IRISH FORESTRY

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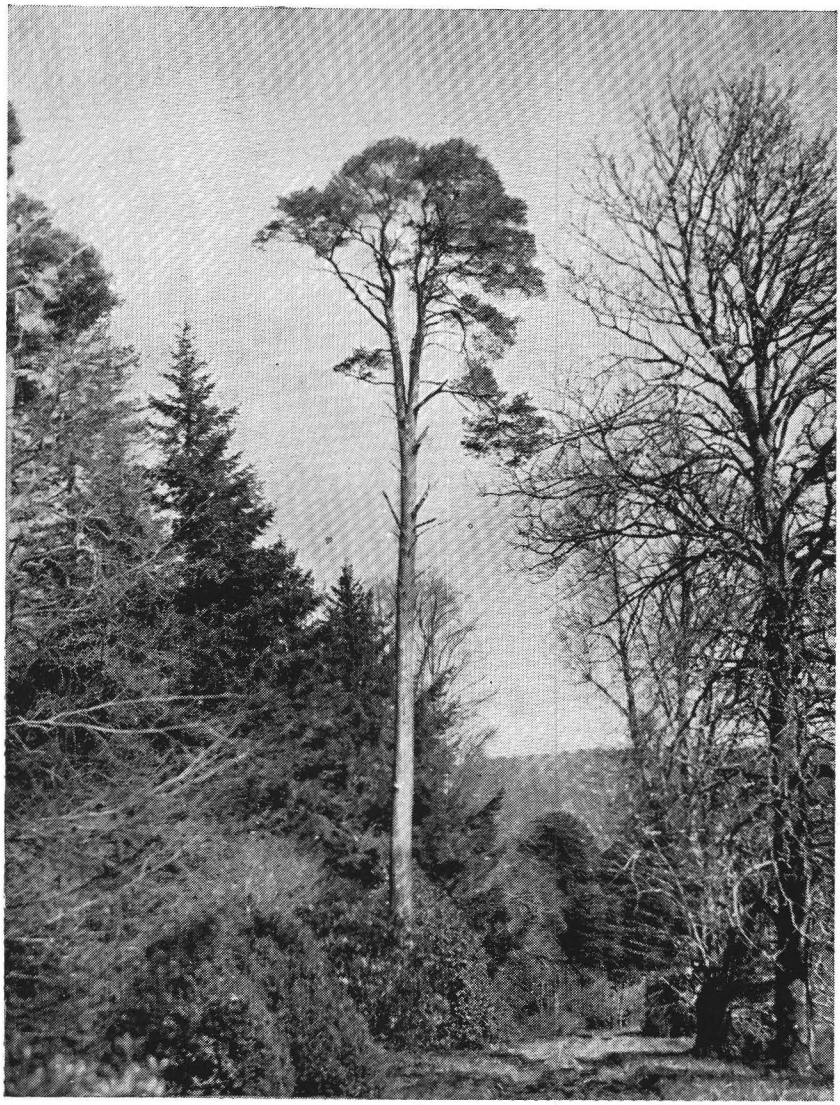

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IRISH FORESTRY

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IRISH FORESTRY

VOLUME III DECEMBER, 1946 NUMBER 2

EDITORIAL

THE FORESTRY ACT, 1946

The Forestry Act, 1946, has now become law and will come into force on a date to be fixed by the Minister for Lands. Its provisions deserve the attention of all interested in the growth of Irish forestry and especially of all landowners and foresters. The study of our Forest Law is made easier in so far as this Act repeals the Acts of 1919 and 1928 *in toto* thus embodying the entire legislation in a single Act of the Oireachtas.

The new Act is not spectacular and it has not become a subject of popular controversy. In fact, it passed through all its stages in both Dail and Seanad without alteration, save in minor detail.

How does it affect State and private forestry ? What innovations does it contain ? It must be made clear, first of all, that most of its provisions are in the nature of a re-enactment of those of the 1919 Act (which established State forestry on a sound basis) and of those of the 1928 Act (which was mainly concerned with the imposition of controls on the felling of trees). In addition there are some amendments of the re-enacted sections and some entirely new sections added. In these, naturally, most interest centres.

Part II sets out the general powers of the responsible Minister. In addition to the power to acquire and manage land, buildings and " works " for forestry purposes, to make advances by way of loan or grant for private planting, to give advice and assistance in management to the private forester, the Minister is given power to take over the management of private forest land on an agency basis. The Minister may also establish a Consultative Committee to give him advice on forestry matters. The composition of this Committee is of interest. It must include (*a*) a representative of the Minister for Agriculture, (*b*) a person having practical experience of forestry matters, (*c*) a person with knowledge and experience of the home-grown timber trade, (*d*) a person with knowledge or experience of labour matters, (*e*) a person with knowledge or experience of the work of County Councils, (*f*) a member of any society existing for the promotion of afforestation, and (*g*) an owner of woodland. The provision for a representative of the home-grown timber trade is a new departure and our Society would undoubtedly have claims for representation under (*f*)—if and when the Committee is appointed.

Part III deals with the extinguishment of Easements, creation of rights of way and compulsory acquisition of land. This Part of the Act breaks new ground in legislation affecting the compulsory acquisition of land for State purposes in departing almost entirely

from the machinery of acquisition which has been in general use under the Lands Clauses Acts for a century past; its provisions are necessarily highly technical and difficult for the layman to follow.

Section 19 provides for the extinguishment of easements or rights affecting land held by the Minister which would hinder its use for forestry. It will also enable the Minister to acquire land over which several individuals have rights, say, of grazing, and which all save one of the interested parties are willing to sell. The Minister may buy out those prepared to sell and then apply for the extinguishment of the right of the remaining party. This will obviate the necessity in such a case of using the more cumbersome machinery of compulsory acquisition.

Section 20 makes provision for the granting of temporary rights of way for timber extraction over land adjoining either a State forest property or privately owned woodland. The right of way which may be granted is limited to a maximum period of twelve months.

Section 21 is an important new addition to the law. It provides machinery for the creation of permanent rights of way serving State forest lands. Its provisions do not apply to private woodlands.

Sections 22-34 govern the compulsory acquisition of land by the Minister for forestry purposes and are, necessarily, of a complex character. Certain points are worthy of notice. Compensation will be fixed by the Land Commission instead of being settled under the Lands Clauses Acts as previously. Further, compensation can be fixed in advance and the Minister, knowing the cost to him of the land, can then decide whether to proceed or not with acquisition. Under the previous law the Minister could be committed to pay a price for land which would not permit of its economic development as forest land.

The provisions differ from the previous Acts in two other important respects. Under the old law the compulsory acquisition of land which formed part of any park, demesne, garden or pleasure-ground or formed part of the home farm attached to and usually occupied with a mansion house, or the acquisition of any land required for the relief of congestion, was prohibited. But unless the land fell into one of these or certain other defined categories, the Land Commission had no option but to grant an acquisition order sought by the Minister. The prohibitions named above are now removed and the Land Commission have now full power to grant, refuse or vary an order sought by the Minister on its merits. Under the 1946 Act the prohibition of the making of an order applies only to land which is required for the amenity or convenience of a dwellinghouse, is the property of a local authority, has been acquired by a Company or Corporation for the purposes of a public undertaking, or is the site of a National Monument owned by the Commissioners of Public Works.

Part IV deals with restrictions on the felling of trees on lands in private ownership and replaces the corresponding provisions of the 1928 Act, with some alterations and some tightening-up, but retaining in general the old scheme of control which proved satisfactory and easy to work.

Under the 1928 Act there was no time limit set to felling notices, or felling licences; both felling notices and " limited felling licences " will now be effective for two years only. Felling Notices given under the 1928 Act are similarly limited in their effectiveness to two years and licences under the old Act will expire two years after the new Act comes into force.

A felling notice must be lodged in the case of any tree over ten years old intended to be cut down. Exceptions include (*a*) a tree in a county or other borough or an urban district or (*b*) a tree within 100 feet of a building, (*c*) a tree cut by a local authority in connection with road construction or because of danger to road traffic, (*d*) a tree which is a danger or obstruction to telephone wires.

In the case of certain " exempted " trees a felling notice must be lodged and the Minister may make a prohibition order but he cannot subsequently refuse a licence and cannot attach replanting or preservation conditions to a licence. The lodging of the felling notice and issue of prohibition order in these cases allows the Minister an opportunity to have an inspection made to verify that the trees are actually " exempted." " Exempted " trees include (*a*) trees which in the opinion of the Minister are not necessary for the ornament or protection of the holding and (1) are stated to be intended for constructional or maintenance work on structures, fences and farm implements on lands belonging to the owner or his immediate neighbours, or (2) which are stated to be intended for use as fuel on the holding; (*b*) trees which in the opinion of the Minister are dead, decayed or irremediably damaged and useless for commercial purposes.

The replanting conditions which may be attached to a licence have been stated more precisely. The licensee must plant the trees specified " in accordance with the general practice of good forestry "—this presumably would entail such preliminary work as drainage, where necessary. The replanting conditions will include a " protection " condition requiring the licensee to preserve the planted trees for ten years from planting date " in accordance with the general practice of good forestry." There may be a condition requiring him to erect and maintain effective fences.

The Minister may, instead of attaching replanting conditions to a licence, impose preservation conditions designed to protect natural regeneration present or expected on part of the holding and may require the area to be fenced off.

In lieu of the above-mentioned conditions the Minister may impose a contributing condition under which the licensee shall be required to pay a sum towards the costs of State forestry work before felling commences. This is designed to fit cases where replanting or preservation conditions would cause hardship as for instance, where the licensee does not possess land suitable for forestry purposes.

The protection, preservation and contributing conditions are novel features which were not present in the 1928 Act. Replanting and preservation conditions are imposed on the owner of the holding *and on his successors in title* and provision is made for the

registration of replanting and preservation conditions as a burden affecting land registered under the Registration of Title Act, 1891.

The general permits issued under the 1928 Act to permit of the conduct of normal felling operations in wooded estates are to be replaced by general felling licences. The relevant provisions of the new Act are generally similar to those embodied in the 1928 Act; there will be a specific requirement by way of afforestation conditions that woods clear-felled under a general felling licence be replaced.

Part V deals mainly with vermin, hares and the burning of vegetation. A provision in the 1919 Act relating to rabbits and vermin other than hares is re-enacted in substance by Section 58. It enables the Minister to authorize entry on infested lands adjoining a plantation (either State or private) for the purpose of destruction of vermin where the owner of the infested land is unwilling or unable to carry out the destruction or take other steps to prevent damage. This section covers damage by deer. Section 59 gives the Minister power to destroy hares by any means on State forest land—a power which had been interfered with by the Game Preservation Act, 1930.

Powers for the destruction of hares in privately-owned plantations or on land adjoining plantations (either State or private) are given under Section 60.

A new provision (Section 62) enables the Minister to authorise entry on uncultivated land for the purpose of destroying vegetation growing within 150 feet of a wood, which represents a potential fire-danger to the wood, and which the owner of the uncultivated land fails to remove on receipt of notice in writing from the Minister.

BACK NUMBERS.

The following is the complete list of back numbers of *Irish Forestry*, all of which are obtainable from the Secretary:—

Volume I. Number 1 (1943)—Price 5/-.
Volume I. Number 2 (1944)—Price 5/-.
Volume II. Number 1 (1945)—Price 3/-.
Volume II. Number 2 (1945)—Price 3/-.
Volume III. Number 1 (1946)—Price 3/-.

THE PRODUCTION OF HIGH GRADE SOFTWOOD TIMBER IN IRELAND

By T. Clear.

Our Timber is Abominably Knotty.

In the production of coniferous timber rate of growth and freedom from knots are considered the most important factors influencing quality. While deals and boards from home-grown spruce, pine and larch have been sawn equal, and very often superior, to the best imported, it must be admitted that the bulk of our softwood timber is abominably knotty. Now apart from rot, knots are the most serious of all wood defects. They render the wood unsuitable for fine sawing and, being so much harder than normal tissue, cause severe wear on saws, cutters and planing machines. The distorted grain around large knots renders hand working difficult and in addition, results in a considerable loss in strength. There is a growing belief that the production of clean timber is no longer of great importance, as the development of pulp, Kraft paper, fibreboard and other like products provide a ready market for lowgrade timber. This is far from being the case. There is greater waste in the " cooking " of knotty timber, greater wear and tear of cutting and grinding machinery and, in many ways, knotty timber is less suitable as a raw material for any of those products. Furthermore the price obtainable for pulpwood is not nearly so attractive as that obtainable for lumber, and other developments in the line of laminated wood seem to indicate that there will be a growing demand for clean timber of large sizes.

How Knots are Caused.

Knots in timber are caused, as every forester knows, by the occlusion of side branches in the bole of the tree. As practically every tree produces side branches it is impossible to get a completely knot-free bole. The important thing, however, is to have as little of the stem affected by knots as possible and to see to it that those knots which do occur are small ones. Degrade due to large knots affects a relatively much greater area than small knots. The aim, therefore, should be (*a*) to have the minimum number of side branches formed on the boles of the trees, (*b*) to prevent these side branches that do form from becoming too large, (*c*) to eliminate them as soon as possible after they cease to be of use in helping to form timber.

The quantity of side branches produced by a tree is largely a matter of species, strain and environment. Some trees are bushy in habit and produce large numbers of side buds, while others produce long internodes free of buds. Among the softwoods, pines are prone to produce bushy forms, with stoutly developing side branches, while spruces, larches and firs are more finely branched. Again rate of growth is important. Rapid growth means long shoots free from buds, while slow growth means a concentration of buds and leads to bush formation. The type of growth, however, can be greatly influenced by proper light control.

THE LIGHT FACTOR AND KNOT CONTROL.

Initiation of growth in the bud of the leading shoot or side shoots depends largely on the amount of illumination of the bud. In poorly illuminated buds growth activity is late or may not start at all. If the quality of light to the side branches is reduced, the buds open slowly and late. Cambial activity is late also. The nutrition of the branch is smaller and this keeps the growth of the branch down to a minimum and it eventually dies. Thus, we see that knot control can be obtained by the timely removal, or reduction of the quantity and quality of the sunlight reaching the buds and foliage of the side branches.

Let us consider the means of controlling side light at the disposal of the tree grower. By judiciously leaving scattered standards of the old crop, or selected small-crowned scrub trees a good deal of side light control can be obtained. It is important, however, that the main or leading bud receive sufficient light to stimulate it to maximum growth. It is possible by this means to get maximum leading shoot development and minimum side branch development. The most important means of controlling side light and, through it, branch development in young crops is, however, by means of the young trees themselves. Close planting and fast even growth are the most powerful factors in branch suppression. When leading shoots are open to the full strength of light they are stimulated earlier than the partially shaded side buds. Thus grass and weeds, and the shade of the neighbouring trees all help in reducing side branch development at a critical stage. It is therefore, unwise to clean over thoroughly. Branch suppression is best achieved then in young plantations by close planting, judicious cleaning but, most important of all, by even and rapid growth in the crop as a whole. Any condition that leads to irregular growth, be it bad planting, poor plants, unsuitable mixtures or rapid changes in site quality, prevents the optimum control of light and tends to poor quality timber growth.

