggest that the Forest Laws were ever enforced in a general way, and it is almost certain that their application to Ireland was little more than a feature of the general feudal system introduced by or associated with the Norman occupation. It is highly probable that the use of the word "forest" in the legal language used in connection with grants and charters has been responsible for many of the exaggerated ideas which prevailed about the wooded state of the country at that time. All waste or unoccupied land, including bogs, mountain tops, etc., came under the head of "forest," and was regarded as the property of the Crown, whereas under the Celtic tribal system, it was held in common under the native chiefs. As a case in point regarding these ideas, I may mention a conversation I had some years ago with a gentleman who might justly be regarded as an authority on Irish mediaeval history. He gravely assured me that the records showed that the whole of the Wicklow Mountains between Dublin and Glendalough were covered with trees down to the last five or six hundred years, and his belief was founded in the supposed application of the Forest Laws to this district, already referred to.

One important but undesirable event can however, be traced to the Norman occupation. This was the introduction, or at any rate the protection of rabbits, and the introduction of fallow deer. The rabbit burrow is frequently mentioned in Charters and State papers of the period, and appears to have had a fairly high revenue value. That these animals were scarce can be judged by the price paid for them, and the trouble taken to obtain them. In the Account Rolls of Holy Trinity, 1329-1380, it is recorded that a William Follyng was given 1d. for going to Holmpatrick to get rabbits. In the same account 100 planks of "Wicklow" board were bought for 14d., so that we may assume that seven planks were equal to the cost of one rabbit.

The first record of fallow deer being introduced is in 1242-4, when about 60 head were brought over from Chester for the deer park of Glencree. Similar introductions are noted in the State and Domestic Papers down to the 17th Century or later. Most wooded districts in the country possess small herds which have either escaped from parks in recent years, or are the descendants of animals which were living free two or three centuries ago. Compared with rabbits they are a minor evil, and at any rate make the country-side more interesting.

From the year 1224 until 1700 or so, frequent references are made to deer parks in charters, grants, patents, etc., and the term "liberty to empark" is almost invariably used. The term was more a matter of form than anything else, for the forest laws prohibited enclosures which prevented deer from roaming freely over the land, and although these laws, as already said, were never taken seriously in Ireland, the legal phraseology was maintained right to the end of the "Stuart Period." Deer parks seem to have been associated closely with rabbit warrens, decoys, fish ponds, and anything connected with game or animals of a wild, or semi-domesticated nature used for food. The creation or maintenance of these features was probably a privilege enjoyed by the ruling classes, and must have been one of the first steps taken when many blocks of land were parcelled out amongst the

adventurers and undertakers who came into forfeited estates at frequent intervals for several hundred years. They seem to have been a long way in advance of the demesnes we are familiar with to-day, and suggest that a good many owners who could not boast of a castle or abbey suitable for a residence, must have built themselves some sort of temporary quarters until the mansions created later were ready for occupation. Writers in or about the 18th century, which are frequently quoted by Lecky and other historians, refer to the poor housing accommodation of the average landowner about this period, although the change then gradually taking place was in the other direction.

Before dealing with the next important development affecting the question, it may be as well to glance at the probable extent of native woodland which survived the various Wars, Rebellions, Confiscations, and other disturbances between the 15th and 18th centuries, or during the 300 to 400 years which covered the Tudor and Stuart Periods, and introduced modern ideas and customs. These periods have been very thoroughly dealt with by modern historians, but unfortunately they have nearly all repeated a number of mis-statements on the supposed abundance of woods and forests in Eire about that time. Most of these errors have been due to the reliance placed upon various descriptions of Ireland written by travellers between 1598 and 1650, and which mix up bogs and woods in a manner which renders it practically impossible to get any clear idea of the actual state of affairs. The confusion which has arisen on this point may be best illustrated by an extract from the volume on Ireland, published in the Cambridge Historical Series in 1898, and which summarises, in a very thorough manner, all that is recorded by numerous writers in the history of the country. This statement refers to the Desmond rebellion in 1580-83, and reads as follows: "Immense masses of forest covered whole counties, the roads were few and bad; the defiles intricate and the open lands, oases in an unexplored wilderness, covered with the castles of Geraldine and Celtic chiefs, and dotted with habitations of their vassals and serfs, were scarcely accessible through morasses, thickets, and all kinds of obstacles."

Yet coming to 20 years later, Fynes Moryson, who is generally regarded as a reliable authority on that period, writes in his "*Description of Ireland*," about 1603: "But I confess myself to have been deceived in the common fame that all Ireland is woody, having found in my long journey from Armagh to Kinsale few or no woods by the way, excepting the great woods of Ophalia and some low scrub by places which they call 'glins.'" He certainly states that Ulster and the Western parts of Munster yielded vast woods, but as these were the regions in which the rebels had chiefly to be dealt with by the army to which he was attached, he would naturally come more in contact with wooded parts than open areas in any particular district.

To take another statement referring to a later period, Lecky, in his history of "*Ireland in the Eighteenth Century*," has the following: "A serious and enduring change passed over the material aspect of the country in the forty years that followed the revolution (1631-51) from the rapid destruction of its forest trees. The history of this destruction is a curious and a melancholy one. When the English first established themselves in Ireland, no country in Europe was more abundantly wooded."

Moryson's account, however incomplete it may be, has the merit of being circumstantial rather than general, and all the more likely to be correct on that account.

The safest plan to adopt is to steer as carefully as possible between various divergent views on the former wooded state of the country, and to assume that a great deal of native woodland of a rough and scrubby character existed down to the 16th Century, and that much of this was cleared, or became incorporated with holdings before the year 1700 or so. Notes by intelligent observers were made by various Englishmen after that date, of whom Arthur Young is prob-

ably the best known, and they all agree that the country at the end of the 18th century was singularly bare of trees, and that most of the plantations they saw on demesnes had been recently planted. All of these opinions and observations cannot be incorrect; and as they were comparing Ireland for the most part with England, which was at that time, a by no means heavily wooded country, the comparison is all the more significant.

There is much evidence that oak timber, bark and charcoal were exported from Ireland in fairly large quantities from certain districts between 1550 and 1700. Pipe staves were sent to the Madeiras, and ship timber, boards, etc., to England, while iron smelting used up large quantities. Instances are given in both England and Ireland of iron ore being shipped to the wood producing districts for smelting. Oak was also greatly valued for its bark down to the last hundred years or so, and long after charcoal had become of secondary importance.

Much of the timber cut about this time was on estates which had been forfeited to the Crown after the various rebellions, and subsequently sold or granted to adventurers and undertakers throughout the country, whose main object was that of turning it into cash before the next disturbance or change of government took place. The Oak woods which are scattered throughout Ireland to-day owe their condition largely to these particular transactions. As is well-known, they are for the most part singularly uniform in age, size and density, due to the fact that most of them were clear cut, and were re-generated by stool shoots, finally reduced to a single stem. They thus possess much the same appearance as planted woods. Their exploitation seems to have been methodically carried out, and the idea that they were deliberately destroyed for political or military reasons has been erroneously entertained, as mentioned a few minutes ago. Old leases granted to Englishmen can often be met with in estate records, which show that the custom was usually to give a long term of 30 or 40 years for clearing a large wood, subject to the condition that cattle were fenced out. We often find that sub-contracts were entered into for clearing up the refuse, or using it for charcoal, and it is quite evident that deliberate waste was not encouraged, although many woods may have been left unfenced or the fences improperly made up. Banks running through many of these woods still exist, and may have been thrown up by the lessees, while saw pits for the breaking down of the larger timber are numerous. The practice of leaving standards of oak or ash at each felling does not appear to have been followed in Ireland, as was almost universal in England at the time, but successive fellings, at intervals of from 25 to 50 years, possibly led to the dropping of a routine which may have been followed at an earlier period.

It is interesting to speculate, not only on the extent of these oak woods in the 16th to 18th centuries, but the causes which led to their preservation or retention, when the land surrounding them was cleared, or the timber on it destroyed. Situation had something to do with the latter in certain cases, no doubt, and rocky and broken surfaces retained their crops of scrub owing to the difficulty of clearing them, and the irreclaimable condition of the ground. But a contributory factor was probably the tendency of oak woods, on the poorer and drier soils, to show a dense surface growth of wood-rush and *Vaccinium*, which characterises most of them to-day. The grazing value of these woods is consequently extremely low, and while better soils gradually changed over from normal forest to woodland pasture, and from this to a comparatively treeless condition, the typical oak woodland was left more or less alone by the rural community until it became private property, and was absorbed into estates. Of the extent of these woods, in the year 1600, for instance, before demesnes and demesne woods had become general, we have no means of finding out. Possibly a quarter of a million acres would not be an exaggerated estimate, and at least half of this area can be seen to-day doing useful work in contributing to the fuel supply of the country. History seems to be repeating itself in many ways in this connection.

The year 1700 can be regarded as the low water mark of the native Irish woods, and brings us to the most important development in the history of Irish forestry of the past, and of considerable importance in regard to its future. This is the creation and laying out of demesnes in all parts of the country, but more especially in those districts and on those types of soil which, in the ordinary way, would be out of the reach of the economic planter. When this work first commenced in a general way it is difficult to say. Probably the more important castles built by the Normans gradually became residences rather than fortresses and, by the time of Elizabeth, had been surrounded by small parks or gardens in which trees were preserved, and an occasional exotic planted. But these early efforts were few and far between, and were continually endangered by Civil War and Revolution. The first definite records of demesnes dated from about 1650, when references are made to Carton, Castlemartyr, and others which no longer exist. In the Domestic Papers of about 1660, correspondence is given between Sir George Rawdon and Lord Conway, on the building of Portmore in Co. Down. This house had a deer park of about 2,000 acres, a rabbit warren, decoy, and a glen specially *planted* for woodcock, and contained magnificent oaks, which were doubtless of natural origin. One of these is said to have been sold for £120 in 1661. Charleville, built by the Earl of Orrery, about 1680, at a cost of £40,000, was burnt by the Duke of Berwick, nine years later. The formation of later demesnes is not always easy to trace, but the process appears to have been somewhat as follows. Large areas of land came into the hands of the Crown between the years 1550 and 1700, as the result of forfeitures and attainders, following the Desmond and Tyrone rebellion at the end of the 16th century, and additional areas after the 1641 outbreak suppressed by Cromwell. Most of this land was granted or sold by the Crown to adventurers or planters, who were prepared to take the risk attending its occupation. In many cases, however, the land so disposed of was sold, or leased for long or short periods to residents in the country, the grantees remaining in England or Scotland until they were more certain of their position. After the Restoration, the condition of the country improved sufficiently for many of the more influential grantees to take up residence on land, already in their possession, or out on lease for short periods. With an area of three or four hundred acres of demesne on their hands, building a mansion was obviously the first step, and while this was going on, the planting and improvement of the demesne was also attended to. Landscape gardeners from England or Scotland appear to have been put in charge of the larger schemes, but, doubtless, many owners had ideas of their own, and carried them out in person. The progress of the work was recorded by numerous visitors to this country about that period, Arthur Young standing out prominently in this connection, and it is evident that every part of the country was a scene of activity between 1750 and 1800, although much work was done before and after those years.

Samuel Hayes, founder of Avondale, describes some of the planting practice at that time, and was particularly enthusiastic over a planting machine introduced by a Scotsman named Robertson for the purpose of pulling up trees of 20 feet high or more by the roots. These trees were used for forming clumps on the demesnes Robertson was laying out, and must have been a very expensive process even in those days of cheap labour. Apart from this method, however, the planting described by Hayes was very similar to that practised to-day, and included all the European and Eastern American species of any economic value. Western American and Japanese varieties were, of course, not then known. In nursery practice, again, there does not seem to have been any great advance. While some of Hayes' statements suggest that he was quoting English or Scotch writers rather than drawing on his own personal experience, other remarks show that he was a keen observer and an enthusiastic forester.

To quote all the authorities dealing with this particular period would be impossible in a short space, but at least one source of informa-

tion of a very reliable order must be made use of. This is the report made to the Departmental Committee on Irish Forestry in 1908, by the late Mr. Richard Moss, on the result of granting premiums for planting and nursery work by the Royal Dublin Society. This has a very close connection with present conditions, when compulsory replanting is the order of the day, and grants to private owners have been sanctioned by law. The report states that the premiums were instituted in 1739, and were continued until 1808, but the returns are incomplete for the first 22 years. In 1761, the Irish Parliament voted the Society a sum of £2,000, which was largely increased until the Union, when the Votes-in-Aid to the Society were reduced, and the premiums ceased. As the returns do not show the entire outlay, it is not possible to give the total acreage planted by the help of the premiums, but 2,800 acres are mentioned in the course of 40 years (or 70 acres per annum) in return for £12,460, or approximately £4 per acre, practically the same as that given to-day. The trees specified for planting a minimum of 10 acres were: oak, beech, chestnut, walnut, sycamore, elm, larch, fir and pine, and varied from time to time. Weymouth pine being mentioned in 1765, and maple and ash in 1783. Oak was occasionally scheduled as a main crop in particular cases, but the quality of the soil was not considered and subsequent reports stated that it was sometimes planted where larch would have done better. Neither spruce nor silver fir is specified, but these may be covered by the word "fir." The most surprising feature was the number of trees to be present on an acre of ground, which varied from 1,000 to 8,000 at the end of 10 and 3 years respectively.

Premiums to nurseries, either by the number of plants sold, or by the acre of nursery ground, were also given, and one hundred and eight nurseries in all raised and sold 24,767 millions, of which Galway alone contributed nearly half. These premiums were finally abolished on account of the frauds practised in connection with them. In one case quoted, the bulk of the trees alleged to have been planted consisted of mountain ash, which were probably self-sown, and pulled out of the nearest wood.

In all these early records of planting methods, we cannot help wondering how the rabbit problem was dealt with, but no mention is made of it. Wire netting at that time did not exist. The earliest reference I can find to netting against rabbits is in Brown's "Forester" for 1871, and the brief statement therein, merely suggests that it was *coming* into use about that time. How were trees protected before then? Or was the rabbit less in evidence? Brown certainly suggests painting the trees with a mixture, but as we all know, this was a very feeble safeguard. The steel trap was also out of the question in those days. One possible reason for a scarcity of rabbits in the 18th and early part of the 19th centuries may have been the very high rural population, and the necessity for keeping down ground game at that time. Against this, we have the tendency of the landlord interest to preserve game of all kinds on tenanted holdings, and their powers in this direction were very considerable. The question, therefore, must be left unanswered, but possibly the game-keeper and the wholesale contractor for rabbit trapping had strong motives for having a good stock on the ground at the end of each season.

