Irish Forestry

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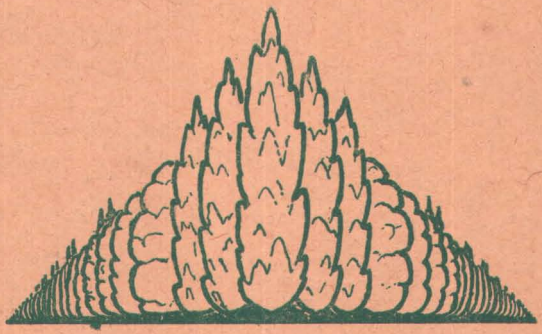

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IRISH FORESTRY

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Afforestation and National Planning

Much has been heard recently of the need for National Planning and Reconstruction, and there is no doubt that there are many unsatisfactory features in our social structure calling for immediate remedy. It is not proposed to discuss in detail the various proposals for improvement which have been put forward, nor to enter into any controversy regarding their practicability or order of priority, but it must be pointed out that their accomplishment will call for vast expenditures of money, material and human energy. In this connection it must be remembered that our present standard of life must be mantained and will absorb a large proportion of our natural resources and the potential productivity of our people. Only the surplus —after these current needs have been met—will be available for reconstruction and improvement. A brave new world will not emerge overnight, and some years must elapse before our planners reach their goal.

It has to be borne in mind that, unlike other more favoured peoples, we do not possess under our land surface large deposits of coal and iron, which are the basic necessities for heavy industry. The lack of these has meant that this community cannot become highly industrialised, and will be mainly agricultural. It is, therefore, inevitable that the future well-being of our people will be bound up with the land. National planning must be for the good of all and not one particular section of the community, so the inescapable fact must be faced that the principal task will be the amelioration of conditions for our rural population, which forms the greater part of the whole.

It is gratifying to observe that afforestation occupies a prominent place in the minds of our planners, and it will not be inopportune to examine its potentialities and the benefits it may be expected to confer on the countryside. It is difficult to draw a strict analogy between afforestation and the lighter industries, such as the manufacture of consumer goods, but comparisons can be made in a general way by considering such points as capital investment and replacement, labour content of current expenditure, location of labour, raw materials and additional work created by the disposal and distribution of the finished products. Unfortunately, it is not feasible to compare profit-earning capacity, as profits can be determined from year to year in industry, whereas, no matter how efficient the forester may be in establishing his plantations and bringing them to maturity, his profits can only be expressed as an annual rental on the land he uses and this is determined by the rate of interest charged throughout the rotation, something quite outside his control. It may, however, be assumed that the planners are not concerned with the profit motive.

Capital investment in a manufacturing concern has to cover the costs of erecting buildings and installing machinery, both of which are subject to continual depreciation and renewal. In afforestation capital expenditure consists of the purchase of land and its preparation for the initial planting. The land is not a wasting asset, as its value continually improves with the creation of a forest condition in the soil with benefit to future rotations. In the course of a century the

factory building and the machinery may have to be written off and renewed several times, whereas the forest land will have improved in value.

In manufactured goods the labour or wage content of the finished product may be subject to wide fluctuations dependent upon the introduction of improved machinery raising the output per worker. Afforestation, on the other hand, is a selective process depending upon the co-ordination of hand and brain in a way that no machine could possibly reproduce. Improvements in planting methods will tend to reduce costs, and thereby the labour content of operations, but not to such an extent as would be possible in industry. In establishing new plantations it is generally agreed that the labour content is never less than eighty-five to ninety per cent. of the total expenditure. Unlike manufacture, afforestation is not subject to violent fluctuations of demand, and the amount of employment given tends to remain steady.

Afforestation is almost completely independent of imports except for such tools and fencing materials as are not made in the country and supplies of seed from some of the North American species. In the course of time the latter can be superseded by home-collected seed, so there would be little or no strain upon the country's external assets. This is an obvious advantage where many of the raw materials of industry may have to be imported.

Factories have to be located in centres convenient to power, transport and a plentiful supply of labour. These factors tend to make them urban in character, and the labour force is drawn from within a comparatively restricted radius. Forests, on the other hand, are more diffuse and are generally established in the hinterlands. The very fact of their spreading over the countryside and not being pinpointed on the map greatly increases the range from which their labour force may be drawn. It is true, to a certain extent, that forestry is a seasonal occupation, but its periods of maximum activity coincide with the slack times in agriculture and vice versa. It is, therefore, a valuable factor contributing to steady employment all the year round.