THE IMPORTANCE OF RING WIDTH CONTROL.

Bound up closely with the problem of knot control is the question of ring width control. Fast grown but immature trees of Douglas fir and Sitka spruce have begun to come on the market and are advertised as suitable as boxwood, structural and other timbers and are eagerly bought up in these times of scarcity. Bulk alone seems to be the criterion by which a tree is judged in the forest. After conversion these timbers are criticised because of their rapid growth and lack of strength and are said to compare very unfavourably with imported timber of the same species. The trade has been long accustomed to handling timber from the virgin forests of Northern Europe and America where growth is exceedingly slow and where trees are felled at a great age. For joinery work slow-grown, fine-ringed timber has many valuable attributes, notably ease of working and stability after making up. Due to our mild climate trees enjoy a longer growing season here than in the far orth. This is extremely important as it enables us not alone to

grow a wide variety of timber trees but also to produce timber of large dimensions on a very much shorter rotation. This is an advantage that we cannot afford to relinquish lightly nor indeed, is it necessary greatly to increase our rotations in order to produce timber of reasonably high quality.

If wood cells (or tracheids) were all of uniform dimensions wood structure would appear homogenous and, more important still, there would be no variation in quality between slow grown and fast grown timber. The seasonal changes in northern latitudes, however, exert a marked effect on the cells produced. In the beginning of the growing season, in coniferous timber, the wood cells are large in diameter and thin-walled whereas the cells in the outer portion of the ring are smaller and thicker-walled. The wood formed in summer being composed of thick-walled fibres with comparatively small cavities, is denser and harder than the wood formed at the beginning of the growth period. As the dense layer of summer wood abutts on the more open tissue of the following spring a marked contrast is produced and thus, in conifers especially, the annual rings are sharply defined. Unfortunately the proportion of summer wood to spring wood is not constant but falls off considerably in fast grown or wide ringed timber with the result that the total amount of summerwood is less in the fast grown than in the slow grown. In softwoods which possess heavy summerwood, e.g., Douglas fir and larch, there is an optimum rate of growth for strength, and moderately fast grown timber of these species contains more heavy summerwood than very slow grown or very fast grown timber. Thus in grading softwoods for structural purposes it is usual to specify that there shall not be less than six rings per inch or not more than twenty. With spruces, firs and hemlocks, i.e., species with relatively inconspicuous summerwood, generally speaking, the narrower the growth rings the stronger the timber of these species. Scots pine is intermediate between these two types of softwoods. It can be taken then that the difference in strength variation for timbers having a ring growth over 6 rings to the inch is not of great practical importance. A clean board of Douglas fir or pine with 6 rings to the inch is probably stronger than a knotty one with 16 rings to the inch. Now a growth rate of mature softwood in this country of between 6 to 20 rings to the inch is the rule rather than the exception. Why then are our local timbers criticised because of their too rapid growth and structural weakness ?

The reason is not far to seek. If we could compare the rings on a butt of a home grown larch, Douglas fir or Scots pine with similar species from virgin forest the following difference might be apparent. In our timber the fastest rate of growth, i.e., the widest rings, appear in the centre where one or two rings to the inch is not unusual. After which the rings gradually decrease in width until a stage is reached when there may be 20 or more to the inch with the tendency all the time for the rings to get narrower. On the " virgin " butt the centre rings are fairly narrow, sometimes very narrow, and they increase gradually or remain constant in width. A full width board cut from the former is much inferior to one cut from the latter not only in appearance and strength but also in seasoning properties.

The wide ringed centre will tend to shrink at a much greater rate and to a much greater degree, particularly longitudinally than the outer narrow ringed portion and splitting, twisting and warping can scarcely be avoided. Skilful sawing might overcome this but would be costly as compared with straight-forward sawing methods.

Immature Wood is Poor in Quality.

Another serious defect of our timber is its relative immaturity. This applies not only to the timber from young trees but to that sawn from middle-aged trees as well, particularly fast grown trees. We are accustomed to hear that our Douglas fir and Sitka spruce timber is not of the same nature as that imported. The same criticism was applied earlier to Scots pine and Norway spruce. In fact at the beginning of the present century the only Irish coniferous timber upon which any value was placed was larch. Scots pine and spruce were considered as weeds in the woods and could be purchased at a nominal figure. There must be some foundation for this persistently poor opinion of the strength qualities of Irish timber. Experiments in many countries have shown that most coniferous timber is low in density and strength during the early years of the stem's growth. This is explained by the fact that the wood cells produced during the early years of the tree's life are smaller in size, and have less wall material—especially those formed towards the end of the season's growth—than the corresponding mature tracheides which are formed later on. The average size of tracheides met with in the succeeding annual growth rings gets larger and larger and it is only in the twentieth year or thereabouts that the full sized tracheides begin to be produced. There is relatively less difference in density or strength between moderately wide-ringed or narrow-ringed wood when the tree is out of its " teens." Any coniferous timber which is composed largely of wood cells produced during the first 20 years of the tree's growth is likely to be low in density and cellulose content, i.e., light and brittle and generally of inferior quality either for sawing or pulping.

The type of growth common in forest plantations is not conducive to good quality production. Wide spacing and rich soil give trees a quick start after planting out and allow extremely rapid growth until the thicket stage is reached when root and crown competition causes increasingly rapid diminution of diameter growth. It is usual then to keep the crop as close as possible to try and clean away the coarse branches which have developed—this at a time when the more desirable mature cells are beginning to be thrown off by mother cells of the cambial layer. The aim rather should be to check diameter growth or reduce ring width as far as possible in the beginning and from the thicket stage or small pole stage to seek to maintain or increase ring width. Gradually increasing breadth of the annual rings at this stage means optimum quality and optimum yield in value. Decreasing breadth on the other hand means a loss. What can be done in practice to attain this desirable type of growth ?

THE " HALF-SHADE " TREE.

While the development of a tree is strongly affected by hereditary qualities nevertheless even with good stock quite a lot depends on the environment and the treatment. With Scots pine for example, close planting on light sandy soils or part shade from tall standards results, by the thicket stage, with good varieties especially, in a crop of tall slim trees, with weak side branches. The stronger the height growth or as is sometimes said, the more " drawn up " the trees, the fewer, weaker and more horizontal are the side branches. These small branches die early while the tree is still of small girth and are easily cast off by ever growing pressure exerted by the expanding bole, or they can be cheaply pruned away. On the other hand on the richer loams and peats pines are often planted because they are easier to establish than spruces or hardwoods or because they are useful in nursing the spruces or hardwoods on such sites. Under such conditions the pines are often widely spaced and the result is coarse growth, the side branches growing at the expense of the leader, and this free grown crop by the approach of the thicket stage is composed of squat trees with abnormally long and thick side branches set at an acute angle to the main stem. The period of " bush " formation extends for 15 years or more, short, thick-stemmed, heavily and acutely branched trees being everywhere in evidence. Only early and expensive pruning can save such a crop from developing into a stand of low quality timber trees. If neglected at this stage no treatment will be of any avail. With the passing of years the coarse branches may be hidden but on the saw bench the soft spongy heart and the coarse spiky knots will be revealed and receive all the publicity the irate sawmiller can command ! Very often in pure stands the rate of development of the planted trees is not quite even or, due to planting failures, a large proportion of the crop has been introduced in beeting operations. These backward trees are under the influence of their more forward neighbours and here we see one of the most important factors of branch suppression at work; by ever reducing the quality of the side light while not interfering unduly with the top light the coarse forward trees reduce the vigour of the side branches and increase the rate of leader growth on the smaller trees, producing a slender fine horizontally-branched type, referred to by continental silviculturists as the " half-shade " tree. These *élite* trees are a feature of our thicket pine stands and often constitute a large part of the crop. Unfortunately by the time treatment is normally forthcoming most of them are dead or hopelessly suppressed and are removed in the first cleaning operation. Nor is this " half-shade " tree confined to pine crops. It is met with perhaps more often in Douglas fir stands than in any other. Indeed a thinning treatment which concentrates on the removal of the coarse dominants with a view to forming a final crop of " half-shade " trees, or co-dominants as they are sometimes called, is recommended for Douglas fir.

I saw some fine examples of this form of treatment at Glenmalure and Glendalough and the effect is really gratifying. It is strange that similar treatment is not applied to pure pine woods or

mixtures. Probably Douglas fir, being a partial shade-bearer, stands over-shading much better than pine and so the fine-branched survive in the crop and stand out in sharp contrast to the coarse " wolves " at the time of the opening brashing and call out for relief.

With all tree crops strong height growth from the beginning and even growth over the whole stand is the best and cheapest method of producing narrow-ringed cores and light side branches. Unfortunately in newly planted areas in this country uneven growth in young stands is the rule rather than the exception. The rapid variation in soil and surface vegetation which is a feature of our afforestable land is one of the chief causes of this undesirable state of affairs. There are, however, many stands of very poor quality where, owing to bad planting, neglected cleaning, damage by frost or rabbits, patchy crops have been allowed to develop beyond the stage when beeting up can be of much avail. Even where beeting up has been done extensively the more advanced trees are allowed to suppress the later introductions although these may be of very promising quality owing to the " half shade " position they enjoy. It is advisable to live-prune in such cases. Most foresters are afraid of live pruning because of the danger of wood-rotting fungi getting in. But, as far as can be ascertained, there is little danger of infection—in the case of pines especially.

Despite all that is written about the value of mixtures, an extensive tour of Irish plantations is sufficient to convince one that successful mixtures are the exception rather than the rule and that pure crops are much easier to manage for the production of good quality timber. Scots pine/Norway spruce is now a popular mixture on cut-away bog and is perhaps a good mixture if one aims at getting a crop of spruce. The pine, however, is very vigorous from the start and the spruce very liable to check. Unless the forester is prepared to live prune, or cut back the pine ruthlessly there is a very real danger of poor coarse crops on such ground. It is difficult to select mixtures which are of even growth rates in the early and critical years and most of the headaches experienced in the treatment of mixed crops result from uneven rates of growth. Very often the less desirable trees or species in the mixture tend to become dominant. For instance, the removal of coarse Japanese larch and contorta pine from over badly suppressed but promising trees of Norway and Sitka spruce has become an urgent necessity in many forests. It would be interesting to have records of all such mixtures as eventually they may be more troublesome to handle and less successful than pure crops even on difficult sites. It may be possible by means of soil cultivation and manuring to get crops to start away immediately after planting and to produce that desirable even growth and this may be less expensive than managing crops where the essential nurse trees are liable to get out of hand.

The Value of Early Pruning.

It appears then that the first stage in the life of a plantation is really very important as it is during this stage between planting and first thinning that the foundation of the timber crop is laid. It is in

those early years that the quality grade of the crop is largely determined. There are many crops, however, in which for a variety of causes, such as uneven growth and wide planting, canopy does not close rapidly. In such stands artificial pruning is essential for the production of clean wood. Even after early suppression the side branches of some species persist for many years and are occluded in the wood as dry or dead knots, and thus the advantages of close spacing are minimised. There is a growing body of evidence to show that good results can be got by relatively wide spacing followed by early pruning. For pruning to be successful it must be done while the core of the tree is still small, say up to 4″ in diameter. A more important factor still is that the growth rate after pruning should be rapid. The typical half shade tree has many qualities that lend themselves to successful pruning. Thin side branches and long internodes make for cheap pruning while the narrow girth guarantees the maximum addition of knot-free increment provided the tree is given ample room for growth after pruning. Pruning is worth while on good soil even though the trees have grown somewhat coarse but it is important that it be carried out early. Early pruning involves the cutting of live branches and many foresters avoid early pruning on this account. It is no unusual sight to see pines and firs being pruned when they are 6″ or more in diameter and when girth increment is rapidly falling off. From all accounts, it appears that the removal of some whorls of live branches has little effect on the growth of the trees particularly if these branches are already partially shaded. The most efficient portion of the crown for the assimilation of sunlight and the formation of wood is the upper portion and by far the most of the assimilation is done by the newly formed needles in the case of spruces and by last year's needles in the case of pine. There can, therefore, be no excuse for delayed pruning.

Thinning and Quality Increment.

Having obtained the maximum amount of branch suppression in the thicket and small pole stage the important thing subsequently is to achieve the maximum addition of valuable timber by a proper grade of thinning. It is very disconcerting for a young forester to hear the many and conflicting views on this important problem. To judge from discussions at our Society's excursions it is largely a case of one guess being as good as another. If in those controversies which arise there were some unanimity as to the final object in view, it should be possible, I think, to get a great deal of agreement on many forestry problems. Of course there is no rule of thumb or set prescription for dealing with silvicultural matters and each stand must be considered in the light of its particular stage of development or condition, but as a rule there can be only one technique that will achieve the desired objective. The greatest complications arise when conditions in the crop are abnormal, for example when the crop is being ravaged by insect or fungus pests or where there has been extensive snow or wind damage. For normal stands the guiding principle in thinning should be to help the best and *largest* trees

rather than to remove the bad. The *élite* trees of the stand must be given the opportunity of putting on the maximum girth increment. The main factor affecting girth increment is the size of the assimilating crown surface. This can be measured by reference to crown length and maximum breadth. Trees with the greatest length of crown react most efficiently to thinning and as these are found as a rule among the dominants it is important that they be given every chance. If we are satisfied that steady or increasing ring width is desirable, regular, light to moderate thinnings at 3 to 5 year intervals, depending on the rate of growth, should give the desired result. It should be remembered that an early or untimely heavy thinning may have very bad results on the timber quality of the second log length. The branches will then have a considerable period of growth before suppression sets in again and no further cleaning will result.

In this short discussion I have of necessity ignored many important factors affecting the production of merchantable timber. The importance of source of origin of seed is appreciated by everyone dealing with the raising of crops and is of, perhaps, greater concern to the forester than any other. Unfortunately it is all too apparent that too little attention has been paid to this matter in the past and it is only natural to suspect that the poor growth of many of our plantations is due to the penny wise policy of using cheap unselected seed.

The raising of physiologically balanced nursery stock is also of fundamental importance. Trees grown on exhausted nursery soils are affected in more than height growth and root development. Lack of potash, for example, may influence the frost resisting qualities of planting stock and therefore affect establishment on frosty sites.

It can be appreciated that the raising of good quality timber under present Irish conditions is not an easy task. Unlike his *vis-à-vis* in countries with long established forests and an older tradition of silviculture, the forester here is dealing with new and untried species and mixtures and is very often poorly informed of the soil or climatic conditions with which he has to contend. Under such conditions the finer arts of silviculture may tend to be neglected. There is a natural preoccupation with the manifold problems associated with the creating of forests on bare ground. It does not pay, however, to neglect or forget the major objective of all forestry endeavour, the creation of a store of *merchantable* raw material for the wood-using industries of the country.