After the great activity in laying out demesnes, which lasted for about a century, and appears to have terminated round about 1820, it is probable that little planting was done until the years following the famine of 1845, when all kinds of relief work were started in rural districts. According to Agricultural Statistics between 1841 and 1891, there was an increase of about 80,000 acres under conifers during the 50 years, although mixed woods decreased by nearly double that area during the same period. Much of the former would be on mountain land, and outside the boundaries of demesnes, but the big decrease in mixed woods is difficult to account for. As 1880 seemed to mark the almost total cessation of planting on private estates, it may have been accompanied and followed by a heavy felling of woods affected

by the Land Act of 1881, and most of the reduction had taken place in the last decade of the period in question.

Two or three incidents which are of some interest occurred at the end of last century, and with them I think this paper may be brought to an end. In 1884, Mr. W. E. Gladstone, one of Ireland's most sympathetic statesmen, ran into a Danish gentleman named Howitz. The latter must have been extremely plausible, for he induced Mr. Gladstone to give him a commission for reporting on "*The Reafforesting of Waste Lands in Ireland.*" The report was a most extraordinary document, and advocated the planting of a shelter belt along the entire West coast to exclude the Atlantic gales, and to bring down the rain which accompanied them. The area of waste land estimated as suitable for planting amounted to 5,000,000 acres, and must have included every bog and mountain top. The species recommended for planting them were apparently taken from a nurseryman's catalogue in alphabetical order. It transpired later that Mr. Howitz had no forestry qualifications whatsoever, and must have compiled the report more in the nature of a hoax than as a serious attempt to grapple with the problem at issue.

About the same time, the Knockboy experiment was inaugurated on about 1,000 acres of bog land in Connemara. As this was the first attempt at State afforestation in Ireland, its failure was little short of a tragedy, but it illustrated the evils of political influence being applied to technical work. About £10,000 was spent on the scheme in about ten years, when further attempts were abandoned. The history of Knockboy is briefly this: Mr. A. J. Balfour—when Chief Secretary—was urged to start the afforestation of so-called waste land. His reply was that the cost of such land would probably be prohibitive, but if an area could be obtained, he would provide the necessary funds. The owner of Knockboy at once came forward with an offer, and to redeem his promise, the Chief Secretary was obliged to purchase, and attempt the impossible.

These two incidents constitute what may be termed the genesis of State action in Irish forestry, and illustrate how wide was the gap between theory and practice, and the amount of spade work which had to be accomplished before a practicable forest policy could be initiated.

I think enough has been said to bring some early events to your notice which have had, and still have a bearing on State forestry in Eire. Some of them are, of course, well-known to students of Irish history, but I doubt if many of you ever think of them in the course of a busy life. But history is said to have a trick of repeating itself, and it is sometimes well to bear in mind that events which happened one thousand years ago may find a parallel in modern times, remote as the probability may seem to most people. If these events are classified in order of importance, I should say that the two which have reacted most powerfully on present-day conditions are the relatively minute division of the land into townlands at a very early period, and the creation of demesnes within the last three hundred years. The former hastened the removal of the natural tree growth, and rendered its reafforestation more difficult, while the latter brought a great deal of first-class land under timber crops which would have otherwise remained in the hands of the farmer.

A Plea for Shelterbelts of Broad-leaved Trees.

S. M. PETRIE.

Foresters in particular and the people in general are being increasingly reminded of the fact that the present emergency is resulting in very extensive clearances of woodland areas and in the rapid disappearance of farm-land screens, groups and isolated trees, mostly with adverse effects not readily foreseen and realised only after many years have passed. This fact automatically draws attention, as in the last world conflict, to the urgent necessity of taking steps for the re-afforestation of cleared areas and for the speedy replacement of cut-over shelter belts and clumps. Immediate replanting, as foresters well know, is desirable if the entry of weed and scrub growth is to be blocked and before the damaged drainage on wet areas become itself a major problem requiring heavy expenditure before planting can be contemplated. Apparent and imperative as the need is, there are many difficulties to its early fulfilment, not the least being that the majority of these areas are in private ownership—the difficulties of satisfactory afforestation by the private individual are legion—and that they are usually small and widely scattered.

Clearances due to Need for Fuel and Food Production.

One of the fundamental differences, greatly affecting the smaller woods and belts in the country, between the present emergency and the last war is the fuel problem which was never more acute than during the past two years and is responsible, to a large extent, for the denudation of the shelter screens and single trees. The wholesale destruction of these belts and screens is arousing attention and stressing the need for preventive and remedial measures. The production of food, in addition to the provision of fuel, is unhappily accelerating this destruction. It is essential that the bulk of the food required by man and beast be grown within the country and large areas of land, formerly used solely as grazing, must now be given over to cultivation. On these lands, the trees which sheltered the stock from summer heat and winter cold are, under the new conditions, regarded as a nuisance and a drawback. They hamper agriculture with crown and root, the former by casting too dense a shade on the field crop, the latter by blocking the plough on its journeys. The only remedy for the matter is the drastic one of immediately felling the trees.

There is undoubtedly a great deal to be said for the clearing of many of the trees in what is termed tillage country, but the farmer who must fell all the trees round a field on which he intends to sow a crop is not taking a sufficiently far-sighted view of the situation. It is possible that when the emergency is over these lands will revert to grazing ground and shelter cannot be acquired as quickly as it can be removed. Stock breeding and rearing may again become the principal industry and the importance of shelter belts and hedgerow trees to the stock breeder is of supreme importance, especially in a country where much of the stock is wintered out of doors and where south-westerly gales are of frequent occurrence. Artificial shelter in the form of open or closed sheds is expensive. Natural shelter is longer lasting and further reaching in its effects. A shelter belt of trees causes no draughts, as does a solid body. It breaks the wind without formation of gusts. It is calculated that on level ground the shelter effect of trees extends ten feet in a horizontal direction for every foot in height above the ground. This effect of a belt of large trees can be felt far out in the field, which is obvious to many who have tested it on the day of a gale—and it is a fact that many farmers mistakenly think that there is more shelter from a thick whitehorn hedge than from a moderately widely spaced belt of tall trees. Large trees serve as shelter over a proportionately larger area of ground.

The shelter and beauty of the Irish landscape are, to a great ex-

tent, due to the broadleaved tree. The judicious planting of belts and groups of hard woods by our predecessors left us a legacy which is all too carelessly being dissipated and with very little consideration for the future. In a countryside of the Irish type, the cutting over of the smaller woodland belts and groups has a greater effect both on the eye and on shelter than has the clearing of the larger tracts. One misses the familiar roadside belt much more so than the hill plantation; so also do the livestock in unfavourable weather.

Species suggested for Replacement of Former Broadleaved Belts.

In a fertile country, as distinct from the poorer hill regions, the natural forest is of the broadleaved type and in a national reafforestation scheme it is possible to allocate a certain area of better class land for hardwood timber production, conifers being the main species for the larger and more easily acquired, higher, poorer, sites. On a smaller scale, the same procedure might be followed on the farm. The major portion of the land must be devoted to the growing of field crops and the rearing of stock but it should be possible on nearly all the large-sized farms to set aside a small proportion of the area solely for the provision of belts and groups of trees. This was common practice in the last century and it would be almost sufficient if these strips—now devastated waste lands—where previously such stands of trees did exist, were re-stocked. They are manifest in all parts and their size, shape and position are such as to make them eminently suitable for this purpose and of little value for any other. To the replanting of these, with suitable species, as well as to the re-afforestation of the large woodland areas in private hands, attention should be given and advice offered by people competent to do so if the state of the countryside, from the farming and the residential points of view, is to be maintained and ameliorated.

The phrase *with suitable species* is the core and centre of the problem and it is here that proper advice is necessary. There are many farmers quite willing to re-plant and many have actually done so. Belts and clumps of Sitka Spruce and Japanese Larch are appearing, like fungoid growths, on arable farms in all districts. They symbolise a new order in private forestry. As stone and lime are replaced by sand and cement, so Oak and Beech give way to Sitka Spruce and Japanese Larch. It can hardly be called a forward step. Useful as these coniferous species are in their proper sites, they are a shoddy couple when seen sprouting quickly upwards, like rank plants gone to seed, on land which, without manuring, can raise successive crops of wheat. They occupy land on which better quality timber might be produced and where a more efficient shelter can be raised; they are unsightly in such surroundings and do not suit the landscape. From the frequency with which groups of the faster growing conifers are now to be met on the richer farmlands, lower slopes and valleys, it is evident that very unsatisfactory advice is being given to farmers and it is in this connection that it seems expedient to draw some attention to broadleaved species, now being so widely neglected, if a useless type of shelter and an artificial landscape are to be avoided.

It is not intended in this short article to set out all the various broadleaved species with their merits and drawbacks as shelter belt trees and with their climatic and edaphic requirements. The commoner broadleaved trees such as Oak, Beech, Ash, Elm, Sycamore and Horse chestnut have all small preferences as regards soil and situation but they can be satisfactorily grown on the majority of Irish arable farms as the many fine specimens now being cut over have proved. The care and attention which must be paid them from the time of planting onwards are more exacting than these required by conifers but not so intricate or laborious as to interfere seriously with farm work. The extra trouble will be repaid with very superior results.

Care and Attention Belts Require.

The majority of broadleaved species are frost-tender and in the young stages, guarding against frost is, if one omits the rabbit scourge,

the principal precaution to be taken. After planting, very little cleaning of soft weeds or woody growth need be undertaken unless these are injuring the planted trees by direct contact. If the leading shoot is free, and unharmed, it will force its way through fairly dense cover and by leaving as much natural growth round the plants as possible, the danger from frost is considerably lessened. In the replanting of cut-over belts, it is therefore advisable to leave all the natural scrub growth and coppice shoots which will not directly interfere with the selected natural and planted hardwoods. These have a beneficial effect on young plants by shading them from too bright sunshine, by protection from frost, by stimulating height growth and by adding to the fertility of the soil with their annual leaf fall. It is a mistake to open up and thereby expose young broadleaved trees by too intensive grass cleaning and weeding.

On the more open sites, the coniferous tree comes in useful as a nurse and as a means of quickly securing shelter and a dense stocking at an early stage, and it is desirable when establishing broadleaved trees on bare land to mix them with one of the faster growing, light-demanding conifers. These will be generally only temporary ingredients of the mixture and will be removed as the broadleaved trees get past the tender period and as they require more room for development. Common Larch, Japanese Larch and Scots Pine are the most suitable species for this.

The spacing of plants in the young stand must now be guided chiefly by costs, prices of plants and wages of men. Generally, with broadleaved trees, the closer the spacing the better and good naturally regenerated stands whose development is watched will show the crop as a thicket until about the twentieth year. Keen competition between the plants is necessary to force them above shrubby weed growth, to enhance the shape of the better trees and to bring into operation the natural pruning of the lower branches. So the denser they can be planted, the more readily can natural conditions be attained. The introduction of the conifer nurses assists in reducing the number of broadleaved trees which it is necessary to plant and in bringing about the thicket stage as early as possible. Not until the conifers, by contact or too dense a shade, are hindering the satisfactory growth of the broadleaved trees, should they be removed and then gradually here and there as their presence is no longer required. Broadleaved trees, unlike conifers, can usually be left as a thick stand almost until maximum height growth has been reached after which gradual thinning may be done to enable them to expand the crown and put girth growth along the entire length of a clean stem.

Broadleaved trees require individual attention in the young stages and where trees are in small belts and groups, as distinct from large woodland areas, this is not a difficult matter. Pruning with the knife or secateur is an operation which needs constant attention since the density of stocking of natural growth cannot be attained in an artificially formed plantation. This work is directed towards giving the plant the best possible shape, a strong single leader, a clean stem at the bottom and absence of too strong side branches. Pruning in such a way accelerates growth to a remarkable degree but a little pruning each year is much more preferable to a sudden heavy pruning after a long interval. This can cause the leading shoot to put on such rapid growth that there is danger of breakage of the shoot by wind in early summer with consequent loss of height and difficulty in selecting a new leader. Only with a full complement of leaves can the plant feed itself as requisite and it should not be stripped of too many at once. As new side branches appear on the growing stem so the older ones lower down can be proportionately removed. Cutting is done close to the main stem and the best season for this work is from June to August when the wounds heal quickly.

Making use of Natural Seeding where it occurs.

The satisfactory restocking of many broadleaved screens could be effected with practically no artificial planting of purchased plants if a little intelligent forestry practice were applied. The natural growth at

all stages of development, to be met on countless devastated hardwood areas, is at once a tribute to nature's conquest of the rabbit by sheer weight of numbers and to the soil fertility of the majority of these sites. On such partially regenerated strips, by thinning out deformed stems, by reducing the number of coppice shoots and suckers to one per old stool, by lifting seedlings from the denser patches and planting them in the unstocked areas and by pruning off double leaders and heavy side branches, promising groups of broadleaved trees can often be formed. It may be possible to induce the restocking of blanks, after grubbing, with naturally sown seedlings if some of the old mother trees are still standing on the site. The introduction of a shade-bearing species, such as Beech, to the blanks among natural groups is strongly recommended for bringing the stand up to 100% stocking, and by doing so the growth and form of the light-demanding species are much improved and soil fertility is increased and conserved. Similar procedure applies to an artificially formed plantation of broadleaved trees—at least one of the species in a mixture should always be shade-bearing and a light-demanding species should never be grown pure.

The natural growth of old hardwood sites is principally Ash which regenerates itself abundantly and appears before, or immediately after, removal of the old crop. Frequency of seed years and small demand for the seed as food by animals and birds are probably responsible, for there is little doubt that the unfortunate absence of natural seedlings of Oak and Beech, even where mother trees exist, is due in great measure to the pigeon and the squirrel before any blame can be attached to the rabbit. Natural regeneration of species having light, readily blown seed is more common than that of species with heavy seed such as the Oak, horse Chestnut, Beech and Walnut.