The disposal of manufactured products is through the medium of the distribution and retail trades. These are mainly urban and not of great benefit to the countryside except in an indirect way by giving the townsman greater power to purchase agricultural produce. By contrast the finished product of the forester consists of mature woods which provide the raw material of many important industries. The mere harvesting of these timber crops would provide a great deal of rural employment which would be further increased if the forest blocks were sufficiently large in extent to justify the erection of permanent saw-mills in their locality.

So far, in endeavouring to present the case for afforestation, as against other forms of industry for rural areas, the chief argument has been left to the last. Timber is an essential raw material which can not possibly be done without and for which the need will continually increase. This country imports on an average between 100,000 and 120,000 Petrograd standards of sawn timber yearly, mainly in softwood species from Scandinavia and the Baltic. These species are all successfully grown at home, and the experience of timber users during the present emergency has shewn that plantation-grown native timber is in no way inferior to the imported material. No matter how much or how little timber we may require in future these imports will have to be financed from our external assets with consequent detriment to our power of purchasing raw materials required for other industries. The extent to which we shall be able

to replace these imports by produce from our own woods is, at present, a matter for conjecture, but it is merely stating the obvious to say that the more we can do so the better it will be in the long run.

It has been stated that the final aim should be 700,000 acres of forests, of which 600,000 acres would be productive and 100,000 acres protective. These figures can only be regarded as tentative in the light of present knowledge. They may have to be modified or increased as time goes on. However well plans may look on paper, they have eventually to come down to earth, and this is literally true in the case of the forests. Land capable of growing economic crops of timber will require to be found. In this connection it is instructive to turn to the Report of the Minister for Lands on Forestry for the period 1st April, 1933, to 31st March, 1938. In that Report, on page 7, the following paragraph runs:

> "Owing to the absence in Eire of large areas of plantable land in the hands of individual owners the process of building up forest units of sufficient extent and sufficiently compact to be economically workable is a slow, complicated and difficult matter which involves initial acquisition of small areas and the gradual enlargement of these by subsequent repeated small additions. This process is unique as far as State afforestation is concerned."

That paragraph puts the whole problem in a nutshell. This tedious process, comparable to fitting together the pieces of a jig-saw puzzle, will not stand the strain of the accelerated progress envisaged by our planners, some of whom dream of a total of 2,000,000 acres under forests.

Whatever the ultimate total may prove to be, the problem of land acquisition must be solved if the forest area considered necessary for our needs is to be established within a reasonable time. It is not merely a question of acquiring a specific area of plantable land. It should be acquired either in blocks sufficiently extensive to justify the creation of independent forest units, or so located that continual additions can be made to existing centres and enable them to carry on regular annual planting programmes until the earlier established plantations have reached the thinning stages.

Such requirements will not be easily met and the attempt to satisfy them will bring to a head the long controversy between growing timber and the production of mutton and wool. Many arguments have been advanced in support of one side or the other of this question, and it is quite probable that finality will never be reached. Afforestation is expensive, but a strong argument in its favour at the present time is the amount of gainful employment it provides. Whatever may be the annual expenditure outside the actual purchase of land it may be taken as certain that no less than four-fifths would go to provide a rural wages bill. In comparison with this, grazings can make no showing at all. The transfer of the comparatively small percentage of our total land area from grazing to timber production could be accomplished gradually and without hardship. Even so, a few individuals may have to sacrifice their own immediate personal interests for the ultimate good of the community.

The impact of the present emergency upon our native woodlands has been almost disastrous. Although they have had to meet a demand which has been considerably below normal, they may now be approaching exhaustion. Unless timber imports can be resumed within a comparatively short time the situation is bound to become serious. It should not be allowed to repeat itself if such can possibly be avoided. The question is not so much whether we can afford to sacrifice a proportion of our exports of mutton and wool and also incur a heavy annual expenditure in afforestation, as can we afford to do without a vital raw material which we can produce ourselves?

Items of Forestry Interest from the Irish Statutes Prior to 1800 A.D.

By M. L. ANDERSON, D.Sc.

However desirable or unavoidable it may be to have revolutions and changes of government in any country, it is important from a forestry point of view to try to secure as reliable and unprejudiced an outlook as possible upon the history of forestry development in that country, if for no other reason than that forests have a faculty for living through several generations of men and even through a number of historical epochs.