Ireland has always been able to import its timber requirements at reasonable prices in normal times and to select species and grades of hardwoods and softwoods to meet the varied requirements of the trade. The stoppage of imports during the war turned the attention of the sawmilling, woodworking and building trades to our own forests as a source of supply. While the supplies of timber forthcoming have been of inestimable value during the past few years the fact that much of the material coming on the market has been of poor quality has fostered or kept alive the prejudice that exists against most local products. It is of the utmost importance

to the future of forestry that this widespread prejudice against homegrown softwoods be combated by every means. It is hoped that locally grown softwoods will play an increasingly important part in the general timber economy of the country. Large areas of pine, spruce and larch are being planted and eventually a " forest estate " capable of meeting all our requirements can be built up. This is the objective of forest policy here and it is the task of the forester to see that this objective is attained. Unless the products of the forests are bought and utilized there can be no stability in forestry. They will not be bought and utilized unless they are serviceable and economic. The timber grower must recognise the defects of his products and must seek to eliminate them as far as is possible. The future of the forestry industry in Ireland lies to a large extent in the hands of those who wield the axe, saw and marking scribe.

FASHIONS IN FORESTRY.

1778. FORBES (FRANCIS) Gent., in *The Improvement of Waste Lands* published in London in 1778.

There is a vulgar saying " A poplar will buy a horse before an oak will buy a saddle."

1790. A COUNTRY GENTLEMAN in *Essays on Agriculture and Planting founded on experiments made in Ireland,* published in Dublin in 1790.

There is a saying in England that an elm would buy a horse before an oak would buy a saddle.

1839. J. MAIN in *The Forest Planter and Pruner's Assistant,* being a practical treatise on the management of the native and exotic Forest trees commonly cultivated in Great Britain. London, 1839.

A Lincolnshire proverb declares that " a willow will be worth a horse before an oak will be worth a saddle."

1851. JAMES BROWN in *The Forester.* 2nd edition. 1851.

There is an old saying among foresters—and it is indeed a true one—that " a larch will buy a horse before an oak will buy a saddle."

Contributed by M. L. ANDERSON.

THE VEGETATION OF IRISH NATIVE WOODLAND

By T. McEvoy.

The present century has seen a revolution in the approach to the study of plant life. Previously field botanists had used what we might call the analytical method—vegetation was divided up into its component species each of which was given its binomial specific name and its general distribution was studied in meticulous detail. The country was divided up into 12 botanical districts and the occurrence of species carefully recorded with reference to these districts (e.g., a plant is said to occur in Districts 1, 4, 6). Thus was built up an elaborate and most useful mass of information covering each species and its occurrence here. The credit for this work is due to such botanists as Alexander Goodman Moore, Nathaniel Colgan, Reginald Scully, Harte and R. L. Praeger. The work is summarised in *Cybele Hibernica* (1898) and Praeger's *Irish Topographical Botany*. Recent work has been mainly confined to the distinction of critical species (roses, whitebeams, etc.) and the picture of distribution is now reasonably complete.

Recent years have seen the emphasis of field work turn to the next stage—the deeper investigation of the reasons underlying present distribution, the interrelation of soil, local climate and flora and fauna; and the plants themselves are treated not as isolated individuals but as members of a community mutually affecting one another and interdependent. This particular type of botanical study is known as ecology—a name which for some unknown reason seems to frighten off many people. The development of ecological work owes much to the remarkable progress made during the present century in the study of soils. Looked at in this light this paper on vegetation follows logically Dr. Gallagher's paper on Soils which in turn was the natural successor to Mr. Mitchell's paper on Geology.

As ecological work progressed it became increasingly clear that any particular plant community should not be regarded as a stable, more or less unalterable, entity, but that whatever degree of stability or permanence it had was the result of a delicate balance or equilibrium of many forces which we lump together under the name locality or habitat factors. A change in any one of these factors—soil, climate, animal population, etc.—will set in train a series of reactions which alter and may completely destroy, the pre-existing community. This brings us to the theory of PLANT SUCCESSION which is now generally accepted. Expressed briefly and in its widest terms, it is as follows:—Given an area under given conditions of climate and soil, natural vegetation is different according to its actual age in that area. Suppose we start with bare ground. The bare space is occupied successively by a number of different plant communities, each of which is capable of ousting its predecessor. Eventually a more permanent community is established usually dominated by the tallest growing species capable of survival in the

area. Normally, preceding communities are unable to oust this final or *climax* type as it is called. The earlier stages are *seral stages*, the whole movement or succession being a *sere*. In the case of Ireland, the climax type in favourable situations is " deciduous summer forest," the dominant tree species being oak and ash.

A concrete example will help to illustrate the process of succession. Many of you must be familiar with the valley of Glencree in Co. Wicklow. In Glencree the lower hill slopes, when this district was heavily populated, were farmed intensively and the fields formed a patchwork of tillage and grass, interspersed with woods. The population has now decreased, very little tillage is carried on; many of these fields—in common with the unenclosed mountain—are used as permanent pasture, mainly for sheep. But without man's interference with nature, without tillage, manuring, grazing and the grubbing of furze, grass pasture is unable to maintain itself. To-day grass occupies a small and steadily diminishing space in the centre of many fields; bracken is spreading by its rhizomes from the fences and has encroached over most of the area so that in summer its interlacing fronds close over and shade the surviving grasses. The shade cast by the bracken reduces the vigour of grass and provides ideal conditions for the entry of several woodland plants such as wood sorrel (oxalis) and bluebell (scilla)—vernal or prevernal species which flower and have their active growing season before the bracken casts its densest shade. Even without the invasion of woody species we have there an approach to woodland conditions. Elsewhere, European furze, its seeds probably carried by ants from ditch-tops, establishes itself in the old pasture. It grows slowly, grazed by sheep into a thick close cushion resembling topiary work until the bush becomes so large that its upper branches are out of reach. It then grows rapidly and forms thickets. The blackberry (or bramble) too, invades the pasture and grass becomes less and less important. Birch seedling spring up at an early stage often sheltered from grazing by furze, and mountain ash, and holly also put in an appearance. Occasional oak seedlings develop and it is these that would, given time under natural conditions, form the climax woodland type. Some of the old native woods of sessile oak still survive in the Glen as examples, albeit altered, of this climax. These various seral stages—these transient communities—are typical of succession on the acidic soils of the Cambrian, Silurian and granitic formations of the East and the Old Red Sandstone of the South.

In studying the development of communities it is seen that certain species act as pioneers; others can only enter at later stages in the succession. The place of each species is determined by its equipment, e.g., seed production capacity, fertility demands, hardiness against frost, height growth, shade-bearing capacity, liability to grazing. In the sere illustrated, bramble and furze have good protective devices against grazing in their thorns. Holly is rather less well equipped and the young tender shoots are sought after by many animals. It is also frost-tender, its bark is thin and relished by animals. Birch is a mobile opportunist species, very hardy, making little demands on soil, fast-growing, producing seed within 10 years of establishment; this seed is produced in great

quantity—millions per tree—and carried far by wind and water. The oak does not produce seed until about the 40th year; most of the acorns fall around the parent tree and are liable to be eaten by mice, squirrels, etc. It is frost tender. On the other hand it can grow under the shade cast by a mature birch stand whereas birch will not thrive under oaks in close canopy. It is much longer lived and in favourable situations its total height growth is superior. It is also more fire-resistant than birch.

When we come to look at the examples we have of climax woodland we must again consider the impact of the various habitat factors. Since these include a number of factors of artificial origin, we must ask ourselves how far the present climax differs from the natural. In fact we have to see how far man has altered the type—to study, in fact, what is known as the " biotic factor."

All our oakwoods have been subject to utilization; they have not been allowed to follow their own sweet will. In this connection it is interesting to note that Turner and Watt consider the Killarney woods on the mountain slopes as the closest approach to natural conditions. They mention that there are no records of exploitation; that felling, legitimate and otherwise, has been spasmodic and that cattle, deer, and ponies graze in the woods; that no record of planting or sowing of oak are known, but that overgrown charcoal hearths are present. I might add an addendum in view of our presence here in Killarney. Dr. Smith in his *History of Kerry* (1756) says the yew " grew in prodigious quantities in the mountains of all our southern baronies " until it was destroyed for making coals for the iron works; it is now quite rare outside the Killarney district. Samuel Hayes of Avondale in his *On Planting* mentions the sowing of acorns at Mr. Herbert's, Killarney, in 1760; also the cutting of Irish Elms for layering (1766). Young (*c.* 1777), referring to Derrycunnihy where Turner and Watt carried out their investigation, speaks of the " great sweep of mountain covered partly with wood hanging in a very noble fashion, but part cut down, much of it mangled, and the rest inhabited by coopers, boat-builders, carpenters and turners, a sacriligeous tribe who have turned the Dryades from their ancient habitations." There are records also of the importation from Britain of iron ore to Killarney for smelting with the local charcoal. So even in this out of the way corner of our island remote and inaccessible woods have suffered exploitation and can be classed as only semi-natural.

Biotic Factors.

What are the effects of exploitation on natural woodland? The prevailing Irish method was, as I have elsewhere stated, coppicing on short rotations without leaving standards, resulting in an even-aged closely-spaced crop of oaks of stool origin. On the other hand under natural conditions trees of all ages from seedling to over-mature trees would occur in the wood and spacing would normally be wide and irregular. However, while coppicing and grazing alter only the type of oak dominant produced, its effect on the subsidiary vegetation—minor trees, shrubs and herbs—is much greater.

A rather striking example of this is to be seen at Greenane Wood, near Rathdrum. This wood, up to the 1914-18 war, was a native coppice oakwood on acidic soil. A public road runs through the wood cutting off one corner from the main block. During that war the main block was felled except for a belt of mature oak on the southern boundary. Replanting took place in 1927—20 years ago almost—and the whole area, including the belt, was protected from grazing by stock and rabbits were kept down. To-day this belt has a complete continuous understorey of young holly, about 6 feet high with occasional older hollies, parents of the younger generation. Fraughan and woodrush are struggling to exist in the dense shade. On the other side of the road, the oakwood, with similar aspect, exposure and soil, has been allowed to stand but has been subject to constant grazing by farm stock. Here no shrubs of any kind have survived, the ground floor is well lighted and grasses (Agrostis, Anthoxanthum and Holcus mollis mainly) predominate with bracken also present. Woodrush is absent and tiny plants of fraughan can be found but sheep grazing prevents their forming a cover.

Incidentally this example proves the ability of holly to form a continuous understorey to oakwood in Eastern Ireland—a fact concerning which Turner and Watt appear to have had doubts. Another example of the importance of a biotic factor in oakwood was observed in the 300 acre Croneybyrne oakwood, also near Rathdrum. It was noticed that in the heart of this wood hollies and other shrubs were very rare while near its boundaries hollies were quite frequent and sometimes (as where it bounded a public road) formed continuous canopy. This was related to the habits of the fallow deer with which, up to about 5 years ago, this wood was infested. They kept mainly to the heart of the wood and avoided the edges—except when engaged on a raid on adjoining farm crops. The old hollies have been grazed bare of branches to a height of 5 feet and the stems in cross-section show signs of repeated barking throughout life. Now that the deer are reduced to a mere half-dozen or so, young hollies are pushing up through the fraughan in large quantities and promise, if undisturbed, to close canopy in many parts in another 10-15 years. Invasion of hollies is slower where the soil is covered by woodrush, but indications are that hollies will at least be numerous over the woodrush which would then be broken up and not present the dense uninterrupted cover it now forms.

The elimination of a species of shrub from the wood may not appear, at first sight, to be serious in itself; yet the consequences may be far-reaching and may involve the capacity of the wood to regenerate itself naturally. Foresters are familiar with woodrush in particular as an enemy of all regeneration. It prevents seed reaching the soil, exposes it to risk of dessication, and smothers seedlings by its dense cover. In addition it forms a raw humus which induces leaching and podsolisation of the soil. It is my belief that owing to the disturbance of biotic factors this species has attained an unnatural dominance in the ground or field layer of our acidic oakwoods—a dominance which is bad for both soil and regeneration. The holly in fact is probably an essential constituent of this type of

oakwood both for the maintainance of soil fertility and for the mechanism of natural regeneration.

To continue our study of the biotic factor: on the Slieve-na-Muck range, foothills of the Galtees the effect of moorburning on an adjoining oakwood was studied. A mountain heath was regularly burned there and the fire swept up to the edge of an oakwood, penetrating some distance in under the canopy. The woodrush groundfloor did not carry fire well, however, and the fire soon petered out. However, the thin-barked hollies were easily killed, regeneration destroyed and the canopy opened so that with increased light, heathers (Calluna and Erica cinerea) formed part of the ground vegetation. This carried succeeding fires farther into the wood and the process is progressive, the woodland edge retreating gradually.

The enclosure of woods, too, often results in the elimination of pioneer and minor species of trees and shrubs. When an enclosed oakwood, surrounded by cultivated land, is in the mature stage such species as aspen may be completely killed out. Aspen has not the height growth to compete with the oak and has not the shade bearing capacity to survive beneath the canopy.

CLIMATE.

As Counties Kerry and W. Cork have an unusually mild climate, some discussion of local climate and its effect on woodland vegetation is, I suppose, topical. All botanists have been struck by the remarkable luxuriance of evergreens and Mediteranean species in the South-west. Rainfall averages 97 inches on Mangerton, 87 inches at Gearhameen near the south end of the Upper Lake—a lowland situation. This compares with 29 inches in Dublin, and an average of 40 inches for the whole of Ireland. Extremely low temperatures are rare and snow seldom remains long on the ground. Arbutus, a Mediterranean species, attains greater height (35 feet) here than in its southern home. It is confined to the South-west except for one station near sea level at Lough Gill in Sligo; it reaches over 500 feet above sea level in Kerry. The evergreen yew is more abundant than elsewhere—it is extremely rare in natural situations in the East but is found most of all in Kerry—but also in the Woodford woods and in limestone scrub, ash-oak and oakwoods of the west. Holly is very luxuriant here and often forms continuous understorey and even forms pure woods. Rhododendron ponticium and laurels generally run wild in the woods. Calluna and Vaccinium exceed in size anything in the British Isles (5 feet), and mosses, and ferns are very luxuriant and epiphytes are very numerous. The Killarney type of oakwood has been compared to the evergreen important forest of Corsica and Teneriffe—in fact the oak is the only deciduous species.

SOILS.

Now that we have spent some time examining the effects of biotic and local climatic factors on woodland, due importance must be attached to the effect of the soil which more than any other factor within a particular climatic region, decides the course of the sere and the nature of the climax which eventually develops. In fact the

classification of our natural climax types is based almost entirely on soil. These climax types in Ireland are as follows:—

A. Oakwoods of acidic soils—on O.R.S., Metamorphic, Cambrian, Silurian and granitic rocks. Sessile oak is always dominant. There are three main sub-divisions:—
   (i) Vaccinium Type.
   (ii) Luzula type.
   (iii) Fern type.