Summary.

To sum up, every area should be planted with the species of tree most suited to its site conditions and as regards the majority of cut over belts and groups on lowland farms and divided demesnes, there can be no question that some broadleaved species or another is the correct one. Where conditions are unsuitable for broadleaved trees conifers may be planted but the present neglect of the hardwood on the small, rich sites and the desirability of maintaining the proportion of good quality timbers where they can be grown require emphasising. Extent of area greatly affects the point. Broadleaved trees require careful and intensive management and are therefore most profitable in small units. The formation of absurd belts of fast growing exotic softwoods on good lowland farms and on the sea coasts should be discouraged. They are inefficient as shelter after the twentieth year or so. They are uneconomic from the forestry point of view and aesthetically they do not blend with the landscape unless on mountain areas. Nurserymen and horticultural officials as well as foresters could, in the normal course of their work, considerably increase the popularity of broadleaved trees for their advice is frequently sought by farmers and others who contemplate planting. The recommendation to plant softwoods is very often being made without due consideration being given to all the favourable features of a site.

As regards young plant stocks of the common broadleaved species, there ought to be no lack of these in all nurseries. Seed crops, at intervals of three or four years, supply abundantly of the fruit of the Oak, Beech, Ash, Horse Chestnut, Elm, Sycamore and others and the technique of collecting, storing and sowing seed of broadleaved species could come, to a greater extent, within the province of many nurserymen. Heavy stocks of the more adaptable conifers are required for the poor soil areas and high-lying sites but these species should not be allowed to encroach upon the small favourable situations to which the more valuable indigenous broadleaved trees have a right and on which they can produce a superior form of shelter, a more pleasing appearance and a useful contribution to hardwood timber stocks.

Handling Native Timber.

Formerly the bulk of our softwood supplies were received from the Baltic countries and arrived square sawn in a sufficiently seasoned state to be immediately useable for most purposes. Merchants who dealt solely with imported timber had no need to concern themselves with the preliminary processes of felling, sawing and drying which the timber had to undergo before reaching their yards, and their knowledge of them was frequently rudimentary and even non-existent. Consequently when all imports ceased they were forced to turn to native woods for their supplies and to enter upon a section of the trade for which, by lack of previous experience, they were exceedingly ill equipped.

It should be generally known, though the amount of ignorance on this point is surprising, that timber when freshly sawn from the tree contains an excess of moisture which renders it unfit for immediate use. Removal of this excess is known as seasoning and it is the lack of the requisite knowledge as to when seasoning should begin and how far it should continue which has contributed to the prevalent notion that native timber is inferior to imported. This inferiority complex is not shared by those who have spent their working lives in growing timber and the blame for any dissatisfaction with the use of the native product lies at the door of those operators who have not troubled to acquaint themselves with the correct procedure.

Moisture content is something which has to be carefully watched at all stages of manufacture and up to the final situation in which the sawn timber will be used. At the very outset it would be as well to dispose of some old wives' tales. First about the sap going down in winter. The amount of moisture in a tree is relatively constant both in summer and winter, the only difference being that in summer the sap is in motion and in winter it is practically static. Another queer idea is that timber seasons in the log; this is completely erroneous, as timber does not season in that condition but merely decays.

Handling after felling. Logs should not be allowed to lie in the woods but should be removed immediately to the sawmill for conversion. If such a course be impracticable they should not be allowed to lie in contact with the ground but should be raised clear on cross billets so that air may circulate freely underneath them. This is particularly important in summer when the higher temperatures favour the growth of those fungi which cause decay. Such timbers as Oak and Larch are fairly resistant to decay and may not deteriorate too much as a result of careless handling, but Scots Pine is very liable to sap stain if not dealt with at the earliest possible moment.

At the sawmill. The faces of freshly sawn timber should not remain in contact, otherwise moulds well develop. As soon as it leaves the bench the timber should be piled with seasoning sticks between the layers of the pile. These sticks should generally be 1" x 1" of clean dry stuff and should be placed vertically above one another in the pile and about two feet apart. As the rate of drying is influenced by the thickness all timber should be broken down to the thickness at which it will ultimately be used. Drying rates also vary according to species and each pile should only contain one species of one thickness.

Drying takes place more rapidly at the ends than at the faces or edges. Consequently if timber is drying in the pile over an extended period the ends will become much drier than the rest of the timber. Once this drying has proceeded beyond the point at which appreciable shrinkage occurs end splitting will develop. This may be counteracted by coating the ends with a good waterproof paint, or if this be not possible the ends of the piles should be protected against sun and wind by sacking. At the time of stacking short sample pieces should be built into the pile in such a way that they can be extracted from time to time without disturbing the rest. If they have been weighed before stacking and their moisture content ascertained it will only be necessary to weigh them at

intervals in order to gauge the state of dryness of the rest of the pile. When the timber has reached a moisture content of approximately 30% it is then sufficiently dry for shipment. This preliminary drying is important from two standpoints. Firstly, it will be sufficiently dry to discourage the growth of moulds wherever the faces come into contact so the buyer will receive it in good condition, and, secondly, the saving in weight. This latter consideration will not greatly concern the miller who disposes of his product at prices F.O.R., but it is of importance to the buyer who would be paying rail carriage on a good deal of useless moisture. For instance, a ton of freshly sawn spruce at approximately 80% moisture content would only weigh about 14 to 15 cwt. at 30%, a reduction in weight of anywhere between 25% and 30%.

Times of drying vary with the species and the thickness of the timber. Softwoods are more tolerant of rapid drying conditions than are the hardwoods. Native Scots Pine, Spruce, Douglas and Silver Fir dry rapidly, but Larch is more refractory. Generally speaking, these will dry without serious degrading up to 2" thickness, but the hardwoods should be stacked with $\frac{1}{2}$ " to $\frac{3}{4}$ " sticks, the thinner sticks being used for such refractory species as Oak. Thickness of the material has an important bearing on the rate of drying. Below 2" it may be assumed that the time required is roughly proportional to the thickness, but 3" stuff would require at least twice the time of 2". Under normal weather conditions hardwoods stacked in the autumn and softwoods stacked in the spring would be fit for shipment by the following autumn.

Frequent reference has been made to moisture content, so it will be advisable to go into greater detail as to what is actually meant by that expression, how it is determined and to what extent moisture may be permitted to remain in timber without impairing its usefulness for the purposes for which it is intended.

In the first place it is necessary to adopt a standard of measurement to which moisture contents may be related, and this standard is known as the oven-dry weight. If a sample of the timber be weighed and then placed in a drying oven it will be found to lose weight as the moisture is driven off. Finally, a stage is reached when further drying is not accompanied by further loss of weight and the sample is then said to be oven-dry. The original moisture content of the sample is then ascertained from the following formula:

$$\text{Moisture Content} = \frac{\text{Green weight} - \text{Oven-dry weight}}{\text{Oven-dry weight}} \times 100 \text{ per cent.}$$

If, for example, the original weight of the sample had been 35 gm. and the oven-dry weight 20 gm. then the difference of 15 gm. would represent the weight of the moisture driven off, and the moisture content at the time of testing would be:

$$\text{Moisture content} = \frac{35 - 20}{20} \times 100 = \frac{15}{20} \times 100 = 75\%.$$

It will be seen from the above formula that moisture content is expressed as a percentage of the oven-dry weight and not of the original weight of the material.

If at the time of stacking a preliminary test for moisture content were made and the sample pieces weighed as they were built in to the pile it will be possible to find the state of dryness of the timber in the pile at intervals. Suppose that at the time of stacking the weight of a sample piece were 45 lbs., and its moisture content 75%, then its oven-dry weight could be calculated from the following formula:

$$\frac{\text{Wet weight} \times 100}{\text{Moisture content} + 100} = \frac{45 \times 100}{75 + 100} = \frac{4500}{175} = 25.7 \text{ lbs.}$$

Each sample piece should be weighed separately and its oven-dry weight calculated. At intervals, as drying proceeds, they can be taken

out of the pile and weighed. Their current weights will determine the stage of dryness from the following formula:

$$\text{Moisture content \%} = \frac{\text{Current weight—Oven-dry weight}}{\text{Oven-dry weight}} \times 100$$

Suppose that, at the time of testing, the sample piece which originally weighed 45 lbs. in the green state now only weighed 34 lbs. The calculated oven-dry weight was 25.7 lbs. and its moisture content would be

$$\frac{34.0-25.7}{25.7} \times 100 = \frac{8.3}{25.7} \times 100 = \frac{8300}{257} = 32.3\%$$

As air seasoning is entirely dependent upon the state of the weather, over which the operator has no control, it need occasion no surprise that the results obtained will be variable. As a general rule thoroughly air-dried timber will assume a final moisture content of between 23% and 17%. Under exceptionally favourable conditions a state of dryness as low as 15% may be reached. For certain environments, such as interiors which are subjected to a high degree of central heating, lower percentages will be required and these can only be attained by kiln-drying.

Kiln-drying. The underlying principles of this process are not sufficiently understood and it has frequently been condemned by the unthinking as an artificial and forcing method. Apparently air-seasoning is regarded as a so-called natural method, but such is not the case, as sawn timber does not occur in the natural state. Kiln-drying is not forcing, but it does augment and accelerate those conditions found in nature which are conducive to the extraction of moisture from timber. There are various factors which govern the time required for seasoning and they are applicable to both processes. These factors are:

- (1) Original and final moisture contents,
- (2) The density of the timber,
- (3) The thickness of the stock,
- (4) Air temperature,
- (5) Relative air humidity,
- (6) Velocity of air currents,
- (7) Length of air travel,

and it will be advisable to examine them in turn. For the sake of uniformity it will be assumed that Scots Pine 2" thick is being treated.

Original and final moisture contents. In the green state home grown Scots Pine has a moisture content of about 85%. Obviously it will require much longer to reduce it to a 12% moisture content than to 30%. It will be found that successive stages of dryness require longer times and if these were plotted in a graph they would form a steeply ascending curve. In a continuously working overhead fan kiln it would probably require 35 hours to reduce to 60% from the initial green, the next stage to 50% would require an additional 20 hours, to 40% an additional 25 hours, to 30% a further 30 hours, to 20% about 40 hours and from 20% down to 12% a further 90 hours. These times are merely approximate and amount in all to some 240 hours and they may be shortened slightly, but it is the attempt to shorten them unduly and to telescope the schedule which constitutes the forcing by which kiln-drying has been unjustly condemned.

The density of the timber. Hardwoods are much denser than the softwoods and in consequence require much longer periods for drying. Taking Scots Pine as our unit it would be necessary to multiply the drying times given above by the approximate factors quoted for the following species:

Ash, Beech, Elm and Poplar	3 to 3½
Spanish Chestnut	5
Oak	8 to 8½

The softwoods also show variations in this respect and the following approximate factors would be required:

Corsican Pine, Norway Spruce and Douglas Fir	$1\frac{1}{4}$
Larch (European)	$1\frac{1}{2}$
Hemlock	$1\frac{3}{4}$

Thickness of Stock. This has an important bearing upon the time needed for drying. Obviously thick stock would take longer to dry than thin, but the times required are not proportional to the thickness. Taking 2" stuff as our unit the following factors would need to be applied for various thicknesses:

Thickness	$\frac{1}{2}$ "	1"	$1\frac{1}{2}$ "	$2\frac{1}{2}$ "	3"
Time factor	0.2	0.425	0.700	1.400	2.00

Air temperature. Kilning may be commenced at much higher temperatures than are available in air drying. All timbers are not alike in their reactions to kilning and some prove much more refractory than others. Such timbers as Elm and Sycamore would require a comparatively low initial temperature of about 105° Fahrenheit whereas the more tolerant softwoods such as Scots Pine and Norway Spruce could bear an initial temperature of 140° to 150° Fahrenheit. At successive stages of drying the temperatures would be raised, but the maximum permissible in the case of very refractory timbers would not exceed 120° Fahrenheit. The more tolerant softwoods could reach as much as 180° in the final stages.

Air Humidity. The higher temperatures in kilning will greatly accelerate the evaporation of moisture from the timber as compared with air drying and if very dry air were used at these temperatures the greatly increased rates of drying would set up stresses in the material giving rise to very serious defects such as case-hardening, splitting, honeycombing and so on. To counteract this tendency it is necessary to raise the humidity of the air above normal at the commencement of the run. This can be done by introducing a fine jet of steam into the drying chamber and checking the humidity by the difference of the readings of a wet and a dry bulb thermometer. As the relative humidity at the beginning should be about 80% the wet bulb should have a reading about 6% less than that of the dry bulb. The actual temperature readings are not in themselves so important but that percentage difference should be maintained. As drying progresses the temperatures can be raised and the humidity lowered. When the moisture content (%) of the wettest timber has been reduced to, say 60% the temperature could be raised another 5° and the humidity reduced to 70%; at this stage the difference in the bulb readings should be in the order of about 8½%. This process of raising the temperature and lowering the humidity would proceed by successive stages until the desired moisture content (%) was reached.

Velocity of air currents. Air in motion causes more evaporation than still air and the higher the velocity the greater the rate of drying. Too high a velocity would cause rapid drying of the timber on the inlet side of the pile and the rapid saturation of the air would mean that the timber on the outlet side would be much wetter. To counteract this tendency it would be necessary to raise the relative humidity of the air in the drying chamber and thereby retard excessive evaporation. Any advantage gained by the higher air speed would thereby be neutralised. In a fan-driven kiln an air speed of between three and four feet per second should be sufficient. Natural draught kilns which depend entirely upon convection currents for the flow of air could not provide such air speeds, consequently they can work at a 10% lower air humidity than the fan kiln to assist evaporation. One important advantage possessed by the fan-driven kiln is the fact that the air flow can be reversed and the timber pile be dried equally from each side.

Length of air travel. Air entering on the inlet side becomes progressively wetter as it travels through the pile and if the pile were unduly wide a stage would be reached where no drying would occur on the outlet side. In the double stack type of overhead fan kiln a width of six

feet should not be exceeded, but up to seven feet would be permissible in a single stack kiln.