The period between 1600 and 1800 A.D. is from the point of view of the forestry of to-day extremely important, because a very considerable proportion of the mature trees felled in recent years were either planted towards the end of that period or as a result of legislation passed during that period and certainly on the lines of forestry or planting experience gained during that period. A perusal of the Irish Statutes enacted by the Irish Parliaments between the years 1600 and 1800 is, therefore, of more than passing interest, and in the present article it is proposed to deal as fully as possible with all items of forestry interest contained in these statutes, whether of a silvicultural, management, protection or utilisation character.

A valuable paper (1) was read in January, 1903, before the Statistical and Social Inquiry Society of Ireland by C. Litton Falkiner called "The Forestry Question Considered Historically," which dealt briefly with some material from the statutes.

A further contribution to the history of Irish forestry was made by A. C. Forbes in a paper (2) read before the Royal Irish Academy in March, 1933, entitled "Tree Planting in Ireland During Four Centuries," but neither of these papers is quite complete in respect of certain rather important matters and they contain some inaccuracies.

1. The 10th Year of Charles I. Cap. XXII. 1634.

The first Act of interest is one which repeals the only other previous Act in the Irish statutes of forestry interest, namely an Act of the 12th year of Edward IV. Cap. II., 1472, entitled "An act for bringing bowes into this realme from the realme of England by merchants and others." The actual wording of the earlier Act is of some interest, and this Act of 1634 is also interesting as an illustration of how laws are unmade. The original Act runs as follows:

> "At the request of the commons, whereas the land of Ireland is desolated of bowes, to the suportation of the said lands, and defence of the said commons against the Irish enemies of the King and English rebels of the same it is ordained and enacted that every merchant and passenger bringing merchandizes into this land of Ireland out of England to the summe of 100£, shall buy and bring with him into the said land in bowes to the value of 100 shillings, and so following after the rate under or over to the summe of 20£; if he brings no bowes to pay value of the bowes, half to the King and half to the searchers of the same."

The Act of 1634 tersely says that "the use of bows not being so needfull now as it was and there would be no vent or utterance for the same, said statute is now repealed and made utterly void."

From a list of rates of duty chargeable on merchandizes in this reign it is specifically stated that "Trees of all sorts are free"—the only item so favoured in the list.

2. The 10th Year of Charles I. Cap. XXIII. 1635.

This is a curious Act in some respects, but it shows that the authorities were already alive to the need for preserving such woods and plantations as then existed. It need not be assumed that the Irish people generally were any more inclined to injure property maliciously than those in other countries at that time. This Act was actually a copy of an English statute of Elizabeth. The title of the Act is "An Act to avoyde and prevent misdemeanours in idle and lewd persons in barking of Trees, etc.", but, as will be seen, the Act is of quite a general nature for the protection of landed property. The main section reads as follows:

> Forasmuch as unlawfull cutting and taking away of corn and graine growing, robbing of orchards and gardens, digging up, or taking away of fruite trees, breaking of hedges, pales or other fences, cutting or spoyling of woods or underwoods standing and growing, barking of growing trees, and such like offences, are now more committed by lewd and meane persons than in former times, and that the said offences are great causes of the maintaining of idlenesse . . . be it enacted. . . . That all and every such lewd person and persons, which from and after the first day of May now next following shall pull up, or take up any fruite tree or trees in any orchard, garden, or elsewhere . . . or shall barke any tree or trees that are growing, or shall cut or spoile any woods or underwoods, poles or trees standing, not being felony by the laws of this realme, and their procurer or procurers and receiver or receivers knowing the same, on conviction shall pay recompense or if not able to pay eftsoones committed to the constable to be whipped."

I give this in full to show how carefully and precisely these Acts were worded. The second section provides that any constable refusing to punish is to be committed to gaol and the third section very fairly stipulates that no justice of the peace or head officer is to execute this statute for offences done to himself.

3. The 9th Year of William III. Cap. XII. 1697.

Section XII. of this Act is of some interest in respect of what it prescribes concerning boundaries and hedges. It run as follows:

> " The mears of lands between propriety and propriety . . . shall, at equal charge of the proprietors thereof, or their tenants, be enclosed with good ditches, where earth sufficient may be had to make the same, and thereon one or two rows of quick sets shall be planted, and where earth shall be wanting, such other fences shall be made as the nature of the soil shall permit."