B. Woods of Calcareous Soils, e.g., limestone and basalt—these soils account for two-thirds of the country, but owing to their greater agricultural value and low-lying position clearance has been almost complete and few natural woods exist to-day on them. There are again three sub-divisions:—
   (i) Oak-Ashwood of deep soils.
   (ii) Ashwood of shallower soils.
   (iii) Hazel scrub of the bare limestone pavements.

In addition there are two more or less permanent types dependent on high water-table in the soil. (*a*) Alderwood—with or without ash; (*b*) Birchwood. Taking these types in turn:—

A (i) *Vaccinium Type:* This is found on the driest poorer sites with shallow soil over rock or on glacial gravels along river valleys. There is usually a slight surface layer of raw humus (Ao layer in profile); the soil is a podsol without "hardpan" or a podsolised "brown earth." P.H. is around 4·0 at the mineral surface and the B horizon usually shows an ochreous colour. Sessile Oak is dominant, usually with crooked stems—except in very sheltered hollows. Diameter growth is slow and epicormic branches frequent. Height growth is poor, seldom exceeding 55 feet even in close grown sheltered woods. Birch, usually Betula pubescens, is occasional in the canopy but where oak stems are closely spaced it becomes less and less frequent as the wood grows older. Rowan is occasional and holly is the typical species of the shrub layer beneath the canopy. Vaccinium is the typical under-shrub, 16-30 inches high with an extreme height of 5 feet. Bracken, Luzula, oxalis, Aira flexuosa. Wood sage, Hard fern are usually present in the field layer.

Under extreme conditions of exposure or on very shallow soil, the type degenerates into scrub and the canopy may be only 10-20 feet high formed of oak (with multiple stems), birch, rowan and holly. There is then no separate shrub layer. The floor is well lighted and Calluna, Erica cinerea, Ulex species and Cytisus scoparius may maintain themselves—also hummocks of a whitish "cushion" moss, Leucobryum glaucum.

A(ii) *Luzula type:* This is intermediate in fertility and moisture content between the fern and Vacc. types. Owing to the wide range of tolerance of Luzula in our humid climate it is extremely widespread on acid soils. The soil is usually a brown earth with slight surface raw humus due to decomposition of Luzula which roots only in the surface soil. A bleached layer 1-2 inches deep is often found at the mineral surface due to leaching. P.H. at mineral surface varies from 4·0 to 5·0 with less acid reactions in the B. and C horizons.

Oak reaches heights of 50-70 feet on the average and although diameter growth is still slow good straight stems are frequent in

close woods. Birch is the principal seral tree—as in Vaccinium type—but is gradually suppressed by oak. Rowan, holly and hazel form the shrub layer, hazel becoming important on the richer types. Where the shrub layer is thin Luzula forms the dense mat already referred to with very few other species present in the field layer. Of these bracken and vaccinium are the most constant associates. Hard Fern is frequent in moister acid parts but the presence of Male fern, Broad buckler, etc., in any abundance denote an approach to the more fertile " fern " type.

A (iii) *Fern types :* On the valley floor sand over basic igneous intrusions—as seen at the Aughrim excursion in 1945—more fertile soils occur and the woods are distinguished by the appearance of ash, wych elm and gean (cherry) in the canopy; by a shrub layer dominated by hazel with euonymus, elder and holly sometimes present; and a field layer in which ferns are abundant (Male, Broad buckler, etc.) Vaccinium, Luzula are scarce or absent and no raw humus is present. Horizons are less easily distinguished in the more uniform soil profile and surface P.H. values vary usually between 5-6·5. The less acid values are associated with the presence of calcicole (lime-loving) species, e.g., Polystichum angulare (Prickly Shield), Hartstongue (Phyllitis), Melica uniflora, Brachyopodium, Allium ursinum (Garlic). Other common field layer species are Scilla (bluebell), Circaea lutetiana, Nepeta, Sanicula, Lysimachia nemorum, Ajuga, Arum maculatum, Asperula odorata (woodruff). The oak is the dominant tree and may reach in exceptional cases (as at Curraghmore) 95 feet–it is usually from 70 feet up at maturity. Ash is particularly prominent in seral stages, birch less so. This site is capable of producing excellent oak on reasonable rotations and economically.

Birch-wood : Climax birchwood above the altitudinal limit of the oak does not now occur here. Pure birchwood of climax type now occurs only on acid peats with a high water-table. These are usually restricted in area and the type often occurs within the boundaries of oakwoods as a society. In the strictest sense it is not " climax " since it is to be presumed that the peat would gradually dry out and a drier type of woodland supplant the birch type.

Molinia in tussocks is the usual field dominant. There is no shrub layer. The birches seldom exceed 40 feet in height, have crooked stems and are shortlived. Even where Betula verrucosa is present on drier ground in the surrounding locality only Betula pubescens seems to occur in the wet Molinia ground. It appears to be a more suitable tree for these conditions although Betula verrucosa is capable of greater height growth and has a better stem-form on dry ground. This point may have an importance for foresters.

Species usually associated with the Molinia are Sphagnum and Polytrichum mosses, Ranunculus flammula, sedges, Juncus articulatus, Viola palustris, Galium palustre, Blechnum, Athyrium felix-fœmina, Erica tetralix with Scutellaria minor and Cephalanthera ensifolia as rare species.

Oak seedlings, 1 and 2 years, have been found and the sphagnum bed seem to provide excellent conditions for acorn germination. In the first year the tap root develops normally but in the second,

apparently owing to lack of aeration in the depth of the cushion, it dies back and adventitious roots are developed at the root collar. The oak fails to survive on the site after exhausting the food supply of its fleshy cotyledons.

Alderwoods: These occur on similarly waterlogged soils but the soil, whether mineral or peat, is distinctly less acid—indeed often alkaline—and richer in bases. In birchwoods alder occurs only along streams and drains where aeration and fertility are better and does not thrive on acid peat. Foresters in planting seem often to underestimate its soil requirements—it is quite exacting. Alder is rarely dominant over Molinia, but is usually associated with a field layer in which Juncus communis is abundant. Other species frequent are Angelica sylvestris, Spiræa ulmaria (Meadowsweet) Mentha aquatica, Lythrum salicaria (Purple loosetrife), Lychnis dioica (Red Campion), Sium angustifolium (Water parsnip), Pulicaria dysenterica, Athyrium felix-fœmina, Lastrea thelypteris and L. oreopteris. Sally, (S. cinerea) and Guelder (Viburnum aquilis) shrubs often occur. Ash is frequently a constituent.

Calcareous Woodland Types.

B(i) *Ash-Oakwood:* Deep calcareous soils are the typical sites for the type—rendzinas with Silica-sesquioxide ratios of 4 upwards—usually where calcareous drift covers limestone. The colour may be black; sometimes grey-brown—never the ochreous colour of the brown earths. Examples of this woodland type are found at Abbeyleix, Clonbrock, the deeper soils at Garryland, Borris and Oakpark in Co. Carlow and woods on the Nore near Thomastown. Seral ashwoods also occur on this type. It is confined to demesnes where it is protected from grazing. The high agricultural value led to early clearance of most of this type of land. Oak and ash are co-dominant, 70-90 feet usually; ash is often more frequent in the canopy than oak and its regeneration is extremely vigorous. Wych elm is a constant though never very frequent species and regenerates adequately. Gean is also occasional. Both birches may occur and also hybrids—though these are usually ousted in the later stages by ash. A seral ash-birch stage sometimes occurs.

Euonymus is the most characteristic shrub; hazel the most abundant and vigorous; elder is occasional, privet locally frequent, although not regarded as native. Rowan, Cornus sanguinea, Rhamnus catharthicus, Prunus padus, Yew (in west) occur also. Ferns are abundant in a matrix of calcicolous herbs similar to those mentioned for the "fern" type in acidic woodland—Allium, Vicia cracca, Melica, Hartstongue, etc.; also Listera ovata, Ivy, Garlic mustard, Ophioglossum vulgatum (Adderstongue).

B (ii) *Ashwood.* These exist on the shallow rendzinas of the drift-free areas. The soil is usually derived directly from the limestone underneath; drainage is better than in the previous type—there is a tendency to drought and surface acidification. Juniper is common on grassland on this soil type. Ash, 25-50 feet high, regenerates abundantly. Oak is never more than frequent, usually Quercus pedunculata of limited height growth. Its presence may

be associated with soil acidification when Scilla, oxalis and even Luzula may appear. These species in woodland correspond to Calluna which often appears on the sheep-grazed light limestone pastures.

Both birches may be present especially in exposed woods. Elm, rowan and gean may occur. Yew, aspen and whitebeam increase in frequency especially on the shallower soil. Shrubs present are similar to the previous type but more vigorous owing to the lighter canopy. In the field layer some of the more distinctly calcicolous species occur such as Geranium lucidum, G. sanguineum, Gentiana verna, Briza media, Thymus serpyllum, Rubia peregrina, Sesleria cœrulea—as well as the usual species of ash-oakwood.

B (iii) *Hazel scrub.* This is typical of the " pavements "—limestone without mineral soil as in North Clare. The distinguishing feature is the inability of tree species to dominate the shrub species, i.e., reduce them to the status of an understorey. Ash, rowan, birch, hazel, euonymus, Cratægus, whitethorn, yew, Rhamnus catharticus, Juniper, Ulex europæus, Aspen, privet, holly may all be present. The height is seldom over 15 feet, usually much less, due to exposure and drought. It should not be confused with the seral hazel scrub of shallow soils which is capable of developing into Ashwood.

I hope, in this paper, I have done something towards elucidating the relationship of geology to soil and natural vegetation and that, in doing so, I have given you a somewhat clearer picture of what the vegetation of our lowlands would be under natural conditions. An understanding of these relationships and of the artificial origin of many of the communities with which he has from time to time to deal is, I believe, a most useful knowledge for the forester.

OBSERVATIONS ON DAMAGE BY HARES AT CLONEGAL FOREST.

In view of the statements occasionally met with in forestry literature that Corsican Pine is less liable to damage by hares than other pines, the following observations may be of interest.

Over several acres at Drumderry property of Clonegal State Forest, where the species are Corsican and Scots Pine, planted in a 50 % mixture with a few belts of pure Contorta Pine, there is, what I consider, unusual damage caused by hares. The area was planted in 1944, and height growth is from 2½′ to 5′.

The hares have almost ignored both the Scots and Contorta Pines—even when alternate in the lines with Corsican—and have nipped the needles from the main stem and side branches of a large number of Corsican Pine. Apparently, this species has, by instinct, been chosen for destruction, and I can only conclude that their needles are more palatable to hares than those of the other pines mentioned.

At a first glance the damage resembles that caused by pine saw-fly.

D. ALLMAN.

NOTES ON THE DISPOSAL OF WEEDS IN THE FOREST NURSERY

By J. J. Deasy.

Weeding in the forest nursery is an expensive operation and is a considerable part of the cost of production of plants. Unlike agricultural crops young trees have little effect in suppressing weed growth, and, moreover, the system of spacing considered best for plants in beds and lines does not lend itself to the employment of horse labour for hoeing. Consequently, for seven months of the year (April to October inclusive) the weeders are engaged in a tooth and nail struggle with those " plants out of place."

Certain factors influence weed growth, e.g., climate, type of soil and control measures employed. In this note I propose to discuss one aspect of the last mentioned, i.e., the disposal of weeds when collected so that their propagation can best be prevented.

It is a fact that although the foresters concerned aim at preventing weeds growing to any size, it is often found in dealing with large nursery areas that weeds get out of hand despite the best efforts of the staff. This occurs during summers with a high rainfall, particularly on heavy soils. In showery weather the weeds torn up by the hoe or pulled by hand often start growing again, and if not immediately removed will form flowers and seeds prematurely.

The regular way of disposing of weeds when collected is to convert them into compost. By composting, a supply of humus is made available, and in the ideal compost heap a temperature is reached which destroys all seeds. Various methods are employed notably the " Indore " method. For the successful employment of any method it is necessary to have at hand a large quantity of suitable organic refuse so that the building of the heap may be completed in one day. A supply of farmyard manure or liquid manure is also necessary to assist activity of certain necessary organisms.

In the forest nursery, however, the building of the compost heap is a protracted business and, by the addition of small quantities at intervals, may continue over a period of several months. It has always been difficult to purchase farmyard or liquid manure, and most foresters found them impossible to procure since the advent of compulsory tillage. Consequently, the conditions in the nursery compost heaps are not all that could be desired for the destruction of weed seeds. There is also the point that there are perennial weeds which propagate themselves vegetatively as well as by seed: e.g., Scutch Grass and Dock. No forester would deliberately include these in a compost heap but if they occur in small quantities they may be included through an oversight.

The shortcomings of composting in the forest nursery were recently brought home to me in a nursery where the making of compost has been practised over a number of years. It happened that as a result of the employment at lining out operations of more

than one group of men in a nursery break, furrows were formed where the end of the piece of ground worked by one group joined with that worked by the next. The furrows were filled with well rotted compost. All during the growing season the furrows thus filled had to get special attention from the weeders. There was a thick crop of rank weeds which had to be pulled frequently or dug over, while the weed growth on the adjoining ground was comparatively light. It was clear that the composting of weeds as practised in the nursery was not satisfactory as regards killing their seeds. The alternative was to burn them.

The burning of fresh green weeds in an open fire is not an easy matter, so kilns were erected at central points in the nursery, which made possible the burning of weeds with comparative ease. Two kilns serve an area of twenty acres.

The construction of these was carried out by the regular nursery staff, each kiln costing three man-days. The materials used for each were approximately 120 second-hand bricks, 1 cwt. cement, 4 cwt. sand and a few worn-out iron fence stakes. The base of each kiln, which is in the form of a square, is 2′ 3″ x 2′ 3″ inside measurements, and the walls, which rise to a height of 4′ 6″, are one brick in thickness. They are perpendicular for the height of four bricks and are then drawn in, the two rows of bricks on top being again laid plumb. The opening at the top is 1′ 6″ x 1′ 6″. There is an air inlet 9″ x 9″ at the base of each wall; these also serve for the removal of ash. Lengths of 1″ angle iron, or iron fence stakes 2′ 3″ long, are laid in a horizontal position 2″ apart, the ends being embedded in concrete hobs which are 10″ high and 2″ thick. At each air inlet an iron plate is laid across to serve instead of the hob. The stakes act as a support for the fire while allowing of a free supply of air.