It has not been possible to do more than sketch in merest outline the principles which govern kiln-drying, but enough has been written to show that it is no haphazard process of merely placing timber in a kiln, leaving it there for a while, and then taking it out. On the contrary, it is a highly skilled operation in which all the governing factors have to be carefully balanced. Much depends upon the operator and an experienced man can secure satisfactory results even with a poor type of kiln. On the other hand, with an inexperienced operator in charge of a good kiln anything might happen. In good hands the results from kiln-drying are more dependable than from air seasoning as all the factors are under control at every stage of the process. J.A.K.M.

Thinning of Young Conifer Stands.

T. CLEAR*

*Paper read to open the discussion on this subject at the Summer Meeting in Clonmel, June, 1943.

My contribution to to-night's discusison on the thinning of young conifers will be just an outline of what is known about thinning in general, and the thinning of young conifers in particular. I am sure that my fellow members will have much to add. Although most of those present are familiar with the principles of thinning, I think it will do no harm, and it might help some of the associate members here to-night if I go over some well-trodden ground.

The forester's main object in planting trees and tending woods is to produce timber, not just any kind of timber, but high quality timber that can hold its own in competition with foreign timber, or with other materials. We must remember that or else we will never make a success of timber growing. There is an idea abroad that anything will do, and that we can adopt a take-it or leave-it attitude. I think it won't work out that way, and in any case, it is a poor way of looking at one's job. Now if we are to produce good timber we must know what good timber is like, and also know how it is produced. Good timber for any purpose, let it be building construction, telegraph poles, pulping, veneering or even composition board, is timber free from knots, of regular growth, combining the qualities of strength and good appearance. Now, it is well within our power to produce such material, but it requires skill, and a certain amount of knowledge of the factors governing tree growth.

When the forester plants an area he goes to great pains to establish a good crop, evenly spaced and as close or as thick as economy will allow. He strives in the years following to maintain that density of stocking, knowing that blanks or failures will lead to coarse individuals and delay in the suppression of weeds. His main concern is to have the crop close as early and as regularly as possible. The sooner the crop closes, the sooner the side branches are suppressed; and early suppressing means small knots and early cleaning and eventually a high per cent. of knot-free timber. After the crop closes, the wood forms a dense thicket in which each tree is struggling with its neighbour for light and root space. This struggle for light is extremely useful in that it forces growth into the leading shoots and crown and tends to make the trees tall, straight and clear of branches. However, the struggle tends to become too keen especially in even crops of spruce, larch, Corsican pine and Douglas fir, with the result that the crowns become restricted and the trees generally drawn up, weak and lanky. The foliage of the crown of course, feeds the cam-

bium which produces the wood of the tree. The amount of wood formed is thus dependent on the size of the crown and also on the size of the roots. Restricted crowns and roots mean a small production of wood and this means narrow growth rings especially near the base of the tree. This progressive reduction in the size of the annual ring means a falling off in growth and will lengthen the time required for the production of trees of convertible size. The trees will have a soft open pulpy heart and a close hard outer core and will therefore produce a large percentage of low quality timber.

The idea therefore should be to prevent the formation of soft wide ringed cores in the early stages and to maintain steady or even rapid growth at the later stages.

How can this be done? Take Scots pine. This tree is our main candidate in the race for the lumber market. It must be of good quality, straight, slow-grown and free from knots, if it is to compete with Scandinavian red deal. Scots pine rarely comes away evenly and there are many ugly coarse and crooked trees in evidence by the time the crop is ten years old. These usually dominate, slightly, a better type of tree, with fine branches and good form. It is at this stage that the quality of a crop of Scots pine can be decided. *Pre-thinning*, that is, the removal or heading back of the worst of these wolf trees from young crops of Scots pine in the early thicket stage, is usually necessary if the good trees are to survive into the pole stage. If this pre-thinning is neglected, these better type trees are usually dead or have become so drawn up and whippy as to be beyond help and we must perforce select our final crop from amongst the better shaped 'wolves,' all of which are by now soft and pulpy at the core and well furnished with coarse knots. No amount of late thinning or pruning will produce good quality timber when this happens although a certain amount of pruning may gull a buyer into believing that the timber is clean and good.

Having allowed the crop to pass through the thicket stage and started the cleaning process well on its way, the forester's main efforts are directed towards maintaining substantial well-balanced crowns on those trees selected, tentatively at first, for the final crop. This he achieves by cutting and removing, for sale if possible, all those trees that unduly interfere with the proper crown development of the final crop and in addition those which have ceased to be useful. In the beginning the thinning is aimed rather at the encouragement of as large a number of stems as possible so that the crop may be even and the suppression of side branches maintained. This is achieved by concentrating on freeing the main body of the dominant trees of the crop from the danger of suppression by a few over-assertive individuals. In addition, of course, all dead dying and suppressed trees are removed as a matter of routine. There seems to be no unanimity about the advisability of removing this latter material. Some authorities say it is a waste of time and money to cut out stuff that can do no harm, others say that it can possibly do harm by providing a breeding ground for bark beetles and other pests and there one is left! To the average forester these dead and dying trees provide a very useful and necessary, in my opinion, outlet during critical thinning operations. He has the satisfaction of marking at least something with which high authorities will not be able to find fault. He calls it a light thinning and sometimes has the satisfaction of making a little profit on the sale of this material.

The modern tendency in thinning is to make it as heavy as possible from the beginning. This applies especially to spruce, larch and Corsican pine. While spruce may not appear to suffer as much as larch from early overcrowding, it is widely recognised in Denmark that lack of early thinning in spruce results in undue length of bole to crown which causes swaying and rupturing of roots and thus increases the incidence of butt rot. The market for spruce thinnings created by the opening of pulp factories has encouraged this tendency as it is now financially sound to thin heavily in young spruce. The type of thinning

favoured is a heavy low thinning that is, all dying suppressed and sub-dominant trees are removed as well as some trees from dominant groups. This allows an increasing quantity of sunlight to reach the forest floor and in this way undue raw humus formation is avoided. The utilization of heavy thinning in the control of disease is also illustrated by what has come to be known in Great Britain as "the Novar principle." European larch suffering from canker is treated under this system as follows: All the cankered stems are cut out leaving only 300 to 500 trees to the acre and then under planting with Thuja, Tsuga, A. grandis, Douglas fir or beech. The result is, that due to the increased air and light the larch grows rapidly, throws off the effects of the disease and the undercrop comes away well under the partial shade, keeps the ground clean and later, when the larch is finally removed the undercrop forms the new crop.

Hearing all this, one is bound to ask when should I begin to thin? How much should be removed? And when shall I need to thin again? It is like dodging the issue to say that every crop must be treated on its own merits. Vigorous full crops of Japanese larch, Corsican pine and European larch will probably need attention from 15 years onwards, every three years up to 30 years and every 5 years after that. Sitka and Norway spruce on good quality soil will be yielding poles when crops on poor sites are still in the grass and being beaten up. The condition of each stand should be the main basis for judgement. Additional aids are the comparison of representative plots with appropriate yield tables to find out the quality class and then the number of stems per acre at the ages of 20, 25, 30 years and so on given in the yield tables.

Another way of knowing whether a crop is in need of thinning is to consider the nature of the crowns of the dominant trees. If they are generally small, less than $\frac{1}{4}$ of the total length of the tree, thinning is needed. Then there are the many "rules of thumb" or traditional prescriptions for thinnings, such as early, little and often, which is a good safety first rule for anyone built that way. Another rule relating to the condition of the forest floor is "Green in the distance, brown underfoot" which of course refers to the scattered clumps of wood sorrel, mosses and ferns which come in under a fairly dense but not over crowded canopy of pine, spruce or Jap. larch, and seem to form a sward at some distance away but underfoot, there is brown carpet of needles.

Another method of deciding on the grade of thinning to be followed is to demarcate a plot of say $\frac{1}{4}$ acre and classify the trees on the plot according to their position in the canopy into (1) dominant (2) co-dominant (3) sub-dominant (4) suppressed (5) dying and dead diseased trees and then to further sub-divide each class according to the quality of stem, uniformity and vigour of crown and so on. A thinning can then be marked which is high or low, light, medium or heavy and carried out and if found appropriate can be applied to the rest of the stand. This is the best way of giving instructions as to the nature of the thinning to be carried out, there can be no misunderstanding directions, so illustrated.

The thinning of young conifer stands will be of growing importance as time goes on. Nearly 100,000 acres of conifers have been planted in the last twenty years and consequently the vast majority of thinning will, for the present and near future, be in young pole coniferous crops. The acreage to be dealt with will increase rapidly since every plantation entering the thinning stage will need attention every third year or so. We will shortly have a much bigger thinning programme than planting programme and every effort should be made to increase our knowledge and skill in this vital field of forestry work. One of the best incentives to proper thinning is the finding of profitable means of disposing of the culled material. The variety and description of material derived from thinnings are unlimited and it is important that the local or general demand for such material be fully exploited. Local demands may be for fencing material, wireless poles,

rough gates, shelters for machinery in the farmyard, pergola work and rustic work, drying trestles for hay, turf and fruit trees stakes. Only recently a farmer asked me about light poles for drying pea haulms. Of course, the local demand is somewhat limited in sparsely populated districts but it should be possible to create some general demand. Pulp manufacture suggests itself for Norway and Sitka spruce, Contorta pine and other white woods such as Abies and Tsuga. Small thinnings are expensive to handle and yield low grade pulp and the industry may have to be subsidised in the initial stages. Small plants consuming 150 tons of timber a day are working successfully in Europe and taking material for a radius of 50 miles, while a haulage of 300 miles is by no means rare in Germany and Sweden where gas-producer lorries also consume large quantities of timber.

In Denmark this problem of utilization has been tackled in a business-like manner. Small mills are working up small produce into potato-sprouting boxes, fish boxes, fruit boxes, week-end huts, tool sheds, military huts. In younger plantations charcoal is prepared in portable kilns and finds a ready market for inclusion in cattle and hen foods, and different industries. As a result of an intense campaign for the use of special wood stoves in country districts, the demand for fuel wood rose beyond power to supply.

In 1935 after a series of experiments on the preparation of a fibre board from low grade mountain pine scrub, a factory was set up to manufacture fibre boards and isolation plates. The industry had to be subsidized at first largely due to the need for research in connection with the material. After 3 years, however, the factory was producing a board equal in respect of price and quality to any foreign plate.

Unless good prices can be realised for the produce of early thinning it must usually be done at a loss. A good deal of this loss could be avoided especially in spruce and pine by concentrating on high thinning and letting the small suppressed trees die on their feet. In this way a smaller number of poles will yield a much better return and the benefits to the final crop may be better than those achieved by a heavy low thinning. However, in the craze for early returns a new type of thinning called commercial thinning is coming into vogue. The idea is to cash in on thinnings even at the expense of the final crop. This might be financially sound but it is bad long term forestry. The business of the state forester is to grow good crops of commercial timber which can meet the country's requirements in time of need. But to explain this commercial thinning, the idea appears to be that if at certain times there is a demand for certain dimensions of poles, say, 5"-8" Q.G. we go through our plantations and cull as many of these as possible without destroying the future crop. This may be all right on a private estate where there is a good man in charge, but in state forestry, I may be pardoned for saying, there is a danger that if the decree goes forth the quarter-girth tape will govern the thinning operation and young stands may be combed every other year of merchantable poles, with the result that there will be no final crop of any use. It can be argued with good reason, of course, that at present we are passing through an emergency and that any thinnings of serviceable size should be felled while the market holds, by so doing we serve the nation and the forest best. But bad forestry like bad farming will not pay in the long run. Our duty is to the forest and no emergency should excuse bad forestry. Short rotations and financial thinning savour very much of the get-rich-quick wheat farming that destroyed much of the land of America, Canada, South Africa. Forestry is a building up process, better crops with each generation, long rotations, increased soil fertility. Quick returns are got only by cutting into capital reserves, be it timber or soil fertility and this country has been eating into its forest capital long enough. Let us keep to sound thinning principles and have patience about returns. The forester will eventually be judged by the trees he has left, not by those he has removed, so let us hope the woods of the future will be monuments to the present generation of pioneer foresters.

Report of the First Annual Excursion to the Valley of the Suir, June 7th to 10th, 1943.

BY T. McEVOY.

Clonmel was chosen as headquarters for the Society's first excursion. The choice proved ideal; accommodation was excellent, and a large and exceptionally interesting area of woodland was within easy range. The weather was favourable and the success of the venture more than justified the decision of the Council to hold the excursion, in spite of transport difficulties.

The following members attended:—Dr. M. L. Anderson (President); Messrs. F. McMahon (Vice-President); T. Clear (Secretary), S. M. Petrie (Convener), Miss N. Brunner, Messrs. Chisholm, T. Cleary, J. A. Crammond, M. Crowley, W. Dungan, N. Devereux, T. Donovan, M. C. Flanagan, H. M. Fitzpatrick, J. Galvin, M. Hudner, P. J. Kerrigan, A. Leonard, T. McCarthy (Cahir), T. McCarthy (Athy), M. McNamara, T. McEvoy, D. Mangan, J. Maher, T. O'Neill, D. S. O'Sullivan, T. Prior, M. Swords, M. Swan and P. Verling.

Carrick-on-Suir Forest. Tuesday, 8th June.

Visit to the State forest of Carrick-on-Suir and the eastern part of Clonmel Forest on the south bank of the River Suir. Theme—treatment of young conifer stands.

The party travelled by train to Carrick-on-Suir and thence walked through woodland to Kilsheelan, where it was met by a horse-drawn brake for the return to Clonmel.

Before entering Coolnamuck wood, the President briefly addressed the party. We had occasion to congratulate ourselves on the attendance and had every reason to expect increased membership and attendance at excursions in the future. He welcomed especially those who did not belong to the State forestry service. It was a matter for great regret that more pressing business and difficulty of transport had prevented our patron, Mr. O'Deirg, Minister for Lands, from being present as he had intended.

Mr. H. M. Fitzpatrick, on behalf of the Minister for Lands, welcomed the Society on its first visit to a State forest, and hoped for many such visits. He then gave a most interesting account of the geology, soil, crop and history of Carrick-on-Suir forest.

Foreword.