It would be interesting to know if this Act has ever been repealed. A later statute is concerned with the same thing.

4. The 10th of William III. Cap. XII. 1698.

This is undoubtedly the first really important legislation of a true forestry character in the statutes, and it has a special silvicultural interest. A point to observe is that the coming into force of the Act was post-dated for five years to the 25th of March, 1703, obviously to give persons concerned time to grow the trees required, which had to be four years old (not five as Litton Falkiner has it). As we shall see, even this time was not enough.

The explanation of the necessity for this statute, and it shows how phases of forestry history tend to repeat themselves from time to time, is as follows:

> " Forasmuch as by the late rebellion in this Kingdom, and the several iron-works formerly here, the timber is utterly destroyed, so as that at present there is not sufficient for the repairing the

houses destroyed, much less a prospect of building and improving in after times, unless some means be used for the planting and increase of timber trees. . . ."

The first section of this statute enacted, that from 25th March, 1703, all persons, being residents within Ireland, having estate of freehold or inheritance therein to the annual value of ten pounds or tenants for years of which eleven had still to run, paying a rent of ten pounds, should plant every year at seasonable times of the year for 31 years. . . .

". . . ten plants of four years' growth, or more, of oak, firr, elm, ash, walnut, poplar, abeal or elder, in some ditch or elsewhere, on the said lands."

It was also provided that the planters should preserve the trees. In addition, every person or society having iron-works had to plant 500 yearly every year he or they had the said iron works. Incidentally, Forbes (2) is in error in saying that the amending Act of 1705 (the fourth, not the fifth year of Anne) extended the trees by adding walnut, poplar, abele and alder. The first three of these were already included in this Act and the last was meant to be, but by mistake "elder" was substituted for "alder." Silviculturally, the list is interesting for comparison with later lists. It is not clear whether the word "firr" may have embraced other species than Scots pine. Forbes (2) comments on the omission of beech and Spanish chestnut.

The second section provided that occupiers of 500 acres or more (plantation, i.e., Irish measure), other than tenants in common, over and above the aforesaid 10 trees, should enclose and plant one plantation acre thereof in seven years from November, 1698, with a good, sufficient fence of stone wall, ditch, hedge, pales or rails and. . . .

". . . plant one plant, at least one foot above the ground when planted for every ten foot square contained in such area in such method as he, she or they shall think fit."

The acre had to be preserved for twenty years. I take it that the height of the plants was to be at least one foot and not that the base of the tree was to be perched up on a mound a foot high. The planting distance, it will be observed, was very wide and works out at 435 trees per statute acre (705 per Irish acre).

The third section provided that every person, body politick or corporate in possession of any lands or anyone in possession of lands in dower, jointure, by courtesie, or who had possession of land as mortgagees or as creditors or by any other ways or means, should be liable to plant a . . .

". . . proportion of 260,600 trees of oak, elm or firr of the age and size afore-mentioned yearly for 31 years from 25th April, 1703, in such manner and proportion as hereinafter is expressed."

The proportions are then given in Clause IV., as follows:

Antrim	9,750	Kerry	4,600	Monaghan	4,500
Ardmagh	4,750	Kildare	7,150	Queen's Co.	3,950
Catherlogh	3,250	Kilkenny	9,000	Roscommon	6,500
Cavan	4,600	Do. City	700	Sligo	5,200
Clare	7,800	King's County	3,900	Tipperary and Holy Cross	18,200
Cork	26,600	Leitrim	3,250	Tyrone	6,500
Donegal	8,350	Limerick	9,600	Waterford	6,550
Down	8,400	Do. City	1,300	Do. City	1,050
Dublin	31,900	Londonderry	6,500	West Meath	6,600
Do. City & Liberties	21,500	Longford	2,600	Wexford	6,500
Fermanagh	4,550	Lowth	5,200	Wicklow	3,250
Galway	11,800	Drogheda	650		
Do. City	1,300	Mayo	6,500		
		Meath	18,200		

It is not very clear upon what basis these proportions were calculated, but presumably not upon the suitability of the various counties for planting. It was more likely on a basis of their financial capacities and in relation to the number of occupiers, free-holders and tenants in the various areas. Observe, too, that the species are now reduced to three—oak, elm and firr. This was amended later.

Section V. provided that the Grand Jury in 1702 should apportion the number to be planted in each barony and subdivide the figure over the various parishes; the apportionment to be certified by the high constables.