The fire is started by burning some inflammable material such as furze or dry withered grass until a supply of red ash is produced. The weeds are then shaken out and fed from the top until the kiln is full. The material can be left to burn until the mass of weeds sinks to the bottom. Generally the kilns can be filled three times a day; morning, noon, and evening or more often if necessary. The air inlets opposite the side from which the wind is blowing are closed; this increases the draught. If weeds, through lack of attention before being brought to the kiln, have turned into a soggy mass, it will be difficult to burn them. In such cases it was found that a mixture of furze or other inflammable material helped considerably, and it is also better in such cases if the material is fed in small quantities. Weeds which burst into flames while burning are mixed with material that will slow up combustion and produce a smouldering mass. In this way a greater quantity of ash is produced.

The ash is very valuable as a manure and can be applied to the soil when green cropping at the rate of about ½ ton per statute acre, or hoed in between lines of plants in Spring at the same rate. If it has to be stored it should be protected from the weather as rain washes out the potash which is soluble. Potash is the only important mineral it contains.

The burning of weeds means that a supply of humus is cut off, but this can be made up by green manuring now that artificials are again available. Apart from the value of the ash produced, I have no doubt that the over-all saving in costs of weed control will more than offset any losses occasioned by the cutting off of supplies of humus.

Abstract

Storage of Wood Fuel. From *Meddelelser fra det Norske Skogforsonsvesen*, No. 30.

Experiments were recently carried out in Norway in order to compare the drying processes of fuel stored under different conditions, e.g., (1) stored in the open, (2) stored in the open but covered only with a paper-like substance, pargaloid, especially made for covering fuel wood and other substances, (3) stored in a shelter. The material used was good quality Spruce and Birch split logs felled in March and July of the same year.

All portions of fuel included in the experiments were stored on proper underlayers on dry ground with a distance of about two feet between the piles. The outcome of the main investigations were as follows: During the Winter months the uncovered fuel kept throughout a little more moisture than the others, though the difference was found to be only 3-4 %. The difference in moisture content between the wood stored in the shelter and that covered with pargaloid was found to be very small, and during the Winter months there was practically no difference in moisture content between the fuel covered with paper and the fuel stored in the shelter. It was proved also that fuel cut in July or later which is properly stored on dry ground with sufficient distance between the piles has nothing to gain by being stored under a roof or covered with pargaloid. Therefore it can be assumed that when the fuel is green, the humidity of the air is greater in the shelter than outdoors where the humidity of the air, surrounding the green wood, is carried away more rapidly.

With dry wood stored in the open, the increase in moisture content was found to be surprisingly low as compared with the amount of rainfall for the period. It seems, therefore, that wood when properly stored in the open can stand a considerable amount of rainfall once it has been properly dried. Further, when properly stored on dry ground and given good air circulation it quickly loses any moisture it may acquire in wet weather. However, if it is preferred to cover dry fuel in order to prevent the slight increase of the moisture content that may occur during the late Autumn, nothing is gained by doing so before the end of September or early October.

T. Donovan.

Reviews

Forestry Commission Bulletin, No. 18 (Second Edition). Spring Frosts. London: H.M.S.O. 2/6.

With the widespread havoc wrought in young forest plantations by the frosts of May, 1945, still vivid in the memory of every Irish forester, any work on the subject of Spring Frost is sure to be of interest to the tree planter. The second edition of Bulletin No. 18 has just come to hand and gives one an opportunity of bringing this very valuable publication to the notice of members at an opportune moment.

A similar frost to that of last year occurred in mid-May, 1935. It caused such alarm in Britain that it was decided to study the whole subject in detail. Mr. W. R. Day, B.Sc., M.A., and Mr. T. R. Peace had the task of compiling the information. The Bulletin gives meteorological data from many localities in Great Britain and records of minimum temperatures over the years. From these it appears that May frosts are commonplace in these islands, that they are mainly confined to the first two-thirds of the month and that an appreciable number of them is markedly severe. There are, in fact, places which are specially subject to frosts of sufficient severity to injure all but the hardiest plants. Further it is pointed out that unless trees are always hardy it is an advantage if they come into leaf and flower after the period of spring frost is over. " Our native trees do, in fact, tend to fall into two categories, those not usually injured by frost, even though they leaf and flower early, and those which are usually injured if severe frost comes after their buds are burst. In the first category fall such trees as sallow, common alder, elms, birch and Scots pine; in the second one fall oak, beech and ash."

The several aspects of frost damage and frost occurrence are explained in this Bulletin. Foresters have noted with surprise how ineffectual was the cover of " nurse " trees in the 1945 frost. It appears that there are two types of frosts, advective and radiation frosts. Advective frosts are caused by freezingly cold air coming from regions where winter still prevails. Such frosts cause widespread damage and even plants grown under shelterwood may be burned. The second and more common type of frost, radiation frost, is caused by loss of heat by radiation to the upper air. Such frosts occur on clear, starry, windless nights.

The following conditions are said to accentuate the severity of a radiation frost:

(*a*) Cold, cloudy weather by day followed by clear, cloudless nights,

(*b*) Wet, waterlogged grass covered surfaces which tend to be naturally cold owing to loss of heat by evaporation and transpiration and

(*c*) Flats and hollows which allow cold air to pool.

Records of remarkable differences in temperature at ground level compared with those at different heights show that there is a

sharp rise in temperature even 6″ above grass top level. The depth of freezing air is usually quite shallow, often not more than two or three feet and seldom exceeding 10 feet, hence serious damage is generally confined to young trees in the pre-thicket stage.

Shelter belts or walls if they lie across the hill, will cause cold air moving downhill to pool. Every obstruction crossing a slope acts in this way. It is important, therefore, to remember that if hedges or belts of trees are left for shelter they should run up and down the slope and not across it.

It would be important to be able to recognise frosty sites in advance of planting. The Bulletin is of considerable value to planters in this respect. The severity of the frost in any particular place is very largely determined by the physical aspect of the countryside. Examples of typical frosty sites are given. The plain and the plateau (or elevated plain) provide situations in which severe frost is liable to occur owing to the inability of the cold air, which forms over the surface of the earth on calm nights, to flow away. " This layer of cold air is not usually very deep, but it is usually sufficient to cover the smaller trees." (It is well known that Sitka and Norway spruce are very difficult to raise in the Irish midlands, particularly the former. The moist " bottoms " are notable frost hollows and experiences at Emo, Garryhinch, Durrow and other midland centres have made foresters spruce-shy).

The broad valley is a similar topographical type and, indeed, a broad flat valley bottom is a plain, though sometimes of rather limited extent. It is, however, a plain on to which cold air may drain from the surrounding hills. (In central Wicklow, low ground, even low hills, surrounded by higher mountains are notably subject to frost, while sites in east Wicklow facing the sea are relatively frost-free. Ballyward property near Blessington is a good example of a frosty hill. It is surrounded on all sides by much higher land, and the whole area is liable to lie below the frost level).

The degree to which cold air fills up a valley depends chiefly on the width, straightness and steepness of the valley. It is also much influenced by the sort of place on to which the valley debouches. Thus a wide straight, steep mountain valley which opens into the sea, or a wide plain, is much less likely to suffer from frost than one which is narrower, more crooked, flat bottomed and opens into another narrow valley. (The Glens of the Slieve Blooms debouching on the central plain are notably frost free, as are also the east Wicklow Glens which face the sea. In the central Wicklow glens the frost risk is high. Glenmalure has a noted frost flat, as has the Liffey valley all the way to Poulaphuca and beyond).

" The height to which trees are liable to be injured depends on the height to which cold air is able to accumulate at night. Thus on a wide plain it will be comparatively shallow, while in a deep narrow valley it may rise much higher than the tallest tree." Where the cold air is shallow it is often possible to create a favourable climate for the growth of small trees by regeneration under shelter, whereas when the cold air is very deep, as in a narrow valley, this becomes

difficult or impossible. (It is probable that frost tender species such as spruces and hardwoods might be successfully raised on the frosty midland flats and cut away bog under a shelter wood of S. pine, Japanese larch, birch, alder or white poplar).

The injury caused by frost on trees and shrubs is considered under four headings according to the parts damaged, namely leaves, young shoots, buds and old wood. Another interesting phenomenon—that of a tree flushing normally and dying later in the season for some unknown reason is explained. While trees are usually frosted from the top backwards and while buds, leaves, young shoots or recently formed shoots are more liable to damage, very low temperatures often occur at grass-top level sufficient to kill the cambial layer at this point while not affecting the top of the young tree. The tree has reserves sufficient for the flushing of leaves and shoots but later dies, as surely as if it were ring barked and for no apparent visible reason.

Trees frosted in one year usually recover extremely well, trees frosted repeatedly become progressively enfeebled and eventually die.

With regard to damage in conifers, leaders are less susceptible to damage than side shoots and when leaders escape the damage is not reckoned as serious. If the leader is injured the shape of the tree is bound to be affected even though only one shoot is allowed to get away. With certain hardwoods, oak, beech, etc., damage to leading shoots is not considered serious as there is often no definite leading bud or shoot. Ash on the other hand can be seriously affected by the loss of the terminal bud or shoot.

Particulars, obtained from reports after the 1935 frost, of the susceptibility to damage of a great range of trees and shrubs planted commercially or for ornament are given. Among forest trees Sitka spruce suffered worst. Further Sitka spruce is remarkably even in its time of flushing, so that in any given place most of the trees flush within a comparatively limited period. There is, therefore, no chance with this species, as there is with Norway spruce, of selecting a late flushing race for use in frosty localities.

Norway spruce differs from Sitka spruce in possessing well defined early and late flushing races. Usually in any normal lot of plants these occur mixed, with a tendency for the early flushing to outnumber the late flushing trees. The early flushing trees are quite as susceptible to frost as Sitka spruce, but the late ones are more resistant. In really frosty places the early flushing plants tend to get killed out, and a pure stand of the late flushing race remains. (A remarkable case of this natural selection of an ecotype can be seen here at Durrow in a bog at Castle Durrow, where scattered, late flushing Norway spruce are flourishing amid the general ruin, and promise eventually to form a crop).

Scots pine appears to be the best frost resistant species among the commonly planted forest trees followed closely by Contorta. The conifers are ranked in the order of susceptibility to frost damage as follows: Abies grandis, Sitka spruce, Norway spruce, Douglas fir, Japanese larch, common larch, Contorta pine, Corsican and Scots

pine. It is interesting to learn that Picea omorika is frost hardy and would seem to have possibilities as a forest tree for frosty localities.

Among hardwoods commonly planted, walnut, ash, Spanish chestnut, oak and beech are recorded as frost tender, poplars, lime, birch and elm are listed as hardy.

The controversial question of the value of shelter against frost is fully discussed. It appears that low shrubs or scattered small trees or belts of low coppice giving low side shelter are pretty well useless in staving off frost damage. The taller the shelter trees and the more complete the canopy the more effective the protection. Of course the shade required for full protection may be too heavy for satisfactory growth of the young plants. It seems that while too much must not be expected of overhead cover, it is plain that it can be of great silvicultural value in creating a micro-climate specially suited to the growth of small, tender trees. The value of shelter should not be judged on the effects during an abnormal frost but rather at a time when a degree or two makes all the difference.

T. C.

Forestry Practice. Bulletin No. 14, Forestry Commission. London: His Majesty's Stationery Office. Price 2/-.

This is a partially revised edition of the bulletin issued originally in 1933. It is remarkably good value for the money as it covers the entire gamut of forestry or rather re-afforestation as practised by the State Forest Service in Great Britain and in addition carries chapters covering wood preservation, marketing, working plans and the newly adopted scheme whereby estate owners may dedicate their woodlands to the State.

The practices recommended are those which have been used by the Forestry Commission since they started work in 1920. Many are based on well tried methods long known to commercial nurserymen and estate foresters throughout England and Scotland; others have been evolved by the Commission's own officers in the course of their duties. They are practices suited in the main to large scale application and the bulletin appears to have been compiled more for the benefit of the owner wishing to afforest an extensive tract of bare land than for the small proprietor anxious to rehabilitate the woods of an ordinary private estate. The style of the compilation is chatty, one might say almost slangy, but in spite of this it is not always easy to understand and the absence of photographs and diagrams is bound to render the description of some operations quite incomprehensible to the novice.

The raising of planting stock from seed and the general management of a nursery is covered by three chapters. Methods of soil preparation, the sowing of seed and the lining out of seedlings are described and convenient tables show the quantity of seed to be purchased for each acre of plantation, the number of plants required at different densities and other useful data. A method found successful in Ireland for the protection of autumn sown Beech, Oak

and other succulent seeds against mice and rats receives no mention. This method entails the piling of soil to a depth of six inches or so over the newly sown seed. The heavy cover prevents the attacks of rodents during the winter and the surplus is carefully scraped off before the seed begins growth in spring.

Chapters IV to VI deal with the establishment of plantations. The preparation of the ground, drainage, fencing and the selection of species are described. The latter difficult task has been reduced to the compass of a brief table. This is surely an over-simplification. The selection of the correct species of tree for ground which has not previously borne trees is a complex and hazardous undertaking. Factors of geology, geography, meteorology and economics must receive detailed examination and a decision based on skimpy indications such as are given in this bulletin may lead to tragic results. Not many foresters will agree that Sitka spruce " thrives on most kinds of peat " and that Scots pine is apparently suitable for exposed sites except where the ground is soft. It is surprising that no differentiation is made between Sequoia and Wellingtonia in their ability to withstand constant wind as it is well known that the latter will thrive exceedingly in places too bleak for Sequoia.

A number of different methods of planting are described; ordinary pit planting with garden or nursery spades, pit planting with semi-circular spades " like over-grown trowels " and notch planting with common or special Schlich pattern spades are all treated. In these days of expensive plants and transport it would seem that over-emphasis is laid on rapidity of work. Cheap planting all too often leads to costly replacements and, more especially for the private owner, can be false economy.

The section on thinning has been completely re-written. It codifies the " low thinning " practices of the Commission in their treatment of experimental stands and makes recommendations for the thinning of plantations of all the common conifers and hardwoods and of mixtures. These recommendations are based on the well known theoretical divisions of the tree stems into canopy classes called dominant, co-dominant, sub-dominant and so on, a division excellent in theory but, alas, full of pitfalls when it is sought to apply it to the average wood which refuses to conform to any rigid classification. The concentration on the method of " low thinning " to the exclusion of all other methods is not likely to suit all cases or all purses. For some markets the removal of many of the largest trees may be economically justified and not sylviculturally unsound and on many private estates the revenue from early thinnings is of paramount importance and its loss may jeopardize a whole forestry scheme. There is one diagram in this section, the only one in the whole bulletin.

Chapter VII contains useful information on the prevention of forest fires, on insect and fungoid pests and their control and on forest tools and appliances. A list of firms manufacturing and supplying equipment is given and this should prove of value to owners starting forestry work.

Chapter VIII deals with utilization. It treats of the classes of merchantable timber and minor produce and explains the methods

of selling which may be adopted and the organization of sales. The subject is regarded solely from the point of view of the producer and the timber merchant is painted as a tricky gentleman who needs careful watching, a sentiment natural enough in its way but extremely rare in government publications. A section on wood preservation points out a simple way of turning less valuable material into saleable produce.