The district is mainly a coniferous area with occasional stands of inferior hardwood, mainly oak. The woods and plantations lie on an outlying foothill ridge of the Comeragh Mountains, skirting the south bank of the River Suir. This ridge is formed by the hard Old Red Sandstone formation which comes between the softer Silurian rocks to the south and the more fertile Devonian and Carboniferous limestone series to the north.

Carrick-on-Suir forest comprises 1,088 acres. The acquisition of the area required seven separate transactions dating from December 1920 to March, 1938, illustrating the tedious and irregular manner in which State forests have to be built up. The Property of Coolnamuck and Churchtown which the party visited has an area of 635½ acres, of which 166½ acres consist of bought plantations, the remainder being new plantations.

Features of the Property.

The Property forms a belt some four miles long, but never more than a thousand yards wide. It lies almost entirely along the somewhat steep slope formed by the hard ridge described above. Except for

occasional pockets and strips of better soil at the foot of the slope or in the hollows, the fertility is not sufficient for hardwoods. The middle slopes are sufficiently fertile for all conifers but the upper and drier areas with a shallower soil are best suited to pines which form excellent stands of not-too-rapid growth. The elevation varies between 55 and 600 feet and over most of the area the aspect is north and shelter good.

The acquired plantations are almost all European larch and Scots pine, 31 to 35 years old. These species, with Douglas fir, predominate in the young plantations but Sitka spruce, Japanese larch and, on the poorest ground, Contorta pine, have been increasingly used of late.

Plantations laid down before Acquisition.

The first of these visited was one of pure blocks of larch and Scots pine, about 55 years old and extending to some 76 acres. This is probably the most interesting wood visited. Most species were planted at a spacing of four feet each way, the plants being supplied from a Scottish nursery. The strains appear to be excellent and the wood is now a perfect sample of a middle-aged conifer stand on true conifer soil. Estate forestry practice in the district was based on the production of pit-props for export and very little thinning was carried out. In this case no thinning was done prior to acquisition in 1927. Heavy and almost yearly thinning has been the rule since 1935 and has yielded a gross income of £2,601, not counting the many fencing stakes obtained. It was emphasized that the stand is still intact—in fact its condition is much improved since 1927, when the whole crop was much less valuable than the figure stated.

This demonstration of revenue by gradual thinning was greatly appreciated by members. It was considered a fine example of the high "expectation value" of plantations which have little measurable timber volume but are just beginning to develop into saleable material.

The soil in the larch area is a deep moist loam with slight, shallow surface podsolization. Woodrush is dominant in the ground vegetation. The pine area has a drier, shallower soil with a typical bilberry undergrowth.

A very interesting discussion arose regarding this wood; its treatment and the disposal of transmission poles which had recently been prepared and were on the ground. We were pleased to hear Dr. Anderson describe the Scots pine as probably the best middle-aged stand now remaining in the British Isles. Mr. Crammond dealt with thinning for transmission and telegraph poles and recent relaxations in their specifications. Mr. Petrie informed us that both butt-rot and canker were quite absent. Mr. Clear raised the question of future management and doubted the advisability of growing larch on a long rotation. It was generally agreed that the larch would benefit by recent heavy thinnings and that an increase in the proportion of crown to stem was to be expected. Dr. Anderson remarked on the extent of squirrel damage to pine in Scotland, where, as a result, it is almost impossible to find undamaged Scots pine stands. We have been fortunate in avoiding a serious epidemic.

Thinning Demonstration in Larch 31 to 35 Years Old.

This plantation was of special interest providing a picture of the approximate condition of the previous stand at an earlier age. The habitat conditions are almost identical. Thinning began, however, much earlier in the life of this plantation and incomplete records show a revenue of £224 from 22 acres since 1937.

Dr. Anderson marked two sample thinnings—heavy and light—in this area and workmen were at hand to fell the marked trees while the party lunched. He first gave a very clear account of the classification of trees into dominants, sub-dominants, etc., and of 'high' and 'low' thinning before giving some practical hints on carrying out the work. A discussion followed in which stress was laid on the im-

portance of early heavy thinning on the margin of plantations in order to provide a wind-firm zone.

Scots Pine, 31-35 Years Old on Richer Soil.

An example of the coarse and unsatisfactory growth of this species on better soils—in this case a fern community type—was studied. The stems were heavily branched in marked contrast to Scots pine on the bilberry type, and there was no hope of producing clean timber. It has been decided to cut out the stand, leaving good isolated stems, and to replant with hardwoods (oak and ash).

On similar soil at Churchtown, a 55-year old Scots pine-larch wood, coarse and squirrel-damaged, had been opened out to allow of ash regeneration. The ash failed to come and in discussing the treatment it was suggested that the failure was due to the scarcity of parent trees and the early formation of an impenetrable briar-bracken vegetation.

Young Plantations laid down Since Acquisition.

In these areas planted by the State the outstanding features are the changes in selection of species and the varying emphasis on particular species during the past fifteen years. In particular the widespread use of Douglas fir in the plantations now 10 to 20 years of age and the freer use of Sitka spruce in the recently planted areas were noted.

Plantations of Douglas fir, Scots pine and larch, 14 to 16 years old cover some 400 acres of the Coolnamuck Property and provide some interesting problems. The ground appears to have been originally covered by open oak scrub. The present undergrowth is mainly a mixture of heather and bilberry. Over part of the area considerable beeting was required and Japanese larch, Scots pine and a little birch were used as late as 1937. As a result growth is now very uneven and discussion turned on the treatment of coarse-growing trees of pine which had a start on their neighbours and threatened to develop into "wolf" trees. Some members favoured 'heading-back' while others thought side-pruning would meet the case. The general opinion was that the crop was too open for immediate treatment. The steady, upright, wind-firm growth of European larch set out as one-year-ones was noted.

Scots pine had been planted pure on the most exposed ground but it still retained the needles of two years. In such situations it is now usual to plant wind-breaks of Japanese larch or an admixture of 25 per cent. Contorta pine.

An area of 13 year-old Douglas fir was inspected which had just been 'brashed' with pruning saws at a cost of 35 shillings per acre. It was emphasized that the object of 'brashing' is to allow free movement through the plantations, not to give clean timber. It is intended to carry out a high pruning of selected stems in this plot. The absence of "wolf" trees—unusual in Douglas fir—was favourably commented on.

Amongst other points of interest was a plot of Japanese larch on ground considered fit for hardwoods. The present tendency is to exclude this species from ground which will grow any of the established, timber-producing trees; in short Japanese larch is regarded as a silvicultural, not as a timber, species.

During our visit to Carrick-on-Suir forest we were fortunate in having with us to answer many queries, Mr. T. O'Neill, the forester in charge.

Clonmel Forest

The State forest of Clonmel adjoins Carrick-on-Suir forest at its western tip. On reaching it, Mr. FitzPatrick made us familiar with its history and gave many other particulars.

Foreword.

Clonmel is the largest State forest with an area of 5,237½ acres, of which 3,774½ acres have been planted since acquisition. It is a feature of this forest that no less than 4,953 acres are held on leases. Its acquisition involved 15 separate transactions from 1922 to 1937. Fires have been a serious problem. One property has suffered from seven fires which have destroyed 375½ acres of young plantations since 1937.

Scots pine has been the main species used in initial plantations, followed by Sitka and Norway spruces, European Larch, Douglas fir and Japanese larch in that order. Smaller quantities of Corsican pine, Mountain pine and Contorta pine, oak, beech, ash, birch, Tsuga and *Abies grandis* have been used.

Gurteen Property.

This was the first area visited in Clonmel forest. It is a very large property with irregular boundaries and topography, and divided into two parts by the steep Glasha valley. A small area over Devonian rocks has a heavier, richer soil suited to hardwoods, one corner has a fertile soil over Silurian rocks well-suited to spruces and, in the better-drained parts, to larch; the main mass, however, overlies Old Red Sandstone, impoverished on the higher slopes but providing good conifer soils on the lower and middle slopes. Aspect varies considerably but seldom faces west and there is good shelter over most of the ground, always excepting the ridge tops.

Treatment of Oak Woodland.

The first area visited was that planted in 1941 and in 1943 on ground cleared of oak scrub. Scots pine, Norway and Sitka spruces were the species most used, with beech and *Tsuga heterophylla* for underplanting belts and groups of oak which had been left for shelter, soil maintenance and amenity. Over the 1941 area, a good deal of oak for fuel had been extracted after planting, with surprisingly little damage to the young trees. Excellent growth of Tsuga on old woodland soils and in deep shade of oak in full canopy is a feature of the forest.

Later we saw an area of oak scrub in the Glasha Valley, presumed to be natural, in which similar treatment preparatory to planting was beginning. Evidence of coppice origin was noticed. Scattered mature Scots pine were felled in 1940. On the high ground, the oak was genuine, stag-headed scrub and only shelter-belts were to be left, but in sheltered hollows solid blocks of good oak were to be retained to mature with the next rotation of conifers.

At the end of the second-day we examined what was easily the heaviest oak wood in this forest in the Derrinlaur property. The position is low-lying and well-sheltered and the soil is deep, moist and fertile. The most pleasing point is the absence of the thick mat of woodrush which is the great enemy of regeneration in our oak woods. In view of the large, well-developed crowns, the abundance of seedlings on the ground, the suitability of the site for hardwoods and the amenity value of the wood, it was agreed that it ought to be treated for natural regeneration. In parts an understorey of beech was already developing.

Property of Messrs. McAinsh & Co.

Before returning to Clonmel on Tuesday, we were privileged to examine an excellent stand of European larch, 26 years of age, the property of Messrs. McAinsh and Co., timber merchants. It had remained unthinned until three years ago and was drawn up but is now likely to improve. We were especially interested in occasional Sitka spruce stems in the crop which stood 10 to 15 feet above the larch canopy. There was a lively discussion as to which species would give the best financial yield. A portable saw-mill engaged in preparing fencing stakes and pit-props was also examined.

A very pleasant surprise was provided when Mr. Hamilton, representative of the owners, arrived with refreshments at a most opportune moment after a long day.

Wednesday, 9th June.

On the second day we continued our tour of Clonmel Forest, starting from Kilsheelan.

Experiment in Natural Regeneration.

The first stop was at a plot of three acres on which natural regeneration of Scots pine is being attempted. 153 stems—the best-shaped and most secure, but not the largest—were reserved at the time of felling in November, 1938, by the courtesy of Messrs. McAinsh and Co., of which about 70 have since been blown. Some seedlings were reported in December, 1941. On examining the ground the party found that there were many one-year and two-year seedlings on bare patches with some heather but that the woodrush-covered ground had few seedlings. Some birch and oak were also beginning to appear. Some doubt was expressed concerning the seed-bearing capacity of the parent trees while weevils, woodrush and bracken were also mentioned as being unfavourable factors. Dr. Anderson summarized the conditions necessary for regeneration as follows:—(1) the stand must be prepared for seed production by heavy thinning over a period of years (this one was not); (2) the final opening of the stand should coincide with a full seed year; (3) light conditions, which have an important effect on subsequent weedy growth and decomposition of the humus must be controlled until seeding is well established. In regard to the third point the importance of having a shade-bearing tree such as beech in the crop was stressed.

A comparison of methods of measuring a felled tree was made on a blown Scots pine.

During the day two examples of forest road-making were seen. Below the main nursery, a lightly metalled road which required steep banking on the lower side and the use of explosives at one part had been made. At Coolishal, the preliminary stages of laying down a road were studied. The ground was flat and the surface consisted of a mixture of peat and mineral soil to a depth of about one foot. This surface was excavated until all peat was removed, then levelled for a width of 15 feet and drains made on both sides. On the formation a sheeting of large stones will be laid and the surface finished off with small broken stones. Mr. McCarthy (Athy), suggested that the formation might be improved by placing a layer of brushwood on the soil surface.

Nurseries.

An area of 15½ acres is devoted to nursery work. It has a light easily-worked soil derived from Silurian shale and is excellent for conifers. Two methods of preparing the ground for the nursery were used. In one case the field was skim-ploughed, and the turf removed and stacked. It was then re-ploughed for lining-out of conifers. In the other case the area was green-cropped with a mixture of oats, peas and vetches, nitrochalk and kainit being applied to the soil. In the following year conifers were lined out. In the two years 1942 and 1943 approximately 7 million plants fit for planting and 5½ million seedlings fit for lining-out have been grown. When discussing seed-beds for alder it was suggested that they should be watered, and Mr. Leonard informed us that he had much better results from beds covered with soil from an alder wood—probably because some important micro-organism was thus introduced. An interesting example of delayed germination of wych elm seed sown in the previous summer was noted.

A plan for the conversion of a narrow screen of larch into a shelter-belt was explained. Heart-rot and consequent windfalls are

extensive in this strip which is known as the "Long grove." The intention is to open out the larch and introduce beech, thuja and tsuga.

Treatment of Poor Ground.

A feature of the Gurteen property is the improved results on poor soil in a wet basin at Coolishal where intensive drainage and mounding operations were carried out. The crop is mainly Scots and Contorta pines and Sitka spruce, now 10 years old. Growth is slow but promising. The main drains follow the main natural channels; the secondaries also follow the natural hollows while girdle drains were sunk round the area at the base of the surrounding slopes. Parallel turf-drains at 25 feet spacing completed the system. On high ground nearby the remains of an old crop of Scots pine apparently killed by fire was seen. The effects of exposure were still obvious and the commercial value of the stand must have been very low.

Derrinlaur Property.

This property contains a large area of high-lying poor soil on exposed gentle slopes over Old Red Sandstone. The lower slopes and the steep northern face, however, are richer and conifers do well. The only hardwood area has already been mentioned.

This "difficult" ground is representative of a very large proportion of the land offered or suggested for afforestation. The growth on this type is therefore of particular interest in view of the figures of volume production sometimes quoted and the short rotations proposed. A large area of Scots pine, 19 years old is only 3 or 4 feet high, severely checked and suffering from leaf-cast. Another tract with Sitka spruce in check was seen. High volume yields and short rotations are possible only on a small proportion of our true forest land.