Section VI. provided that each high constable should deliver the list showing the trees to be planted in each parish to the ministers and church wardens, who then had the task of making the final adjustment amongst individuals, after discussion and agreement at a vestry, all within a prescribed time. Forbes quotes the record (3) of an instance in County Down where, at a vestry held on 9th March, 1708, in the parish of Seagoe, it was agreed that 137 persons, holders of 30 acres each (in accordance with the amended Act) should carry out the provisions of the Act. If each person in that parish alone planted his ten trees *per annum* they would have completed 1,370 out of the 8,400 trees allotted to the county. There are now 67 parishes in the county, so that Seagoe was undertaking to shoulder a high proportion of the task in that county. No doubt efforts were made elsewhere to comply with this unique Act. It is very probable that the mathematics of the statute were not on a sound basis and the scheme may have been impossible to work on account of its lack of concentration.

Subsequent sections in this statute provided for tenants, mortgagees and creditors in possession securing compensation from landlords, on the latter resuming the lands, to the extent of . . .

> " . . . twopence per tree planted under the Act which shall be found growing on the lands in good condition for timber, not being cut, broken or thinted, but well fenced and preserved, according to the intent and meaning of this Act."

The word " thinted," now obsolete, does not occur in any dictionary I have consulted. Failure to pay compensation was to result in a levy upon the estate under warrant if necessary, supported by two credible witnesses, if necessary. Further, a lessee with less than twenty years of his term of lease to run when he planted his acre could claim . . .

> " . . . the sum of ten shillings yearly towards the maintaining and supporting of the fence,"

besides being allowed to deduct the yearly value of the acre from his rent.

An important section number XII, stipulated that no sheep or cattle of any sort must be allowed to graze or trespass on the land so inclosed. The penalty on conviction for the offence was to be twenty shillings, half of which was to go to the poor and half to the informer.

The next section, number XIII, seems to have been a genuine attempt, amongst other things to keep the goat in its proper place. The nuisance of cutting of trees for gads or gadds, that is, goads for driving plough oxen, etc., makes its first appearance and remains a sore point through several reigns. This section is:

> " No person whatsoever shall strip bark from any growing or standing tree whatever, or shall cut, make, or sell any gads made of oak; or shall cut or place at their doors or elsewhere any green trees, commonly called May-bushes; or shall keep any goat or goats other than in mountains, under the penalty of forfeiting the same, and likewise of paying the sum of twenty shillings for every such offence, to be levied as hereinafter directed."

Here again the informer and the poor of the parish were to go halves on the proceeds of the fine.

Section XIV. speaks for itself and gives some idea of how generally useful the forest then was.

"And whereas the bark of standing trees has been heretofore usually stript for tanning hides of stolen cattle in boggs and other private places, and for dying linnen yarn, thread and skins by persons in private houses"—for remedy whereof—"be it enacted that no broag maker or others, except publick tanners shall tan or keep in pit hides or skins nor any person except known dyers shall colour linnen yarn, etc., with bark." The penalty was forty shillings.

Section XV. was designed to clear up certain points concerning trespass:

"And whereas several idle and vagrant persons do usually cut down or grub up the roots, upon presumption that such offence, being no more than trespass, they may escape punishment; for remedy whereof be it enacted — That from and after the 20th November, 1698, every person and persons, who between sun-rising and sun-setting shall saw or otherwise cut down any tree or trees, not being thereunto authorised by the person who has a right to such tree or trees, shall for every such offence forfeit to the owner treble the value and shall pay a fine not exceeding forty shillings and not under five shillings as the justice deems reasonable, in default of which"

—to the house of correction for three months. It is pointed out that cutting of trees after sunset and before sunrise was already a felony.

The comprehensive nature of Section XVI. is to be admired. From it one can conjure up quite a vivid picture of drama in country life. It runs thus:

"And whereas divers persons do hire themselves to work in noblemen's, gentlemen's and nurserymen's gardens, with design to steal from thence trees, plants, greens, or flower roots or to give notice to their accomplices how and at what times they may steal the same . . . be it enacted—That all and every person, who shall be taken with or found having or selling any sort of fruit-tree, nursery plant, trees, green plant, flowers with their roots, or their roots alone, or any quantity of fruit, such person not having a nursery, flower garden or orchard of his or her own, or who does not publickly follow the trade of buying and selling fruit; or who shall be taken with beehives with honey or combs in them, or with fresh honey in combs, and not keeping bees of his or her own, shall be obliged to prove how he or she came by the same; and upon failure of such proof shall be deemed and taken to be guilty of stealing."