The final chapter is devoted to questions of working plans, account keeping for income tax purposes, the law relating to death duties on woodlands and the scheme of dedication adopted in the 1945 Act. This last has no counterpart in Ireland. When woods are dedicated the owner undertakes to work them in accordance with a plan approved by the Commissioners. The Commission for its part agrees to furnish financial assistance by way of grants and loans for forestry purposes on private lands and presumably to give all necessary technical advice on the establishment and management of dedicated plantations.

Considering that the bulletin is written for private owners, agents and foresters it is strange that the peculiar needs and problems as well as the advantages of tree growing on the ordinary estate receive scant mention. Most private owners wish to stock ground already partly covered with trees. Questions of amenity and shelter and in many cases game preservation are uppermost in their minds and they will be loth to order clear felling or to adopt the barbaric custom of " ringing " recommended in this bulletin. The wisdom of the complete clearance of all woody growth before planting on the score of convenience is controversial and the recommendation to cut down everything on the ground in the way of stool shoots seems to ignore the beneficent influence of shelter from winds and hot sun and the value of leaf fall to soil fertility as well as the advantage of grass suppression. An enthusiastic man may wish to train some of the advance growth by careful pruning and there can be no doubt that with judicious selection of stems and continued treatment excellent results are possible. So, too, with systems of natural regeneration. Many of the recognised methods such as the selection, the uniform and the group systems are well suited to demesne conditions and their adoption would give an interest to a private owner and yield better results than any artificial restocking would ever do.

H. M. F.

Bulletins

Forestry Commission Bulletin No. 8. British Bark-beetles. H.M.S.O., 3/6.

This is a reprint without revision of the original, issued in 1926.

Forestry Commission Bulletin No. 17. The Cultivation of the Cricket Bat Willow. H.M.S.O., 2/-.

This also is a reprint without revision of the 1936 issue. It deals fully with the conditions necessary for the Cultivation of the Cricket Bat Willow, its propagation, planting, tending, disease and insect pests, and uses of the timber.

The remark of the Chairman of the Commission in the Preface that " the claims of poplars as quick-growing trees for planting under much the same conditions as those suitable for willow are worth consideration " seems to apply to Irish conditions.

Forestry Commission Leaflets Received.

LEAFLET No. 2. Adelges Cooleyi. Revised, December, 1945.
LEAFLET No. 5. Conifer Heart Rot (Fomes annosus). Revised, January, 1946.
LEAFLET No. 6. Honey Fungus (Armillarea mellea). Revised, January, 1946.
LEAFLET No. 17. Chafer Beetles. Revised, January, 1946.
LEAFLET No. 25. Replanting of Felled Coniferous Woodland in Relation to Insect Pests. Issued December, 1945.

Leaflets Number 2, 5, 6 and 17 have been extensively revised and brought up-to-date in the light of more recent experience. In the leaflets dealing with fungi the inclusion of additional material under the heading " Conditions determining infection " is welcome and the treatment under " Control Measures " is more realistic. Photographic illustrations are larger and clearer than in previous issues.

Leaflet No. 25 deals with the dangers of insect damage in replanting recently felled or burned areas and is a new issue. Advice is given on the period which should elapse before planting can safely be undertaken and methods of trapping for weevils and bark beetles are laid down.

A New Abstract Series

FOREST PRODUCTS AND UTILIZATION.

The Imperial Forestry Bureau, Oxford, is publishing a new abstract series on the utilization of wood and other forest products. In the past, *Forestry Abstracts*, the Bureau's quarterly review, has covered the utilization of wood as well as forest policy, silviculture, management, protection and allied sciences. In future, Section 3 (Utilization) of *Forestry Abstracts* will appear as an extra series under the sub-title, *Forest Products and Utilization*. It will provide abstracts of current literature on the properties of wood, harvesting and logging, wood working and products of mechanical conversion, seasoning and drying, chemical utilization, minor forest products and timber constructional works; and also occasional reviews of progress in selected fields of applied research.

The annual subscription to Section 3 *Forest Products and Utilisation* is 10*s.* 0*d.*; single parts 3*s.* 0*d.*

Report of the third Annual Excursion

By Niall Ó Muirgeasa

The third annual excursion of the Society of Irish Foresters was to Killarney. It was held on 4th, 5th and 6th June, 1946. The following members attended:—Messrs. H. M. FitzPatrick (*President*), M. L. Anderson (*Convener*), T. Clear (*Secretary*), M. Bogue, L. F. Branigan, Mrs. C. Doherty, Miss N. Brunner, Miss S. Cahill, Messrs. J. Canning, W. Chisholm, L. Condon, M. Connolly, R. Crerand, J. J. Deasy, V. Deeney, J. Galvin, Captain J. Hamilton, J. P. Harte, H. R. Langley, T. McCarthy (Mallow), T. McCarthy (Athy), T. McEvoy, D. McGuire, M. MacNamara, J. J. Maher, D. P. Mangan, N. Ó Muirgeasa, D. O hAragain, P. Ryan, Capt. R. C. F. Ryan, P. J. Sheils, M. O Beirne, J. Saunders, W. F. Cusack, J. Doyle (Forester in Charge, Killarney Forest), G. McCool (District Inspector), S. M. O Sullivan (Inspector). M. Swords (Inspector) represented the Forestry Division.

Tuesday, June 4th.

On this first day the weather was not too kind. Mist wreaths hung suspended over the hills for most of the day and there were frequent showers of drizzle. The majority of the party was prepared for such an eventuality and so lost but little of the enjoyment and interest which the day's programme provided.

The excursion party assembled at the entrance to the Department's nursery where they were addressed by the President, Mr. FitzPatrick. He said it was very cheering to the Council to see such a good turn out of members on this, their third annual excursion. As on previous occasions they were indebted to the Minister for Lands for the permission to visit the State Forest and they all looked forward to a most interesting tour through the nursery, plantations and woods of Killarney Forest and to hearing instructive details of management from the forester in charge and the inspectors who were accompanying the party.

Mr. FitzPatrick contrasted Killarney with the State properties seen on the occasions of the first two excursions. At Clonmel they had inspected a forest of scattered woods acquired from many proprietors and strung together for the purpose of management. Aughrim Forest, the venue of the second excursion, was built up laboriously over the years by the purchase and planting of contiguous blocks of sheep grazed mountain land. Here in Killarney the main part of the forest was in Muckross property. Originally the property of the O'Sullivans, Muckross had always been worked as a single estate. In the eighteenth and nineteenth centuries it was the home of the Herberts who did much planting of woods as well as carrying out many improving works. Many of the present magnificent trees date from the time of their ownership. Later the place was bought by Lord Ardilaun who was responsible for some of the younger plantings and from him the property passed to Mr.

Vincent who continued the care of the trees and woods which had been a characteristic of the estate for over two centuries. Mr. Vincent presented Muckross as a gift to the nation and the woodlands were now in the charge of the Forestry Service.

Mr. S. M. O'Sullivan representing the Minister for Lands, welcomed the members to Killarney State Forest, and hoped they would enjoy their tour. He did not agree with Mr. FitzPatrick's description of him as " the last of the O'Sullivans," preferring, he said, to describe himself as " the most recent of that clan."

Dr. Anderson spoke briefly on excursion arrangements and on the precautions to be taken during the excursion.

THE FOREST NURSERY.

The party then entered the Muckross nursery. It was started in 1933. Severe droughts were said to occur because of the light soil. For this reason seed-sowings were confined to pines and hardwoods. The stocking was largely of hardwood transplants, e.g., sycamore, elm, ash, alder, maple and oak which had been lined out in the previous February and March. There were some beds of ash, lime and oak seedlings. The ash seedlings were from seeds with delayed germination.

DOUGLAS FIR STAND (Compt. 2).

Passing from the nursery the party went to a twenty years old stand of Douglas Fir. Planting had been at 6 ft. x 6 ft. No treatment had been given since planting save a recent, combined weeding and thinning. Growth was rapid but a high proportion of crooked stems occurred.

Questioned as to the utilisation of the thinnings, Mr. Swords said that the rougher stems were suitable for fuel only. Tops were useful as pea-stakes and heavier butts could be sawn into box-boards. There was a variety of uses for the straight poles.

In response to questions concerning the canopy, Mr. McCool said that thinning was not yet complete. The policy was to thin gradually for some years to come.

It was stated that prior to planting the site carried a dense crop of nettles. Mr Clear sought opinions as to whether Douglas Fir would be planted on such a site to-day. Mr. McCool was of the opinion that a mixture of Douglas Fir and Spruce would be more likely to-day, while others plumped for hardwoods.

CARRIGAFRE LANE WOOD.

In this wood an example of the group planting of Oak was seen. Some trees of the previous oak crop remained on the ground. They were retained because of their amenity value and also in the hope that natural regeneration might be obtained. This hope was not realised, however. Dr. Anderson explained the group method to the party. Instead of spacing the plants evenly over the ground at 3 x 3 ft. or 4 x 4 ft. the hardwood species were planted close together in groups set in a matrix of a conifer species. The conifer acted as a nurse and was removed according as the development of the hard-

wood rendered it necessary. In the groups the plants were set 18"-24" apart—each group having 13-21 plants. The distance between the groups (centre to centre) varied, but he thought that 18 ft. x 18 ft. should be the maximum, as wider spacing might result in an insufficiency of trees for a final crop.

Mr. O Beirne asked why not plant at 3 x 3 ft. or 4 x 4 ft. in the groups. Dr. Anderson replied that the closer planting in the groups ensured cleaner stems. This method of planting was still in the experimental stage, however, and so far it was not certain that the results hoped for would be obtained, i.e., that each group would provide one well-shaped tree for the final crop.

THE POOL WOOD.

The party crossed an open field to enter the Pool Wood. En route a veritable sea of tree-tops stretched out in varying hue to ascend the distant slopes and become lost in cloud. This prospect, together with others seen later, disproved in a most convincing way, the accusation that State forestry does not give sufficient consideration to the amenity value of woods in the beauty spots of our country. While working ceaselessly to harness the productive powers of these forest lands the greatest care is also taken to ensure that nothing of the charm which trees lend to the scenery is taken away.

The Pool Wood consisted of a sixteen year old stand of European larch. The height growth and form of the stems were extremely good. Mr. O Beirne thought immediate thinning was not necessary. With this Mr. Bogue agreed, but suggested that an occasional dominant could profitably be removed. On the other hand Mr. FitzPatrick held that further thinning was necessary, as some of the stems were inclined to be whippy. Mr. Clear pointed out that no serious damage can be done to larch by over-thinning except—as Mr. O Beirne observed—by allowing excess light to the floor and thus encouraging unwanted ground vegetation. A sample thinning had been carried out in one area to give members an opportunity of seeing what the canopy would look like after such treatment.

On the question of canopy preservation Dr. Anderson said that correct thinning helps to maintain the canopy, because it enables the trees to build up proportionate and well-balanced crowns. It also firms the trees' hold in the soil. Mr. Swords told the party how thinnings would be disposed of.

The terrain in this area might be described as rolling. The soil is sandy and deep. Mr. O Beirne said that on such ground Scots Pine would do better than Larch on the ridge tops. On these the water-table sank too low in dry weather to provide the Larch with a sufficiency of water. This retarded its growth and rendered it liable to fungous diseases. Scots Pine on the other hand was adapted to such conditions, he said.

THE LACA WOOD.

Leaving the Pool Wood the party followed the public road up to Laca Wood. Before studying the stand, however, members

forgot silviculture for a moment. Turning westwards they were silent while the reflected lights from Killarney's lakes met their gaze. From this vantage point they enjoyed what must have been their loveliest view of Killarney with its verdant forest and shimmering waters.

The Laca Wood was planted in 1917, with Scots pine and Corsican pine at a spacing of 3 ft. x 3 ft. Growth was good, the Corsican pine especially looking fine and healthy. As regards the timber of Corsican pine, Mr. Bogue said that its uses were many, especially when high quality was not essential.

The Mossy Farm Wood.

In one part of this twenty-nine years old wood there was an irregular mixture of Scots pine, European larch, Sitka spruce and Norway spruce. Elaborate mixtures are generally difficult to deal with when thinning time arrives. This stand was no exception, the light requirements and rate of growth of the four species varying widely. The Forestry Division held the view that the site was best suited to Scots pine and hence the treatment being applied aimed at its preservation for the final crop.

In the other part of the wood there was a pure stand of Japanese larch. In 1924 this was planted as a 50 % mixture with Scots pine, the two species being in alternate lines five feet apart. To-day, except for a marginal line of Scots pine the stand is pure Japanese larch. It was not known when the pine disappeared. Such information as was available, however, indicated that the pine had succumbed to heavy weevil attacks in early life, thus leaving the larch to fend for itself at a spacing of 4 x 10 ft. The larch formed a very pleasing crop of straight clean poles.

The National Park.

After lunch at the Muckross Hotel the party visited the National Park. Along an avenue known as the Queen's Drive members saw some fine specimen trees of Scots and Monterey pine and European larch.

Compartment 18.

In this compartment members saw two twenty-five years old stands, one of Sitka spruce and one of Douglas fir, growing on similar ground. Height growth of both species was good—dominant stems averaging 50-60 ft. Both stands had been thinned in 1936/37 and 1941/42. The Sitka had been thinned again in the current year. Mr. Crerand considered the recent thinning of the spruce not too heavy, while Mr. McCarthy said he would like to see more of the "wolf" trees removed from the Douglas fir crop. Mr. O'Sullivan pointed out that some marginal trees had been removed in the recent spruce thinning. Dr. Anderson said that normally, marginal trees would not be removed lest a grassy vegetation should spread into the stand and use up the humus on the floor. In this case there was no such danger as there was side shade from a younger crop adjoining.

Mr. Bogue asked why was it, that the Douglas fir planted in Ireland about a century ago had such good stem form, as compared with that of more recent planting. He proffered the suggestion that it might be due to the use of seed of different origin. Dr. Anderson agreed saying that the original Douglas fir seed was imported from the Vancouver Island region while the more recent importations were from the Washington area. Of late, the Forestry Division has been trying to import seed from the more northerly end of the range.

COMPARTMENT 30.

This fine sixty year stand of European larch was being thinned for E.S.B. line poles. The present thinning was normal, but later the stand would be divided into a number of parallel strips at right angles to the prevailing wind. The crop was to be opened up by heavy thinning and Silver fir, Norway spruce or Douglas fir were to be underplanted, beginning at the leeward end and working into the wind in strips.

All the thinnings from this stand were not accepted by the Electricity Supply Board as some had heart-rot. Mr. Mangan, who selects poles for the E.S.B., said that pre-war specifications were very exacting. The war-time shortage of material rendered a certain " watering-down " of specifications necessary. The principal modifications were in regard to straightness and general form.