The question of the economic plantability of poorer types arose. While better results are hoped for with a change-over to Contorta pine and more intensive soil-preparation, it is extremely doubtful if attractive financial returns can be obtained. Suggestions were invited for the treatment of the checked pine area. Extra drainage, the planting of Contorta belts across the wind direction, and thickening up the plantation by interplanting Contorta were suggested. It was agreed that Scots pine would not be chosen for this type of ground to-day. The possibility of soil improvement by tractor sub-soil ploughing as has been done on moorlands in Britain was also suggested, but doubts were expressed of the practicability of such a method on areas of this type.

In a sheltered hollow on good soil, a trial in planting over-size Sitka spruce plants 30 to 36 inches high was visited. The plants had put on only a few inches in height in two years.

The most extraordinary sight during the excursion was an old plantation of Scots pine on a hill top. The trees were stunted and the stems had assumed fantastic shapes; some of cork-screw growth, others growing horizontally, more having grown vertically downwards and making a complete loop at a few feet above the ground. One member aptly described this wood as a "forester's nightmare." The probable causes were thought to have been exposure, fire and deer damage in combination.

Mr. T. Prior, Head Forester in charge of Clonmel forest, kindly supplied much interesting information during our visit.

Thursday, 10th June.

On the final day two parties were formed; one to continue the tour of Clonmel Forest and the adjacent woods owned by Mr. J. Bagwell, Marlfield; the other to visit Cahir Park woods and the Cahir Estates Company's sawmill.

Marlfield Estate.

The visit to Marlfield, by kind permission of Mr. J. Bagwell, provided variety and change from the coniferous woodland on siliceous soils. Here on fertile soil on the banks of the Suir are to be found magnificent specimens of rare as well as common hardwoods. Yet the unpleasant suggestion of a collection or of exoticism is entirely absent, the arrangement and appearance of the trees harmonizing with the landscape. We had the pleasure of Mr. Bagwell's company and most informative conversation for the day.

Among the individual trees there are unusually large specimens of *Tilia cordata*, ash, single-leaved ash, Turkey oak, *Catalpa*, Beech (13 feet in girth), Tulip tree, *Populus nigra*, *P. canescens*, hornbeam (spread of 96 feet), some others of great height. Also of interest was a Cedar of Lebanon grown from seed brought back from Mt. Lebanon; some Chinese poplars from seed brought home by the late Professor Henry; and a fine line of sycamores forming an admirable screen.

An example of open self-sown woodland was seen on the steep slopes on the Waterford bank of the Suir. A Scots pine-larch plantation with beech groups and oak at the eastern end was felled in 1870-71. There now exists a thin wood of Scots pine, birch and mountain ash, with scattered oak and larch and *Rhododendron ponticum*.

On crossing over into Clonmel State forest Mr. Bagwell was cordially thanked.

Kilnamack and Russellstown Properties.

These properties again provided examples of 'difficult' types where exposure and soil impoverishment cause poor growth. Extensive fire damage occurred and the opportunity was availed of to use more accommodating species. Generally speaking, Mountain and Contorta pines replaced Scots pine on the poorest areas; Japanese larch and Scots pine were planted on the better pine areas and on some of the larch-Douglas fir ground; Sitka spruce and Norway spruce on the heavier Douglas fir ground. An adjustment of the planting limit was also made. If the new plantations warrant it, an upward re-adjustment can be made later.

Treatment of old oak woodland was similar to that practised in areas visited on the previous days.

Cahir Estates Company.

Visit to Cahir Park and sawmill by kind permission of Colonel R. B. Charteris.

Mr. Frazer, the sawmill manager, showed the party over the sawmill which is equipped to deal with timber grown in the Demesne and Estate woods. The well-appointed office was admired and the lay-out, tidiness, and fine storage room and drying sheds impressed us particularly. We were shown some fine large butts of Spanish Chestnut and elm from the Demesne and high-quality planks of elm, lime, oak, chestnut, larch, etc.

Mr. Robinson welcomed us on behalf of Colonel Charteris and showed us over the demesne and castle. One of a group of Douglas 57 years planted was 129 feet high. An exceptionally good oak-beech wood on limestone soil was noted. Elsewhere open hardwood groves have been successfully underplanted with *Thuia* and other shade-bearers. Among specimen trees were *Pinus cembra*, *Abies cephalonica*, *Abies pinsapo* and very large old oaks. A suspension bridge across the River Suir attracted much attention. It was regretted that our visit to Cahir Park had to be cut short to fit in with the railway time-table.

Discussion on the Thinning of Young Conifer Stands.

To conclude the Excursion a meeting was held in the Technical School, Clonmel.

The subject for discussion chosen was "Thinning of Young Conifer Stands." The President, Dr. M. L. Anderson, took the chair, and Mr. T. Clear opened the discussion by reading a paper on the subject the text of which is published elsewhere in the Journal.

Mr. Fitzpatrick congratulated Mr. Clear on his paper. In particular he agreed with the development of the pulp and plastics industry. On the question of "commercial thinning" he thought no danger existed in State forests.

Mr. McCarthy (Athy) considered the removal of suppressed and diseased stems justified as a hygienic measure.

Mr. McEvoy emphasised the importance of regional climate in the development of thinning technique. Practice successful in the almost snowless areas of Cork and Kerry might be disastrous in the Central Wicklow highlands. In districts with heavy snowfall early and regular thinning was to be recommended. He also called attention to the need for examining spruce crops for butt-rot before thinning.

Mr. Mangan made a plea for the simplification of "this frightening business" of Classification of tree types.

Mr. Crammond, who had considerable experience in handling spruce crops in the Slieve Bloom Mountains, dealt with the formation of raw humus. He found that very heavy thinning was effective in bringing about the decay of a two-inch layer of cast needles.

Mr. Chisholm could not agree with the view. The only hope in his opinion was to prevent the formation of the layer by early thinning. Commercial thinning or Intermittent Yield management was a 'sin' of the private owner. On the Continent under this system there was no real final crop but it prepared the way for natural seeding. He disagreed with the view that plastics helped forestry. By using 'tops' and sawdust plastics reduced the demand for timber.

Mr. McNamara, dealing with Mr. Clear's remarks on "whips" and butt rot, thought that the entry of disease might be due to the rapid growth, after thinning when the tree has room to "whip."

Mr. Clear, replying, said that a rapid destruction of saleable timber now would lead to a decline in the native timber trade after the emergency and the creation of vested interests depending on imported timber. The President summing up the discussion, joined in the congratulations to Mr. Clear on his comprehensive treatment of the subject. He added a word of warning regarding the 'Novar System' for larch. It was based on two small areas and the survival of the underplanted species was due in large measure to good water supply and soil fertility. In general side shade, not top shade, was to be aimed at. He also mentioned the danger of using the British Yield Tables as a thinning guide. These tables were based on abnormal or unthinned stands—they were in fact normal for abnormal stands. It was he thought extremely difficult for a conscientious forester to overthin. He was extremely pleased with the debate which 12 to 15 years ago would have been quite impossible.

A discussion followed as to a suitable subject for debate at the General Meeting next Spring and as to the venue for next year's Excursion.

A vote of thanks to Mr. Petrie, the Convener, who marked out the itinerary and acted as guide; to the President for the mass of useful information he had compiled; to the Secretary for correspondence; and to Mr. Prior and Mr. O'Neill who smoothed our passages through their forests, was passed with hearty acclamation. Mr. Fitzpatrick, representing the Department of Lands, was also thanked for his services during the excursion.

OBITUARY



THE LATE MR. DANIEL McCAW.

15th July, 1882—29th March, 1943.

Members have read with regret of the death of Mr. D. McCaw, one of the first Councillors of the Society, in whose formation he took the keenest interest.

Mr. McCaw left his Antrim home in 1905 to begin his forestry career at Avondale, where he was an apprentice until 1907. From 1907 to 1911 he was a scholarship student at the Royal College of Science, where he took his diploma in 1912. Later he was granted the degree of B.Sc. of the National University. After a short period of practical experience in England he was appointed Forester in the Department of Agriculture and Technical Instruction in 1913 in charge of Knockmany Forest. His next move was to Baunreagh as first-class Forester in 1920 and while there he was appointed District Officer under the Forestry Commission. His transfer to Clonmel took place in 1923 and he remained there until May, 1940, when he was transferred to Headquarters duties as Acting Inspector. It was during his long term of seventeen years in Clonmel that most of us got to know him.

Although Mr. McCaw was suffering in health for some considerable time, that did not prevent him from applying himself energetically and without respite to his important duties in the forestry service. Indeed, it appeared at the last to be his intention literally to work to the end and it took some persuasion to get him to seek medical advice. Unfortunately his condition was worse than was thought, but even so his sudden death came as a shock.

Mr. McCaw was a figure well known to all in forestry circles in this country and he was held in affection for his many good qualities. His professional keenness was an inspiration to all and even at the last he was reading technical papers dealing with forest soil problems, in which he took a special interest. He was a careful and sound forester and had a thoroughly practical outlook.

There was a simplicity and honesty about Mr. McCaw which he could not disguise and he had a very shrewd judgment coupled with a rare sense of humour. His memory and powers of observation were remarkable, which made him a most interesting travelling companion, although the rapidity with which his mind travelled from one subject to another sometimes made it difficult to follow him.

His presence will be greatly missed. He has left for himself a monument in the valley of the Suir.

Annual General Meeting, 1943.

The first Annual General Meeting of the Society was held in Jury's Hotel, Dublin, on Tuesday, the 9th February, 1943 at 7 p.m. The attendance numbered about forty people.

After the minutes of the inaugural meeting had been read and signed, the President, Dr. M. L. Anderson, read the report of the Council for the year 1942, as follows:

COUNCIL'S REPORT.

My report falls into two parts, namely (1) a report of the Council's activities for the year 1942, and (2) an address dealing with forestry progress during the same period.

Patron.—The Council is very glad to be able to report that Mr. T. Derrig, now Minister for Lands, agreed to accept the Society's invitation to become its patron and I am sure that the Society appreciates very much the honour which Mr. Derrig has paid it and the interest which he has displayed in its formation. Mr. Derrig is in a position to appreciate, not only the need for forestry development, but also the difficulties attending it and the desirability for increasing the standard of technical forestry in this country and the knowledge of forestry generally. His support is, therefore, a great encouragement to the Society in its work.

Council's Report.—I need only refer to the inaugural meeting on the 21st September, 1942, which resulted in the appointment of the Council and has been dealt with in the minutes.

Council Meetings.—Two meetings of the Council were held in Dublin. The strength of the Council was 12 and the average attendance was 9.

Membership.—The members who enrolled themselves at the inaugural meeting in September amounted to 31. Since then there has been an increase of 105 duly elected, making a total membership of 136, consisting of 37 Grade I technical members, 78 Grade II technical members and 21 Associate members. This is considered to be satisfactory, but now that the Society has made a good start, an increase is hoped for, especially in the Associate Members, and your help is asked for in this connection.

Finance.—The audited abstract of accounts has been placed in the hands of members. The excess of assets over liabilities at the end of the year was £10 Os. 10d., of which £10 has been placed on deposit receipt. A current account has been opened with the Ulster Bank.

Journal.—The Council consider that in accordance with the avowed objects of the Society, it was important that an attempt should be made to publish at least one issue of a Journal in 1943. The preliminary investigation as to ways and means has been made and prospects seem hopeful. On the recommendation of the Editorial Committee, the Council approved the title of "Irish Forestry" for the Journal and also that it should, under existing circumstances, be published entirely in English. It is hoped to issue the first number in June and that members will contribute to the Editor not only articles for publication, but also suggestions on what form the journal should take.

Excursion.—The Council also decided that it would be in the interests of the Society to hold, if found possible, a forestry excursion on a modest scale and on lines which would not throw too much responsibility on the Council. An Excursion Committee was therefore formed to investigate the possibility of holding a three days' excursion with Clonmel as the centre in June, 1943, provided the necessary permission to visit the forests and woodlands in the district can be obtained. Members attending will have to make their own arrangements re accommodation, etc., and if the attendance justifies it, it is proposed to hold an ordinary general meeting during the period of the excursion. It is appreciated

that the present is a difficult time for this sort of activity, but it does seem important to make a start on these lines. Members will have full and timely information of the proposals when arrangements are completed so that they can take the necessary steps to enroll.

Kindred Bodies.—The Council have been in communication with the Royal Scottish Forestry Society, the Royal English Forestry Society and the Society for Foresters of Great Britain and have agreed to exchange publication with these Societies.

D. Anderson asked for observations on the following:—

1. Proposed Title of the Journal.
2. The proposal that it should be published solely in English, and
3. The proposal to hold an annual excursion.

There were no observations on the question of the name of the Journal. Mr. Chisholm asked why the Committee could not see its way to arrange for accommodation for members in Clonmel during the Summer Excursion. In reply, Dr. Anderson stated that the Council did not feel in a position to make such arrangements at the present time; but explained that Mr. Petrie, the Convener of the Excursion Committee, would be very glad to be of assistance to the excursionists in this matter.

Dr. Anderson put it to the house that the name of the Journal is acceptable to the Society. The motion was carried, as were also motions 2 and 3.

THE PRESIDENT'S ADDRESS.

According to Rule 5, it is either my duty or my privilege as President, to deliver an address which shall review, amongst other things, the advances in forestry or forestry knowledge during the year.

The present is not a good time for obtaining information on forestry progress abroad so that my review must be confined to this country.

The first important development which has taken place during the year is the commencing by the Government of a Census of standing woodlands in Eire. This census, if sufficiently detailed and comprehensive, could provide useful data regarding the distribution, composition and character of the woodlands throughout the country, the lack of which has been a serious disadvantage in the past.

The appointment, with the support of the Government, of a specialist in forest pathology by University College, Dublin, is also a new departure, which should prove of great use, especially at the present time when extensive fellings increase the risk of insect damage.

I wish to draw attention to the important part played by the woodlands of the country planted by private owners in the past and now in their hands or in the hands of the Government, in supplying materials essential for the life of the community. Timber for a variety of necessary purposes, such as building construction and repair, military needs, railway requirements, telegraph and transmission poles, box manufacture for packing and transport of agricultural produce, firewood for fuel, making of charcoal for use in producer gas units, pit props for Irish mines, and a number of less obvious but also important purposes, has been supplied from these woods. There are two aspects of this trade which cannot fail to impress members of this Society. The first of these is the debt which the country owes to former planters and forestry enthusiasts for the planting which they undertook, often at considerable outlay, in the past. The second is the emphasis which it puts upon the possibility of sound forestry, as a national asset, in this country and on the national utility of the existence of adequate stands of satisfactory growing timber within the country. The pity is that such stands are so inadequate at the present time. The home-grown timber trade deserve commendation, I think, for the way in which they have risen to the present emergency. Their relationship with the timber growers appears to be harmonious.