Subsequent sections arranged for appropriate penalties for failure to plant. These were for every ten trees ten shillings, for every 500 trees, five pounds, and for every acre not enclosed and planted, five pounds. The trees had to be preserved till the end of the lease and if the occupancy changed hands, the new occupier became liable. Curiously enough, the proceeds of the penalties and fines levied and paid, other than those specially specified above, had to be applied to the encouragement, not of planting, but of the linen and hempen manufactures, after defrayment of the necessary charges of the several sessions.

We may regard this Act as a valiant attempt to encourage and protect forestry activities, however small, and to discourage malicious damage and check harmful trespass in woods. It shows that the fundamental needs for successful planting were fully appreciated at that time. The statute, apart from being compulsory, had its great weaknesses, however, and it had its opponents, who were not long in bringing pressure to bear to have it modified. (See item 6.)

5. The 2nd Year of Anne. Cap. II. 1703.

This Act is of special significance as it very definitely attributes the destruction of the forests to the home iron industry; proposes to encourage the importation of iron from abroad and also that of bark, barrel staves and other forest produce, while at the same time ensuring, of course, her Majesty's revenue. The first section reads as follows:

> "Whereas the great duties laid on foreign iron are a great discouragement to the importation thereof, and tend to the lessening of her Majesty's revenue, and to the destruction of the woods of this kingdom; and whereas there is great scarcity of all sorts of timber in this kingdom, and the great duties laid on hoops, bark, laths, and on staves imported for making barrels, pipes, or casks are a great hindrance to the importation thereof; for the remedy thereof be it enacted . . . after 1st November, 1703, all duties on unwrought iron, bark, hoops, laths, staves and timber for casks shall cease. . . ."

The new duties substituted were five shillings custom and five shillings excise per ton of iron imported and sixpence custom and sixpence excise per 1,200 staves for casks; one penny per 1,200 for hoops or laths and the same per barrel of bark.

The second section was designed to restrict export of timber by increasing the existing duties, as follows:

> "And for the preventing the exportation of timber out of this kingdom to any ports beyond the sea, other than to the kingdom of England, be it enacted that there shall be paid over and above all duties now payable £2 10s. per ton for timber or planks and proportionally for any greater or less quantity; 5/- per 1,000 for laths; £3 per 1,000 for staves."

Timber made up as part of a ship or vessel was exempted. The last section is an illustration of the fallibility of the statute-maker. It provides that the word "elder" in the 10th of William III., XII., should be amended to "alder."

6. The 4th Year of Anne. Cap. IX. 1705.

This was an explanatory Act to explain and put into execution items 2 and 4 above. The first eight sections made important changes in 10th William III., XII.

In the first place the liability to plant ten trees annually was to be determined on an area basis in place of a valuation basis, namely:

> "such person as hath or holdeth 30 acres of land or more in manner aforesaid and no other person or persons whatsoever."

Secondly, the following areas were specially exempted from liability—the city of Dublin, the city and suburbs of Londonderry, either within them or within one mile of them, and any area within one mile of any city or town corporate. We can only surmise why this attitude, which is the antithesis of modern ideas on town planning, was adopted, but it may have been for local defence reasons.

Thirdly, certain penalties which individuals had incurred under the previous Act by reason of the shortness of time allowed for planting were remitted, and fourthly, an extension was allowed for planting to those not now exempted up to 25th March, 1708; that is, an extra five years.

Fifthly, the omission of ash in Section III. of the main Act was rectified and ash was included along with oak, elm and firr. Why will these legislators not take and act upon the advice of their technical advisers?

Sixthly, people holding land in several parishes were allowed to do all the planting for which they were liable in one parish, and the

penalty for not planting was reduced from one shilling per tree to "twopence and no more, for every tree not planted." That amendment may have done more to kill the Act than anything else. It must have cost a great deal more to grow or buy and plant a decent-sized tree, even in those days.

The seventh section opened a rather wide loophole for evasion and gave much scope for differences of opinion. It enacted:

> "That where lands are mountainous, and of a nature that will not nourish trees, or so very near the sea that trees cannot thrive or grow, the occupiers of such lands may appeal to the quarter-sessions of the peace in the respective counties."

As a result of the appeal in such cases, the Grand Jury were given powers to acquit owners or occupiers of any penalty for not planting trees.