Mr. McEvoy spoke a few words on the floor vegetation in the stand, saying that the Woodrush (Luzula), which was the dominant species, found conditions under a deciduous exotic tree, i.e., larch, similar to those prevailing under the indigenous oak.

The party then made its way down the winding path to the top of Torc waterfall. Here members took time to contemplate the majesty of the scene. Some were reminded of Tennyson's " Splendour Falls ":—

" The long light shakes across the lakes,
The wild cataract leaps in glory,"

as the roar of the tumbling water echoed and re-echoed amongst the trees.

Mr. O'Sullivan pointed out to the party that the white " X " marks so frequently seen on trees in this area were put there to ensure their retention from felling and so preserve the beauty of the scene.

Mr. FitzPatrick gave an account of the planting of this area. Ratcliff's *Survey of Kerry* stated that in 1801 Torc mountain was planted with Scots pine, oak, ash and sycamore. The pine was only intended as a nurse but did so well that in 1812 more of it was planted where some of the hardwoods did not thrive.

WEDNESDAY, JUNE 5th.

On Wednesday the weather was dull and at times there was light rain—which, however, did not interfere with the progress of the excursion. A strong wind blew for most of the day and brought the " white horses " out on the lakes.

The National Park was the venue. Mr. O'Sullivan led the way to an old stand of mixed species. It contained European larch, Scots pine and Monterey pine, beech, etc. The intention here was to open up the canopy gradually and encourage natural regeneration of hardwood species. All the species present showed specimen stems of great dimensions, and members spent some time estimating their volumes and debating the results obtained. Needless to say the sawmillers and the foresters were not always in agreement! As the material was being neither bought nor sold, however, their parrying served to bring an air of joviality into the proceedings.

The larch and Scots pine ranged from 80-100 ft. in height. A sample tree of larch measured 16″ Qr. girth at breast height. This tree was estimated to have a volume of 70 to 80 cu. ft. of timber and therefore to be worth £4 5s. at present prices.

A sample Scots pine measured 16¾″ Qr. girth at breast height. It measured 70 ft. (approx.) to timber height and had an estimated volume of about 80 cubic feet.

Gollen Wood.

Taking a pathway along the lake-margin, the party came to Gollen Wood. Here members saw twenty-five year old stands of Sitka spruce and Scots pine which had not been treated since planting. Height growth was good, but the lack of thinning had resulted in a large number of compressed crowns. The site was flat and wet. Dr. Anderson pointed out that thinning would have to be very carefully carried out on this shallow wet alluvium.

Along the margins of the wood several species of silver fir had been planted. On the windward side it was noticed that Abies brachyphylla did better than either Abies pectinata or Abies nordmanniana.

The Muckross Peninsula.

On this limestone peninsula several of the rarer herbs and shrubs for which Killarney is noted, were seen. Arbutus and yew were abundant in their natural habitat on the bare windswept limestone of the lake margin while whitebeam and madder (Rubia peregrina) were also found among the rocks. In the interior some scattered clumps of naturally regenerated oak were noted. One particular clump was ten to fifteen feet high and was situated under the spreading limbs of a large pine where abundant side light entered. Various theories were put forward to explain why this dense growth of oak should arise underneath a pine tree. Dr. Anderson said that natural regeneration was successful on the peninsula because the light conditions were correct and because stock was excluded.

An extremely large Douglas fir was the next item of interest. Without proper side shade it naturally had grown very branchy. Estimates of its volume were only very approximate—ranging from 275 to 350 cubic feet. It was interesting to see such growth of Douglas fir on limestone since it is generally regarded as a calcifuge species.

A massive oak of 48 ins. Qr. girth was estimated to contain 160 cubic feet of saw timber and 9-10 tons of firewood.

On reaching a handsome rustic bridge of cedar wood the party halted and some of the members occupied the interval before returning to take photographs.

On the way back to lunch members spent a pleasant half-hour in visiting Muckross House and its beautifully laid out rock garden.

After lunch at the Muckross Hotel the party returned to the National Park. The first item of interest was an eleven years old stand containing two species of Eucalyptus (E. mulleri and E. viminalis, coastal and mountain types, respectively) together with Lawson's cypress and Douglas fir. The Eucalyptus was doing well—averaging 25-30 ft. in height. Mr. O Beirne gave members an interesting account of the eucalyptus—its origin, its importation into Ireland, the methods adopted in its cultivation here and of the success of the various species here.

Close by the gate lodge were some fine specimen trees of Monterey pine (P. insignis), Scots pine and European larch. One Scots pine stem measured 28 ins. Qr. girth (Breast height) and was 50 ft. to timber point. A stem of European larch measured 31 ins. Qr. girth and was 55 ft. to timber point.

JAPANESE LARCH AND BEECH MIXTURE.

This sixteen years old stand of Japanese larch and beech had about one fifth of the larch stems removed in order to free the beech which had largely been suppressed. Originally the larch had been intended as a nurse for the beech. It had not been removed in time, however. Mr. Clear questioned the necessity for the nurse species in this instance as beech was able to draw itself up and produce clean stems. He also said it was useless to endeavour to rescue hardwoods which had been suppressed unduly in early life.

In passing the party visited the famous Muckross Abbey where lie some of the great poets and chiefs of Munster. The tombs of Aodhagan O Rathaille and Eoghan Ruadh O Suilleabhan were seen.

In the cloister the party gathered to the five centuries old yew tree. It measured 29½ inches quarter girth at breast height and was 58 ft. high (approx.)

Mr. FitzPatrick gave members a resumé of the history of the Abbey.

Turning again to forestry the party visited a fine old stand of sessile oak. This particular stand was said to be the best in that part of the country. Mr. McEvoy said that the soil was deep and the vegetation it carried indicated it to be fertile, the principal species represented in the ground vegetation being Enchanter's Night-shade, Herb-Robert, Blue bell and the Male, Broad Buckler, Prickly Shield and Hart's Tongue Ferns. The two latter indicated a high lime content in the soil. The Yellow Pimpernel, which was present indicated a moist site. There were approximately forty-five trees per acre. This spacing was unusually wide for an Irish oakwood.

To conclude the day's proceedings members visited a thriving ten years old plantation of Hemlock (Tsuga heterophylla). The

spacing had been 4½ x 4½ ft. The crop averaged 15-20 ft. in height and the stems were of very good form.

THURSDAY, JUNE 6th.

On Thursday a visit was paid to the property of Colonel The McGillicuddy at Beaufort. As members assembled at Beaufort House the sun shone brightly.

Colonel The McGillicuddy welcomed the party. It was a pleasure, he said, to see the members of the Society of Irish Foresters at Beaufort. He carried on forestry on a small scale, regularly planting small areas. He kept a small forest nursery because the cost of commercial stock was so high, the supply was not regular and also because the plants were frequently in bad condition when received. Of 6,000 nursery trees which were planted out last autumn many failed and hence the practice of transplanting natural seedlings was being adopted. Boys were employed to dig up the seedlings around the estate.

Referring to State forest policy he said that Ireland was following the traditional English methods, i.e., planting was being done by the State and by large land owners, but nothing was being done by the small farmers. When small farmers do carry out some planting they seldom give the trees any further assistance and hence they fail to grow properly if at all. He suggested that such people, on contracting to plant a prescribed minimum area should have the services of a trained foreman available to them in that and subsequent operations.

THE NURSERY.

The party was then shown the Estate Forest Nursery. It was a long and narrow strip about one tenth of an acre in extent and lying on the south side of the garden wall and well stocked with a variety of species. There were Cupressus macrocarpa seedlings and thriving Monterey pine (P. insignis) transplants. Colonel The McGillicuddy pointed out a bed where eighty selected Spanish chestnuts had been sown and where only nine germinated. Mr. O Beirne said that the failure might have been due to the depredations of rats or to poor ripening of the seed. There were transplants of oak, beech, Lawson's cypress and Scots pine also. Five thousand natural seedlings of oak, ash, sycamore and birch collected on the estate were lined out.

THE FLOWER GARDEN.

The spacious and well stocked garden was managed by Madam McGillicuddy whose hobby it is. It did her credit on that fine morning. The lupins, pinks and columbine were in full bloom, joining with the blossoming cherries, peaches and apples to give a pleasing display. In the rock garden likewise, where the party spent a pleasant hour, the colour scheme was exquisite. Flowering herbs and shrubs of many species were effectively arranged to give the most pleasing harmonies and contrasts of colour.

Before departing Mr. Fitzpatrick thanked Colonel The McGillicuddy on behalf of the Society, for inviting its members to so beautiful and interesting a place.

DUNLOE CASTLE AND GROUNDS.

After lunch the party travelled to Dunloe Castle, Miss Pettit's property, where members spent a most interesting and enjoyable evening. The sun shone brightly, seeking as it were, to be forgiven for its neglect in the early stages of the excursion. Entering by the main avenue, the party was met by Mr. Moriarty, Miss Pettit's head-gardener, who, in the unavoidable absence of Miss Pettit, acted as guide.

Miss Pettit's comprehensive collection of trees and shrubs is unique amongst private arboreta. Outside a botanic garden one would not expect to come by such a variety of rare exotic trees and shrubs. In fact several species not usually seen out of doors were growing excellently, testifying to the mild local climate. As Mr. Moriarty led the party from one species to another members had many opportunities of testing their knowledge of identification. With great enthusiasm did they do so. Such species as Cryptomeria japonica, Cedrus atlantica (glauca), Quercus rubra, Robinia pseudacacia, the tulip tree (Liriodendron) and the maiden-hair tree (Gingko) presented little difficulty but such species as the liquidamber (which produces the satin-wood of commerce), hornbeam-leafed maple (Acer carpinifolium), the Siamese maple (Acer griseum), and Tricuspidaria lanceolata were not so well known. The latter species with its brilliant scarlet, Chinese-lantern-like flowers attracted much attention.

In the garden members had an opportunity of seeing a yew tree measuring 36″ Qr. girth B.Ht. It was said to have been an old tree when the Muckross Abbey yew was planted. When the evening's programme was complete Mr. FitzPatrick thanked Mr. Moriarty on behalf of the Society.

The excursion then officially concluded.

DISCUSSION ON MR. McEVOY'S PAPER.

At 8.30 p.m. on Wednesday, June 5th, a meeting of the Society was held in the Glebe Pavilion, Killarney.

Mr. FitzPatrick opened the proceedings by introducing Mr. H. Downing, Chairman of the Killarney Urban Council to the assembly. Mr. Downing said that he had come to represent the Council at the meeting and to welcome the members of the Society to Killarney. Had he known that the meeting was open to the general public he would have ensured a greater attendance of local people. In Killarney they were all aware of the valuable work being done by the Forestry authorities not only for Killarney but also for Ireland as a whole.

The President thanked Mr. Downing on behalf of the Society for his attendance at the meeting and for his appreciative comments.

After a short discussion on the question of the proposed one-day excursions and on the venue of next year's annual excursion, the

President called on Mr. T. McEvoy to read his paper on "The Vegetation of Irish Woodland." The text is recorded elsewhere.

Proposing the vote of thanks to Mr. McEvoy for his paper, Mr. T. Clear asked what was the value of such a study of vegetation as Mr. McEvoy had made. What connection had the study of oak-wood vegetation with modern Irish forestry, which was largely concerned with coniferous species? In answer he said that the forester has to deal with a long-term crop and cannot afford to make mistakes in planting, i.e., in his selection of species. The study of vegetation *in situ* (i.e., ecology) is a great help to him in guiding him along the proper course, enabling him to grow healthy tree crops.

Forestry, he said, is not just a matter of planting trees—the aim of the planter is to establish forests. To do this the forester must first get to know nature's secrets and having done so, must make use of the knowledge to harness her productive powers for his own benefit. It is through the science of ecology that the forester learns most about the various planting sites.

To-day the aim of the forester is not to grow indigenous species, but fast growing exotics. These may be grown on much shorter rotations than the native hardwoods. Through modern processing methods, timbers having all the good qualities of the slow-grown timbers may be produced from fast-grown soft-wood trees. Hence in his opinion the days of the oak-woods were past. Whether we aim at producing oak crops or crops of exotic soft-woods, however, we must study the vegetation which has survived the vicissitudes of the years.

He formally proposed a vote of thanks to Mr. McEvoy for his interesting paper.

Mr. M. O Beirne seconded the vote of thanks saying that the paper provided much food for reflection. One point that struck him was that the presence of such vegetation as Mr. McEvoy had mentioned, on the floor of Irish oak-woods indicated faulty treatment. In properly managed woods such vegetation would not occur.

He said that natural regeneration is prevented by the browsing of stock. It is also prevented by the formation of raw humus. The growth of trees is bound up with the presence of certain bacteria and fungi in the soil. When vegetation of the Luzula type occurs on forest floors raw humus accumulates and natural regeneration is prevented. This is because the biotic complex does not favour the growth of the tree species. On high ground imperfect seed formation may prevent natural regeneration. In cases where natural regeneration is prevented by excessive floor vegetation, scarifying the soil, or the planting of a beech understorey may encourage it. The production of large quantities of seed was another essential for natural regeneration.

Dr. M. L. Anderson, associating himself with the vote of thanks said that Mr. McEvoy's paper followed logically on Dr. Gallogher's paper on "Some Aspects of Soil Classification." Referring to Mr. Clear's question as to the value of the study of vegetation, he said that the study of vegetation in any woods gave an indication of what the conditions prevailing in those woods were and hence was of great value to the forester. The study of woodland vegetation

also gave an indication of the value of the understorey of shrubs, e.g., holly, hazel, etc., which at present appeared to be useless. We may yet find it profitable to plant such under-shrubs, he said. He did not agree with Mr. Clear's assertion that the days of the oak-woods were over. Weight production per acre was sometimes more important than volume production per acre. Also, in wood distillation, the hard woods, e.g., oak, had a greater number of by-products than the soft woods. He thanked Mr. McEvoy once more for his interesting paper.

Mr. N. O Muirgheasa said he found Mr. McEvoy's paper particularly interesting because in Woodford forest where he was stationed he was surrounded by sessile oak woods. As a result of the information obtained from the paper he would in future derive much more benefit from his study of the vegetation in the woods.

Mr. L. Condon said that as a result of the paper he would concentrate on the floor rather than on the canopy when walking in the woods in future.

Mr. FitzPatrick said that Mr. McEvoy's paper made us see the woods in a new light. Had we heard it before that day's outing we would have derived more benefit from our trip through the oak woods. Mr. McEvoy was continuing the work of botanists in Ireland and other countries. Cajander of Finland was an outstanding example. He had gone the length of preparing volume tables for tree crops as a result of an ecological examination of the vegetation on the ground to be afforested.

Commenting on Mr. O'Beirne's contribution to the discussion, he said that Mr. O'Beirne reminded him of the old text-book which said that " silviculture is the pivot of the whole forestry business." Mr. O'Beirne realized this and always came back to silviculture because it was of fundamental importance.

He pointed out that nobody had mentioned the importance of birds in the woodlands. In France the understorey of shrubs which was maintained in the woods encouraged birds, while in Germany nesting boxes were provided for them.