I might also refer to the various Emergency Powers (Control of

Timber) Orders issued by the Government and also to the Control of Prices Orders affecting firewood and timber, namely Orders Nos. 121 and 148. The latter Order gives the growers for the first time a suitable basis for securing a satisfactory price for their growing timber. The prices are adequate and growers should be securing a high enough return from timber sales to enable them to carry out satisfactory and ample replacements. They should also bring growers to realise more fully the value of their growing timber. There is no doubt that generally private forestry is at a very low ebb and that the standard of knowledge of forestry prevalent amongst land-owners is low. As a Society we may be able to render some assistance in remedying these defects.

The Society appreciates that there are difficulties in the way of undertaking satisfactory replanting at present, but it is to be hoped that a fair proportion of income from timber sales will be set aside for future replanting at a later date when these difficulties have disappeared. This is now the time for the nursery trade to be making every effort to increase its stocks of suitable plants for the extensive replantings to be expected and which we hope will be undertaken in the near future.

It is also hoped that during this difficult time the Government will find it possible to maintain its afforestation programme to the fullest extent possible and that steps will be taken to resume the process of expansion of the State forestry programme which was interrupted by the present emergency. It is also hoped that the problem of ensuring that young and middle-aged stands will receive the attention necessary for their proper development to maturity will have full consideration.

Mr. T. Donovan moved the adoption of the Statement of Accounts to 31st December, 1942, a copy of which had been sent to all members. Mr. O'Leary seconded the motion. It was carried unanimously by the house.

Mr. Gaynor proposed that the election of the following office-bearers and officials (for the year 1943) be confirmed:

President—M. L. Anderson, 16 St. Stephen's Green, Dublin.

Vice-President—Felix McMahon, Annagh Bay, Hazelwood, Sligo.

Secretary and Treasurer—Thomas Clear, Albert Agricultural College, Glasnevin, Dublin.

Editor—H. M. Fitzpatrick, Kendalstown, Delgany.

Business Editor—M. Swords, Cillaodain, Adelaide Road, Glengary.

Auditor—Duncan Craig, 102 Grafton Street, Dublin.

Councillors (1943-1944)—M. O'Beirne, Casino House, Rathdrum, Co. Wicklow; S. M. O'Sullivan, Flower Hill, Navan, Co. Meath; P. Delaney, Crone, Enniskerry, Co. Wicklow.

Mr. McCarthy seconded and the motion was carried.

ELECTION OF MR. A. C. FORBES TO HONORARY MEMBERSHIP.

Dr. Anderson, in proposing the election of Mr. A. C. Forbes to Honorary Membership, said:

We have with us to-night Mr. A. C. Forbes, late Director of Forestry in the Government service of this country, and he needs no introduction to most of you here. Mr. Forbes has had a long and distinguished career in our profession and I am glad to say is still actively engaged in Forestry work.

His connection with this country dates officially from September, 1906, when he was appointed the first technical forestry expert to the Dept. of Agric. and Tech. Instruction. He continued to occupy the chief forestry appointment for a quarter of a century up to the time of his retirement in June, 1931, holding in succession the posts of Forestry Expert and Advisor, Inspector of Forestry, Asst.-Commissioner under the Forestry Commission and finally Director of Forestry, from 1920.

He also held the important post of Asst.-Controller of Timber Supply during the last war.

Prior to his appointment in 1906 he had already made a reputation for himself in Great Britain as a practical forester with considerable experience of estate forestry and as a writer on forestry subjects. He was selected as the first lecturer in Forestry at Armstrong College, Newcastle-on-Tyne, which post he filled for some two years before coming to Dublin.

Mr. Forbes had to start off in this country from scratch and for some time was the solitary official representative of our profession, engaged in the usual struggle against the, perhaps, not altogether sympathetic powers that were. I believe he began his official career by sharing part of a table in the Department's office and with two forest areas, namely, Avondale and Ballyfad, now Coolgreany. He had not only to lay the foundation of the forest area which the State now owns, but to form the nucleus of the technical staff and the organisation required for future development. In fact, all of us who are now employed in the State Forest Service are in a sense heirs of Mr. Forbes and still work along lines initiated by him.

On his retiral in 1931, the area of land which had been acquired for Forestry purposes by the State had risen to over 50,000 acres. The two forests had increased to 42 forests and a total of over 30,500 acres had been planted.

During the early part of his career he was an essential witness before the Dept. Committee on Irish Forestry which sat in 1907 and which produced a comprehensive report which is still a mine of useful information. During the latter part of his career the Forestry Act (1928) was passed through the Dail and he had a high responsibility in the initial stages of its production and also during the first two years of its administration.

He had the satisfaction of knowing when he retired that the foundation of State Forestry in this country had been well and truly laid, that a technical staff had been considerably expanded to meet present needs and that all was set for further expansion.

To those ignorant of Forestry matters, and they are many, this may appear to have been a very modest beginning, but we, who realise how difficult and complicated Forestry work in this country is, know how to appreciate that initial creative effort. For that notable service to Irish forestry Mr. Forbes is fully deserving of recognition by this society and I think we would all deprecate the slighting reference to Mr. Forbes's work which has been made in other quarters.

In addition to his official duties, however, Mr. Forbes, whose energy and activity of both mind and body are bywords amongst us—and they do not appear to be seriously impaired even yet—has from time to time written numerous essays and papers on matters of importance to foresters, which have appeared in various publications and has also published two comprehensive books on Estate Forestry which had important influences at the time of their appearance. Mr. Forbes's writings have brought him recognition from the Highland and Agricultural Society of Scotland, from the Royal Irish Academy and his work on Timber control also earned him distinction.

For his wider contributions to Forestry in the past 50 years, therefore, but more especially for his pioneer work in the establishment of the State Forest Service in this country, he is fully worthy of the highest honour which this Society can bestow upon him and I have the greatest pleasure in proposing his election as the first honorary member of the Society of Irish Foresters.

Mr. Fitzpatrick seconded the motion which was carried with acclamation.

Dr. Anderson then directed the Secretary to enrol Mr. Forbes as first Honorary Member of the Society.

Mr. Forbes, in thanking the Society for the honour conferred on

REVIEW.

A Note on the Forestry Position in Denmark.

An article on "Denmark's Timber Balance" by Mogens Andersen in "Intersylva," Vol. 1, No. 2, April, 1941, contains some interesting information and figures. It is usually the custom in Eire to compare our forestry position with that of countries very different in respect of the extent of their natural forest area and in respect of their wealth, resources and economic position. Such comparisons with Sweden, for example, with its large area of natural forest, or with Great Britain, with its great industrial resources, tend to give a wrong perspective. There is a much greater similarity of Irish conditions with those in Denmark and it may be useful as well as interesting to know how forestry stands in the latter country.

Denmark's total land area amounts to 10,625,000 acres, compared with the 17,025,000 acres in Eire. The net area under forest is 889,000 acres, which is 8.2% of the whole. The passing of an act in 1805 led to the preservation of a greater area of the old natural forest than has survived here and at the present day some 518,000 acres of that area are still under forest. The remaining 371,000 acres consist of plantations or afforested areas which have been laid down in the past 150 years, for the most part on extremely poor soils and on sand dunes.

The present distribution of species in the Danish forests is illuminating. There are some 371,000 acres of broad-leaved species, comprising 252,000 acres of beech forest, 44,500 acres of oak forest and 75,500 acres of other broad-leaved trees. The 518,000 acres under conifers comprise 201,500 acres of spruce, 123,500 acres of Mountain pine, 114,000 acres of spruce and Mountain pine mixtures and 79,000 acres of other conifers. The high proportion of what, from a timber-producing point of view, can only be regarded as unproductive forest land contained in the 237,500 acres under Mountain pine pure or in mixture with spruce, is noteworthy. The remaining 280,500 acres of conifers are, however, highly productive. Under the highly skilled and intensive Danish silvicultural methods it is claimed that Denmark takes first place in respect of the annual return in material obtained from its forests. This amounts for material over 2 inches diameter with bark to 62 cubic feet Q.G. per acre per annum for all forest areas. For broad-leaved areas alone it is 89 cubic feet Q.G., and for conifer areas 45 cubic feet Q.G. per acre per annum.

It may be remarked that the total forest area of Denmark in 1875 was some 494,000 acres which means that afforestation operations since then in the past 66 years have added the remaining 395,000 acres, equivalent to a regular planting programme of some 5,100 acres per annum. It may be presumed that something like 3,000 acres of that annual programme consisted of Mountain pine either pure or in mixture.

The volume of timber and firewood produced in the year 1938 amounted to a total of 56,277,000 cubic feet Q.G., comprising 27,723,000 cubic feet Q.G. or 49% of timber and no less than 28,554,000 cubic feet Q.G. or 51% of firewood. The value of the firewood alone leaving the forest is placed as high as £936,000, taking the Danish crown at pre-war par value. It consisted of 21,624,000 cubic ft. Q.G. of broad-leaved material and 6,930,000 cubic feet Q.G. of coniferous material. The consumption of wood for fuel amounts to 8.59 cubic feet Q.G. per head of the population, which is equivalent to 30% of the total consumption of timber and timber products.

The proportions of broad-leaved and coniferous timber were 11,089,000 and 16,635,000 cubic feet Q.G., respectively. The coniferous timber is classified in three categories, as follows: 9,706,000 cubic feet Q.G. of constructional timber, saw-logs, poles, telegraph poles, etc., or 58%; 3,602,000 cubic feet Q.G. of small constructional timber, laths, fishery poles, fencing posts, etc., or 22% and 3,328,000 cubic feet Q.G.

of stacked timber, etc., or 20%. The broad-leaved timber comprised 679,400 cubic feet Q.G. of logs in long lengths or 61%; 360,300 cubic feet Q.G. of stacked timber or 33% and 69,200 cubic feet Q.G. of poles, posts, etc.

The timber imports for the year 1938 are given under five main groups, as follows: Softwoods, 26,060,000 cubic feet (true); hardwoods, 1,166,000 cubic feet; wallboards, panels and plywood, 13,170 tons; cellulose and wood-pulp, 78,200 tons and paper, cardboard and fibre panels, 98,110 tons. The total value of these imports is given at £5,269,220. Exports of timber in 1938 amounted to 988,400 cubic feet, of which some three-quarters consisted of broadleaves species, both in the round (or squared) condition and sawn, of which a considerable proportion went to Sweden, Holland, Norway and Germany. This trade would seem to be somewhat analogous to the pre-war hardwood trade from Eire to Great Britain.

Home-grown timber takes first place in the saw-milling industry. About 350 industrial concerns, employing a total of 5,000 workers, are devoted exclusively or mainly to the conversion of Danish timber, whereas 150 concerns, employing some 2,000 workers, deal specially with imported timber. The above figures do not include furniture factories. About 79% of the home-grown timber used in the country goes to three main uses—to the building industry—40% for packing boxes—26% and for agricultural, horticultural and fishery purposes—13%.

As regards imported timber, by far the greater part of this, amounting to 19,190,000 cubic feet, is used in the building industry. Three-fourths of the timber used for building is imported, and the quantities imported are largely influenced by the activity of the building trade. The box-making business absorbs 2,825,000 cubic feet of imported timber.

From tables given it would appear that Denmark's total timber and firewood requirements in 1938, leaving exported material out of account, were met by the use or conversion of 110,650,000 cubic feet Q.G. of round timber, 56,230,000 cubic feet Q.G. of which was grown in Denmark and 54,420,000 cubic feet Q.G. grown abroad. The last-named figure contains 10,960,000 cubic feet Q.G. in respect of paper, cardboard and fibre panels and 6,204,000 cubic feet Q.G. in respect of wood-pulp and cellulose, none of which so far seems to be produced from home-grown timber.

In 1924 the population of Denmark was 3,386,274 inhabitants compared with the figure of 2,968,420 for Eire in 1936. The above figures and statistics should therefore be of considerable interest in view of the strong similarity between the two countries in many ways, especially in arriving at what area of productive forest should be aimed at to meet the country's needs, making due allowance for the great difference in firewood consumption between the two countries. The calculation may be left to those interested, if they are prepared to accept the figures furnished, which the writer admits may be disputed.

These figures refer to the position before the outbreak of war in 1939. It has been radically changed by the present situation. The disappearance of the main Danish export trade and, as a result, of the possibility of acquiring foreign currency, has greatly restricted the opportunity of making purchases abroad. This together with the loss of a large proportion of the coal, coke, petrol and oil which was formerly imported, has placed an exceptionally heavy burden upon Denmark's forests. It has been found necessary, as in Eire, to make maximum prices orders to control timber prices which soon reached twice or even three times normal; to arrange for supplementary fellings to supply the increased demands, especially of firewood and of wood for producer-gas units, and to impose restrictions in many directions. The Danes are experiencing some difficulty in securing the extra forest produce required because of the intensity of the thinnings which has been the normal practice in Denmark for some decades.

In connection with the extensive waste land afforestation in Denmark mentioned above, some additional information is furnished in an article by A. Howard Gron on "Heath-Afforestation in Jutland" in Vol. II., No. 1, January, 1942, of "Intersylva." The economic results of this work are dealt with in some detail. When this work was started during 1870 to 1880 by a number of wealthy people it was repeatedly claimed that it would finally pay a return of 4% per annum on the capital invested. This has not been realised, even although the cost of labour was then very low. From the point of view of private enterprise this afforestation has indeed been very unsatisfactory. With a large number of the plantations it is expected that it will now be possible to obtain a surplus of current receipts over current expenses and that they can thus be regarded as economic, but only by ignoring altogether the costs of establishment and the interest due thereon. In the case of the unsatisfactory plantations, however, it is doubtful whether their maintenance under "forest" can be justified. Looked at from the national point of view, however, it is considered that there have been advantages. Small amelioration in climate is claimed and what is called an advantageous distribution of home purchasing power has been achieved from the fact that the money involved came from the wealthy and was spent not on luxury articles from abroad but on the production of capital goods at home. It is said that no one has increased his fortune by these plantations on heath and moorland, but Denmark has grown richer. If one may be permitted to comment on such an observation, it would be to suggest that Denmark might have grown richer still if such money had been spent on less unproductive enterprises. The lesson we have to learn from these heath plantations is, I think, to hasten slowly—as we are doing—and to concentrate our afforestation work in these, its early stages, on areas which we are reasonably certain will be productive. It would be unfortunate if any large proportion of our plantations were to resemble one, a picture of which accompanies the article mentioned. This shows a 55 year old stand of Mountain pine ready for its first thinning with a height of 39½ feet and a volume of 1,900 cubic feet Q.G. per acre, and apparently not typical of the worst conditions. As we know, that risk exists and it is a very real danger.