The eighth section affirmed, with a view to removing all doubt as to liability:

> "that all and every person in actual possession and occupation of the several lands in this kingdom, whatsoever estate such person shall have in the lands, shall be obliged and liable to the planting. . . ."

Section IX. returns to the charge concerning gadds, now accompanied by withs, and is once more solicitous of the future of the hempen manufacture. It runs as follows:

> "And whereas great quantities of young trees are daily destroyed by the making of gadds and withs, and that it will very much conduce to the incouragement of the iron and hempen manufactures, that gadds and withs be no more used in this kingdom, be it therefore enacted . . . that from the 1st November no person or persons shall make or use in plowing, drawing of timber, or other work whatsoever, or in wattling the walls of houses, or cabbins, or out-buildings, any kind of gadd or gadds, wyth or wyths, of oak, ash, birch, hazel or other tree whatsoever. . . ."

Section XI. was intended to reinforce the 10th Charles I., XXIII. and is interesting for its expanded list of minor forest products. It enacted:

> ". . . . that if any person or persons unlawfully, and without consent of the owner or owners, possessor or possessors, shall from and after the 1st of August, 1705, take, cut or spoil any kind of wood or underwood, poles, or young trees, clap boards, barrel staves, shingles, gadds, wyths, wattles, willows, or shall dig or pull up any fruit trees or other trees or break or cut any hedge, pales, rails, or fence . . ."

shall pay ten shillings to the poor over and above satisfaction to the aggrieved party. Where the satisfaction exceeded ten shillings, the offender was to be bound to the next sessions, and in default to be committed for one month or whipped; for a second offence, three months or whipped; for a third offence, two years and deemed to be an incorrigible rogue. The authorities were obviously getting vexed. This Act further provided that—

> "any person by warrant of a justice may search suspected houses and places for any wood, under-wood, poles, trees, clap-boards, barrel staves, poles, rails, stiles, posts, gates or for any gadds, wyths, willows, hedge-wood, bark, rind or coat of any tree, unlawfully barked as aforesaid. . . ."

Buyers or receivers might have to pay treble to the injured party if the value was less than thirty shillings, otherwise the case came before the sessions.

Before leaving this statute finally and passing on to the next item, it is important to note that although tenants and occupants, other

than those who held in fee simple, were liable to plant trees, the right to the trees vested in the landlord. The only compensation allowed was to be twopence per tree found growing in good condition when they gave up the land, and in respect of the planted areas an abatement of ten shillings *per annum* on the rent for upkeep, *plus* the yearly value of the acre planted. As we shall see, quite a struggle ensued before the position of tenants was so modified as to make them really interested in the fate of the trees, and so enthusiastic planters.

7. The 9th of Anne. Cap. V. 1710.

The Irish councillors of Anne were having a good deal of bother over William's Act and found it necessary to produce "An Act for the further explaining and putting into execution of an Act for planting and preserving timber trees and woods."

The first section of this Act was meant to bring pressure to bear on the clerks of the Crown and the high constables to see that all individuals concerned in the planting under William's Act were advised to that effect and of their responsibilities. The officers had to do this on penalty of a forty-shilling fine within a stated period and in each parish a book with the list of the persons liable to plant, which could be consulted as required, was to be provided—at the cost of the parish. For their trouble these officers were to be entitled to a fee. Failure to comply with the Act was attributed either to the non-observance of the methods prescribed for proportioning the trees or to the fact that the methods had not answered the good intent and meaning of the Act.

The second section provided for the remittance of penalties for not planting, under the main Act and under 4th Anne IX., already incurred by any person whatsoever, for not planting any sort, number or quality of trees as required by these Acts.

The following section again post-dated the time allowed for execution for four more years until 25th March, 1712. Not much progress had been made in the fourteen years since the inception of the scheme.

The fourth section is of peculiar interest, as it shows that some effort at least has been made to comply with the Act of William and also provides evidence of the existence of a tree nursery trade. It reads:

> "Provided always, and be it further enacted by the authority aforesaid, That all trees, hereafter to be planted pursuant to the several acts herein before mentioned, be planted out of nurseries only, and not from woods and other places as have been too frequently practised, to the destruction of woods and timber: and in case any person or persons do or shall plant otherwise than as is hereby directed and required, he or they so planting shall, for every tree or trees so planted from the woods, forfeit the sum of two pence for each tree, to be recovered in a summary way by civil bill at the assizes by such person or persons, who shall prosecute or sue for the same."