He did not agree with Mr. Clear that the days of the oak-woods were past. He held the view that people would always prefer real to composite timber.

Mr. McEvoy in his reply said he was pleased that Mr. O'Beirne had mentioned silviculture because silviculture was the application of ecology.

It was very important in studying vegetation that its history should be ascertained. Burning and grazing had great effects on vegetation and due regard must be given to them. He had found in some cases that grazing was favourable to the establishment of natural regeneration for a time but then became detrimental due to damage to the seedlings. He suggested that it would be interesting to carry out an experiment by allowing stock to graze in the forest until a crop of seedlings grew and then to remove the stock and see if the seedlings would survive.

He was pleased that Mr. FitzPatrick had mentioned bird-life in the forest and its relation to the undergrowth. Birds had a very important function in the forest.

Thanking the speakers for their appreciative comments on his paper, he concluded the discussion.

Mr. Mangan proposed a vote of thanks to the Minister for Lands for permitting the Society to visit Killarney State Forest and also for the facilities provided there. He also thanked Mr. O Sullivan, Mr. Swords, Mr. McCool and Mr. Doyle, who represented the Forestry Division on the excursion.

He proposed a vote of thanks to Colonel The McGillicuddy and to Miss Pettit for allowing the members to visit their properties.

Mr. McCarthy seconded the votes of thanks and the members signified their assent by a round of applause.

Mr. Langley proposed a vote of thanks to Dr. Anderson, Mr. Clear and the Council of the Society for the efficient arrangement of the excursion. Mr. Chisholm, seconding, said that in his opinion it was the best excursion of the Society to date.

Mr. O Sullivan replied suitably to the vote on behalf of the Minister and his representatives.

Dr. Anderson replying to Mr. Langley's vote, said that with goodwill and co-operation much can be accomplished.

TO OUR NEW READERS.

The Society of Irish Foresters has for its object " to advance and spread in Eire the knowledge of forestry in all its aspects."

With this end in view, meetings are held at which papers are read and forestry problems discussed; excursions are organised to forest areas of special interest; the Journal is published at least twice a year; a Register of Notable Trees has been opened; and, with the co-operation of the Central Students Library, a library service is available to members.

Members receive gratis one copy of each part of the Journal and are entitled to be present at every meeting and excursion of the Society.

Membership consists of two Orders, Technical and Associate. The former consists mainly of whole-time foresters; the latter of persons desirous of promoting forestry but not qualified for Technical membership.

Rates of subscription are as follows:—

Technical Member, Grade I, £1 per annum.
Technical Member, Grade II, 10/- per annum.
Associate Member, 15/- per annum.

The Society is anxious to extend its Associate Membership as it is mainly through it that it hopes to create and maintain an informed public opinion on forestry matters.

Forms of application for membership are obtainable from the Secretary.

Local Excursion to Avondale

SEPTEMBER 28th, 1946.

By J. J. MAHER.

The Council are to be congratulated on providing, for the benefit of members unable to travel to the annual excursion, an opportunity of gathering for one day at some place of forestry interest. Avondale, the home of Irish forestry, picturesquely situated near Rathdrum and surrounded by the old woodlands and young plantations of the Wicklow hills, was a happy first choice and the response exceeded predictions.

The following members were present:—Messrs. H. M. Fitz-Patrick (President), T. Clear, W. Chisholm, M. Connolly, T. Conlon, F. Clarke, R. Crerand, T. Donovan, J. P. Doyle, J. Dowds, A. C. Forbes, L. F. Flanagan, J. Galvin, G. Haas, D. Mangan, T. McEvoy, P. J. McCartan, T. McCarthy (Athy), P. McMenamin, M. Bogue, Capt. and Mrs. Trant and the Recorder. Dr. Anderson, Mr. Ryan, and Mr. Hanahoe, represented the Department of Lands.

The President welcomed the pleasant gathering and most heartily thanked the Minister for Lands for having so graciously allowed us to visit Avondale, the State school of forestry which had a very important influence on the growth and trend of Irish forestry. He gave a brief and lucid summary of its history from the time it was in the possession of Samuel Hayes (that keen tree planter and author of the first book on Irish forestry entitled *Planting*, published in 1794), to its acquisition by the Department of Agriculture and Technical Instruction from the successors of John Howard Parnell to whom the property had passed on the death of his brother, Charles Stewart Parnell.

It was unfortunate, he said, that the Superintendent of the school, Mr. O'Beirne, could not be with us. His courteous manner, guidance, and fund of information about the trees and woods here would be missed very much. His absence was, however, less serious than it might have been for we had the great good fortune of having with us Mr. Forbes, late Director of Forestry, who, exactly forty years ago this month had come to Avondale and laid out this impressive experimental station on the lines of a continental forest garden. Mr. Forbes, he continued has always kept in close touch with the place and no doubt would be kind enough to give us the benefit of his experience.

Dr. Anderson, Director of Forestry, welcomed the party on behalf of the Minister for Lands and hoped that they would spend an enjoyable and fruitful evening. Mr. Ryan, Inspector, Department of Lands, had, under very short notice, undertaken to lead the party round in the regretted absence of Mr. O'Beirne. Mr. Hanahoe, Forester in Charge, would also accompany the party.

Mr. Forbes thanked the President for his flattering remarks. He reminded the members when assessing results to-day, that, as he

was allowed but a limited time to lay out the plots, most of the exotics used had to be imported fit for planting out. Not only were those plants in poor condition when received, due to length of time in transit, but also in most cases, the origin of seed was unknown.

The party first visited the School and were received by the Matron, Miss Devane. They were shown over the Parnell museum, where the many personal effects, testimonials, flags, coins, and cartoons associated with the honoured memory of Parnell are preserved.

NURSERY.

The School Nursery presented a beautiful picture of multifarious greens. The healthy sheen, the perfect form and vigorous growth not only of the common conifers, but also of the exotics grown from seeds collected by students in the grounds, proved that a nursery can, even after forty years of continuous use, remain in good heart. Here as in the Arboretum and Pinetum coniferous species, geographically and climatically far separated, were grown side by side. Some rare ones were: Pinus leucodermis and Armandi; Picea likiangensis and rubra; Abies bracyphylla, arizonica, veitchii, pinsapo and cephalonica; and Tsuga diversifolia. The Eucalypt species seen were excellent, some being the first generation grown from home-collected seed from the first planting in 1910. The technique used in growing these delicate seedlings and the development of the eucalypt plots was given in full by Mr. O'Beirne in a short article in *Irish Forestry*, Volume II, Number 1.

Before recording the treatment and present conditions of the plots visited the following note may be of interest. It is condensed from *Avondale Forestry Station, 1906-1912* which was written by Mr. Forbes and published by the Department of Agriculture and Technical Instruction in 1913.

The station was established, for the purpose of testing the silvicultural possibilities of newly introduced species, to obtain data for determining their yield and commercial value and for the training of young men as working foresters.

The main portion of the property formed a long narrow strip adjoining the Avonmore river and extending from about one mile south of Rathdrum to the Meeting of the Waters. The elevation rises rapidly from 200 feet along the valley floor to 400 feet where the land levels to an undulating tract. The soil in general excepting two alluvial deposits was derived from the underlying silurian rock.

The undulating higher ground was roughly bisected by a broad glade or ride three chains wide. Right and left of this glade, plots approximately ten chains by one chain were laid off, having the narrow side of each plot adjoining the glade. Other sections were formed in a similar way on the slopes and low ground. In general each plot, especially of the rarer species, was planted with 75 % of nurse species. These were either closely related to the main crop species or capable of yielding a quick economic return. They were intended not merely to nurse the crop but to enable planting to be carried out at a cheaper rate than if the expensive species alone

formed the crop. At the time of planting the demesne land, except the scrub-covered slope adjoining the river and a few acres of tillage, was under grass with a few scattered trees. The grass land was ploughed and planted by digging pits which extended into the soil beneath the furrows. On parts which were not ploughed not only was the percentage of failures much higher but growth for the first few years was slower and the trees suffered more severely from spring frosts.

THE PLOTS.

Forty years has brought a big change. In some plots the main crops were successfully established, in others the nurses now form the main crop whilst other plots were dismal failures.

SILVER FIRS.

The most notable plot in Avondale was Abies grandis which had an average of 300 stems to the acre and an average height of 90 feet. It was straight, clean boled, free from disease and overtopped all other species. Of the other silvers, Abies nobilis was next in merit. Abies pectinata was used both as main crop and nurse to the other Abies species. It was the only absolute failure in the Silver fir section. Mr. Forbes recorded in 1912 that with the exception of Abies grandis all other Abies species suffered severely from late frost; common silver most severely of all, many of them being no higher than when planted.

SPRUCES.

Norway and Sitka spruce have been very successful. Norway spruce has produced a most uniform crop of first quality from a pure plot and also from those plots where it was used to nurse other spruce species, Colorado Douglas Fir and many hardwoods, but completely suppressed the intended main crops. The best plot is the flat alluvial deposit by the river where it completely suppressed at an early age the Colorado Douglas Fir which was intended as main crop. Sitka spruce on the other hand had a very chequered career. It was planted in 1905 with 50 % Japanese larch as a nurse. For years the spruce suffered badly from spring frosts with the result that the larch had suppressed it at an early age. From 1917 onwards the larch were heavily thinned each year, and the spruce—many of them resembling bushes rather than trees—recovered in a remarkable manner. In the first year dwarf leaders developed and by the end of the third annual thinning normal growth of from 2 to 3 feet was being made. It has now formed the main crop and many thinnings have been made in recent years.

The volume of Japanese larch removed by 1925 was 3,345 cubic feet. The Sitka spruce had reached a volume of some 3,500 cubic feet by 1938. For a more detailed account of this mixture, its advantages and disadvantages and other mixtures used at Avondale we refer readers to " The Role of Mixed Woods in Irish Silviculture," by T. Clear, B.Agr.Sc., in *Irish Forestry*, Volume I, Number 2. A plot of P. morinda at the back of Casino House and a plot of P. Omorica near the " big ride " were developing steadily, having an

average height growth of from one to two feet per annum. These plots were planted about 1916.

Oregon Douglas Fir.

Just a fringe of Oregon along the river remains of the plot with European larch planted 25 : 75 at 3½ feet in 1906. Both grew rapidly from the beginning but were severely frosted, especially in June, 1911. The larch, suffering from canker and frost damage, either died out or was suppressed at an early age leaving a pure crop of Douglas fir. This crop was blown during the heavy snowstorm in February, 1933. The effect of the 1911 frost was very apparent, most of the stems being forked and crooked at the same height from the ground. A completely different picture was seen in a more recent plot on a somewhat similar site across the river. The Oregon Douglas was mixed with Norway spruce. It was of good form and on an average was 15′ above the crowns of the Norway spruce. The relative heights were approximately 75 and 60 feet.

The Cupressus section was depressing. Cupressus Lawsoniana had a high percentage of multiple leaders. The original planting failed and the present crop is the result of planting rooted cuttings. The Cupressus Macrocarpa plot was extremely branchy and rough. Juniperus virginiana was a complete failure only a few straggling stems remaining.

Larches.

With the exception of European and Japanese species, the other larches—sibirica and occidentalis—were failures, being severely damaged by late spring frosts. The Japanese larch grew vigorously but were slightly sabred and inclined to branch in the crowns. There is little sign to-day of the canker prevalent in all the European larch plots during the early twenties. This disease has noticeably diminished due to the vigorous growth of the larch and constant heavy thinning.

The larches have been very valuable not only by giving an early yield of all valuable material but also by acting as effective nurses, once the canopy had formed, to the tolerant frost-tender species.

Amongst other plots seen was one of Tsuga mertensiana planted in 1906. Amongst the scrub on the slope adjoining the river prolific clumps of natural seedlings were seen growing where normal openings of the canopy had been made in thinning. Where openings were too severe briars and weeds were present in abundance—but no seedlings.

Hardwoods.

These were on the whole the least promising. Pure crops of sessile and pedunculate oak planted in 1905 were fair, a plot of Spanish chestnut planted in 1916 behind Casino House was excellent as was also a small group near the School, of oriental beech. This plot had very straight stems and was fast growing; a great change from the pure crop of common beech which was of a very bad type, having never formed definite leaders.

The attempt to grow hardwoods as a main crop mixed with 75 % larch or spruce nurses or 50 % hardwood nurses when planted, did not work out well. This was due to a large extent to the absence of close supervision and attendance to silvicultural detail during the period 1914-1918, the most critical period in the life of the mixtures. Practically complete suppression of intended main crop species by the more vigorous nurse species resulted. This occurred in the European larch and Norway spruce mixtures with oak, beech, hornbeam, Spanish chestnut, Norway maple. Acer dasycarpum, A. saccharinum and A. macrophyllum. One member remarked when passing through the maples-larch mixture, that coppicing of the many straggling surviving maples might give good results.

In the case of the beech-oak mixture the former was more vigorous and the oak proved unable to survive under its dense shade. An attempt, some eight years ago, to save what was possible of the oak by heavy thinning of the beech has resulted in a small number of good oak stems surviving in the beech matrix. Spanish chestnut also proved too vigorous for oak in a similar mixture and the plot is now practically pure chestnut.

Before dispersing, a vote of thanks to the Minister and his representatives was passed with acclamation.

DR. ANDERSON'S NEW APPOINTMENT

The good wishes of all members will go to Dr. M. L. Anderson on his appointment to the position of Deputy Director of the Imperial Forestry Institute at Oxford.

His tenure of office here as Chief Forestry Inspector (1927-'39) and as Director of Forestry (1939-'46) has been remarkable for the growth of silvicultural technique, particularly in the thinning of plantations, in the establishment of new crops on old woodland sites, and in handling difficult peat types. This period has also seen the rapid expansion of the utilisation aspect of the work and the beginnings of a forest road system which will make closer utilisation possible. Dr. Anderson's close personal interest in all operations, his intimate knowledge of every forest and his extraordinary grasp of detail were the marks of a service given without stint. Irish forestry is deeply in his debt.

Our Society, too, owes much to him. Its inception and guidance through its formative years were due mainly to his enthusiasm and prodigious energy. As first President, as Editor, as Councillor and as Excursion Convener, he has left an indelible mark on all phases of the Society's activities.

OBITUARY

WILLIAM FREEMAN, 1880-1946.

We regret to record the death on November 14th, of William Freeman of Coolgreaney, Co. Wexford. Up to his final illness, he was State Forester in charge of Coolgreany Forest. He had been connected with forestry since 1904, having a long record of faithful service.

A man of outstanding physique, he always enjoyed perfect health. His many good qualities and friendly disposition made him highly popular both in the Forestry Service and in his native Coolgreany. Essentially a family man, his interests were centred in his home and family and in his hobby, the collection and cultivation of flowers and flowering shrubs.

W. Tempest, Dundalgan Press, Dundalk