Until the timber census now in progress is completed, it will not be possible accurately to compare the position of forestry in Eire with that in Denmark, but it would appear that Denmark has progressed some considerable distance further along the road to forest self-sufficiency than has Eire. She is still, however, so far as conifers are concerned in the position of having the younger age-classes markedly predominant, so that full production of softwood timber has not yet been reached. On the other hand, her distribution of broad-leaved age-classes is very uniform, a very different picture to what we have here. The restoration and improvement of a great deal of the existing woodland in Eire remains one of our first tasks, which will be assisted by the greater demand for fuel wood to be expected in the future. M.L.A.

NOTES.

Extract from "The Trees of Great Britain and Ireland." Elwes and Henry. Vol. III., pp. 559, 560, 561, 562, 563.

Arbutus Unedo. Linnæus.

A small tree, attaining in Ireland 40 feet in height and 10 feet or more in girth, usually a shrub in the Mediterranean region.

This species is widely spread throughout the maritime regions of the countries bordering on the Mediterranean, occurring in Spain, France, Corsica, Sardinia, Italy, Istria, Herzegovina, Dalmatia, Greece, Turkey, Syria, Algeria and Morocco. It is also met with in the maritime belt along the Atlantic from Portugal to Kerry in Ireland. It occurs either as an undergrowth in forests, when in favoured situations it reaches the dimensions of a small tree, or is one of the shrubs com-

posing the *maguis* or heaths, which spread over large tracts of siliceous soil that have been denuded of trees in past ages. It is apparently only in Ireland that the *Arbutus* grows to be a forest tree, moderate in size, but equalling in height and girth the trees of other species with which it is associated.

The *Arbutus* is unquestionably wild in the south-west of Ireland, where it is associated with other plants, which like it are Mediterranean in type and not indigenous to other parts of the British Isles. It has been known to the Irish since early times, and is called *caithne* (pronounced *cahney*) in Kerry, and *cuince* in Clare. The former name occurs in several place-names in Kerry, as Derrynacahney, the "oak-wood of the *Arbutus*," two miles south-east of Crusheen; Cahnicaun Wood, near the Eagle's nest, Killarney, which is *coill caithneacan*, the "wood of the little *Arbutus*" in Irish; Ishnagahinny Lake, five miles south-east of Waterville, which is *uisge-na-geathne*, "*Arbutus* water" in Irish.

The Clare name, *cuince*, is supposed to occur in several place-names, anglicised as *quin*, which, however, often represents a family name of another signification. Cappoquin, in Waterford, means the field of the *Arbutus*, and Feaquin, in Clare, the wood of the *Arbutus*. The occurrence of names like Quin, a parish in Clare, and Quinsheen, one of the islands in Clew Bay, Mayo, may point to an extension of the distribution of this plant far to the north in ancient times.

At present, *Arbutus* *Unedo* is restricted in Co. Kerry, the extreme south-western part of Co. Cork, and Sligo. In Co. Cork it is thinly scattered through the woods in the vicinity of Glengariff, growing in company with oak, birch, holly, hazel, and mountain ash, and attaining about 25 feet in height and 3 feet in girth. It is said to grow here and there among the mountains to the west of Glengariff and was seen by R. A. Phillips at Adrigole, ten miles to the west, high up in the mountains among the rocks, and without the shelter of other trees.

The *Arbutus* has its headquarters in Co. Kerry in the Killarney district, being particularly abundant and luxuriant on the islands and shores of the lakes generally, where it forms a considerable part of the natural forest. At the base of Cromaglaun Mountain, near the tunnel on the Kenmare road, there is a wood composed almost exclusively of *Arbutus*, and it is also met with on the Cloone lakes, south of the Kenmare River.

About Killarney the tree is indifferent as regards soil, as it grows on limestone on Ross island, on sandstone on Dinis island, and on slate grit and conglomerate elsewhere. It is much more affected by climate and aspect than by soil, and seeks the most humid and mildest situations. In the Killarney basin it occupies practically the whole northern shore of the northern lake, but does not grow on the exposed islands of this lake. It is absent from the shore itself, when this is marshy or composed of shingle or sand, and grows on the rocky headlands, where it forms a natural wood with oak, holly and mountain ash. It is very common on the long indented promontory of Muckross, and reaches its greatest dimensions on Dinis Island, which is perhaps the dampest and most sheltered spot in the whole district, protected by high mountains on the east and west, but open to the south. It usually does not extend far from the lake shore, but in the very humid and shaded Torc ravine it recedes into the general woodland along the rocky banks of the torrent, and ascends to an elevation of several hundred feet. It flourishes also on the rocky and sheltered islands of the southern lake.

The date of the introduction of the *Arbutus* into English gardens is unknown; but Mrs. J. R. Green has kindly sent me the following extract from State Papers showing that its existence in Kerry attracted in the sixteenth century the attention of the English settlers, who called it *Wollaghan*, a corruption of *ubhla caithne* (pronounced *oolacahney*) or "*arbutus* apples," a name used for the edible fruits: "You shall receive herewith a bundle of trees called *Wollaghan* tree, whereof my Lord of Leicester and Mr. Secretary Walsingham are both very desirous to have some, as well for the fruit as the rareness of the manner of bearing

which is after the kind of the orange, to have blossoms and fruit green or ripe all the year long, and the same of a very pleasant taste, and growing nowhere else but in one part of Munster, from whence I have caused them to be transported immediately unto you, praying you to see them safely delivered and divided between my said Lord and Mr. Secretary, directing that they may be planted near some ponds or with a great deal of black moory earth, which kind of soil I take will best like them, for that they grow best in Munster about loughs, and prove to the bigness of cherry trees or more and continue long."

Observations on Corsican Pine in Glenmalure

By T. McEvoy.

The suitability of Corsican Pine for planting on dry limestone or other calcareous soils, e.g., the Dry Grass-Herb and Dry Grass communities, is well known. Observations on the Silurian and Schistose formations of central Wicklow suggest that this species may also be of value in that area. In the state forest of Glenmalure especially, it has been planted on a variety of soils and under varying conditions of exposure with considerable success. It ranges from 500 feet to 1,400 feet in the Ballybraid valley where there is good shelter from the prevailing wind. On the whole, however, frequent high winds must be considered a significant factor of the locality. The oldest stands are now twenty years planted.

Soils. Satisfactory stands now exist on the following types: Fern community; Grass heath and Calluna heath, but gaps occur owing apparently to the high percentage of failure usual with this bad planter. It appears to be markedly superior in health and rate of growth to Scots Pine and its main use would seem to be as an alternative to that species on those types where exposure is great. It has two advantages in this case: its comparative immunity up to the present from needle cast (*Lophodermium pinastri*) and attacks by birds which destroy the leading and other buds. The latter is severe on Scots Pine on high grouse moor and repeated attacks result in slow growth and crooked stems of low value. Corsican Pine might also replace Japanese Larch at high elevations.

Use in Mixtures. Corsican Pine seems to be unsuitable for mixture by individuals with Scots Pine owing to its more rapid growth and to the fact that small Scots thinnings are practically unsaleable. On exposed larch soils, Corsican Pine may equal or exceed European Larch in height growth and the larch is then sheltered and grows better than in pure stands. Being subdominant, and useful in pole sizes, the latter is probably the ideal admixture for removal in thinnings. The Corsican might be planted pure or with 25% larch and beaten up with larch. No mixture with Japanese Larch was observed, but it is anticipated that the latter would be too fast growing to suit.

Corsican Pine is especially suitable as a mixture by strips running across the wind direction in exposed areas in the Fern community, Grass heath and Calluna heath types. This is particularly noticeable in the Clonkeen plantation (planted 1929) where its action as a windbreak is already useful.

The Heather-Molinia Community. A description of Corsican Pine on a difficult peat type is treated separately on account of its special interest. Typically this Heather-Molinia community occurs above the 1,000 feet contour on moderate slopes and forms the lower margin of the peat cap which is a regular feature of the higher mountain land in this area.

The following is a description as it is found after long enclosure from grazing: Calluna dominant, continuous, 1 ft. to 3 ft.; *Erica cinerea* frequent, constant; *Molinia* frequent, constant, of diffuse growth under and through the heath species. No other species occurs in quantity, but

Agrostis tenuis *Festuca ovina* and *Hylocomium* type mosses are local where *Molinia* is scarce or absent, connecting it with the *Calluna*-Heath and Grass-heath types. Elsewhere, especially on flatter ground, *Scirpus caespitosus*, *Erica tetralix* sphagnum, etc., mark its relationship to, and replacement by *Calluna*-moor. The peat is 6 to 10 inches deep, dark in colour, non-fibrous, moist but not waterlogged. Under heavy sheep grazing the vegetation forms a closely grazing turf, the heath species are scarce, absent or degenerate, and *Molinia*, *Nardus stricta* and *Aira flexuosa* share dominance.

European Larch, Douglas Fir, *Abies pectinata*, Scots Pine, Norway and Sitka spruces have been tried but are not satisfactory. Sitka is patchy, doing best where *Molinia* is most abundant. *Pinus contorta* (var. *Murrayana*) and Corsican Pine have done best and Mountain Pine is useful on the upper margin of the plantations. The only objection to the use of *Pinus Contorta*, which grows fastest, is the possibility of extensive windfall later in the rotation. If the ground is planted with Corsican and beaten up with *Contorta*, or if strips of the wind-firm Corsican are planted to stiffen the stand, this objection may be overcome. Both these species are liable to be thrown in the pre-thicket stage, but they continue with stem decumbent for a few feet at the base.

Method of Planting. Planting distance should be close on this type—say four feet—and turf planting and drainage are likely to give good results. Turfing has only recently been extensively used on this type.

Summary. Corsican Pine has distinct possibilities as an alternative to many species and as a wind-break species in the exposed mountain forests of the south-east.

It is still too early to form definite conclusions regarding the most suitable species for each soil type and in this note the writer merely indicates what appear to be the present tendencies. In particular it may be necessary to assess the value of Sitka Spruce on the Heather-*Molinia* type from the results of recent plantations in which intensive draining and turf-planting methods have been used.

Planting of Forest Trees.

G. McCool.

The following notes are intended to set out, as briefly as possible, a few hints which may prove of interest to those interested in tree planting. The first four important points to be considered in the establishment of young plantations are as follows:

- (a) Fences, (b) Drainage, (c) Suitable species, (d) Best type of plants.

Fences. It is imperative that the planting area should be securely fenced against trespass by farm stock. If rabbits are numerous it will be necessary to use rabbit netting to exclude these destructive pests and all rabbits must be destroyed within the area.

Drainage. As most trees dislike stagnant or water-logged soils, it may often be found necessary to drain the site in advance of planting operations. The distance between the drains and their depth will be governed by the conditions prevailing on the ground. Generally speaking, drains placed approximately 20-25 yards apart could be regarded as sufficient, even for semi swampy soils. Care should be taken not to overdrain in the first instance. In all cases, main drains should be opened first; these should be kept to the lowest hollows on the ground, i.e., placed in such a way as to carry away all water that will flow into them from the side drains which will be opened later. Drains for forest purposes need not be covered but should be cleaned periodically. Open drains should have a width at the top of approximately twice their depth.

The width at the bottom should be about one-third the width at the top. This will give a good slope to the sides and thereby reduce maintenance costs. If the sides were cut with too steep a slope undermining would ensue and they would ultimately collapse.

Selection of Species. From a forestry viewpoint this means the selection of plants which would give the best return at the end of the rotation. This can only be achieved by planting trees which are best suited to the soil and other prevailing conditions. The following table shows briefly the more important likes and dislikes of tree species commonly planted at present:

Species	Type of surface vegetation and soil conditions.	Unfavourable conditions	Other Remarks
Norway Spruce	A mixture of three or more of Rushes, grasses, bracken, bilberry or molinia Moist	Poor tight deep peat gravelly or stagnant soils or severe exposure	Useful for planting old woodlands if soil and other conditions are favourable
Sitka Spruce	Somewhat similar to above Moist	Similar to above, but stands exposure better	Faster growing than Norway. Dislikes frost hollows
Scots Pine	Mixture of two or more of Furze, heather, bracken, grass or bilberry Dry	Poor tight peat Stagnant soils or severe exposure	Not too exacting. Will succeed on most soils
Contorta	Dwarf furze, heather and inferior grasses or heather furze and bracken Dry	Heavy soils	Very useful for planting on poor gravelly mountain soils
Silver Fir	Better pasture grasses (pure) or mixed with briars and bracken Moderately heavy fertile soil	Poor soils	Stands shade well. Useful for under-planting
European Larch	Mixture of Ferns, briars and grasses Dry fertile porous soil with rapid moisture percolation	Peaty, sandy or stagnant soils or severe exposure	Does best on steep fertile rocky slopes
Jap Larch	Somewhat similar to Scots Pine Moist	Deep peat or water-logged soils	Fast grower, wind-firm, suitable for shelter purposes
Beech	Mainly good pasture grasses Dry, moderately heavy, fertile calcareous soils	Poor soils or severe exposures	As for Norway Spruce
Oak	do. Moist, heavy, fertile soils	do.	As for Norway Spruce
Ash	do. Moderately damp, fertile soils	do.	As for Norway Spruce

Type of Plants. In all species the best plants are those with well developed root systems and stout healthy stems. A good root system is much more important than stem development and lanky drawn out plants should be avoided.