The question is: Who would?

Section V. made another attempt to put a stop to the cutting of young growth for "gads or withs," as follows:

> "and whereas the cutting and using gads or withs is found to be very destructive to all young plantations of woods; be it further enacted . . . that any person or persons who shall from and after the first September, 1711, cut or make use of any gads or withs on his or their plows, carrs, carts, harness, tackle or otherwise; or in whose custody or possession any gads or withs shall be had or found, either selling or using the same, shall for every gad or with so cut, sold or found, forfeit the sum of two pence, to be immediately paid to the informer by the said offender or offenders. . . ."

The offender could not get away with a blank refusal to pay, for, if he did, by warrant of the nearest magistrate the sum could be secured from him by levy, and if there was no convenient magistrate the constables could claim payment, and, if that was refused, could hail the offender before the next justice to levy double the sum and if the offender had no means of paying the levy he could finally be whipped. Prosecution, however, had to be within one month of the offence.

All this bother about these small items may seem trivial now but it should be remembered that nearly all the trees planted were broad-leaved trees and that the planting distance was very great and it must have been very galling to planters to see their young trees cut and removed just when they were beginning to grow.

8. The 2nd Year of George I. Cap. XVI. 1715.

So much for Anne. Coming now to the first George, we find that his councillors were extremely interested in the matter of butter-boxes, a subject first dealt with by the third William in Cap. II. of his tenth year in 1698, an Act for reforming abuses in the making of butter-casks and preventing of false packing of butter. This laid down that the casks were—

> "... to be made of sound, dry and well seasoned timber in different sizes for firkin, half barrel, three-quarters barrel and barrel, and every such cask, hereafter to be made, shall be made of three hoops in each quarter, to be set on with twiggs or sufficiently notched, and have two heads to be put into riggles and made tight, so as to hold pickle. . . ."

Forestry interest in these Acts relating to butter-casks lies in the kinds of timber specified. William's Act does not specify any species.

The title of the Act now under consideration brings the butter-cask problem and the planting problem together. It runs thus: "An Act for the more effectual amendment of the law in relation to tallow and butter casks, and of an Act for planting and preserving timber trees, and woods, etc."

The first section prescribed that the tare of the casks should be branded on the sides and bottom and gave the main reason for the Act. Complaints had been made by merchants and traders in butter and tallow that these commodities had been brought into great disrepute abroad, and did not command their just price, because of the fact that in spite of several Acts of Parliament:

> " by the fraudulent dealing and practices of coopers, in making the casks for packing of butter and tallow of unseasoned timber; and of farmers, owners and packers of the butter and tallow in packing their butter and tallow in casks, weighing more than by law they ought to do. . . ."

Section II. goes on:

> " And for the preventing the fraudulent practices of coopers in making casks of unseasoned and boggy timber, be it further enacted —That from the 24th of June, 1717, no butter casks shall be made, or butter exposed for sale in any cask but such as are made tight and will hold pickle and made of well-seasoned timber, either of oak or ash, and to be of the sizes and dimensions following (viz.) the firkin containing half a hundredweight of butter at the head and bottom of the cask to be of the breadth of 10½ inches, at the bung 11½ inches, and the length within the cross 16 inches and to contain 7 gallons and no more . . . etc. . . . etc. . . (up to two hundredweight casks) . . . at the heads and bottoms of the said casks to be set into the cross and the cantils to be dooled, and every cask, so to be made, shall be with hoops twigged and no other . . . and no other cask to be made and exposed for sale."

Sections III. to VII. dealt with tallow casks, and Section VIII., complaining that, notwithstanding Section V. of Anne's Act (item 7):

"great quantities of gadds and withs are daily sold in markets and fairs to the great destruction and almost utter ruin of the young growth of wood in this kingdom; for the better preserving whereof . . ."

further enacted:

"Any one may seise gadds or withs found in any fair, market, town or place to his own use and any in due possession found, to be brought before the justice to be whipped."

It is not at all clear under this and other acts just who were empowered to do the seizing and who were to be subjected to it.

9. The 4th Year of George I. Cap. XII. 1717.

The authorities had put their foot in it by departing from the safe procedure of not being too explicit in their definitions and this statute was enacted to amend the preceding one. It arranged for changing the specifications of the butter-casks and for allowing the casks to be larger or smaller, because the dimensions specified were not sufficient to contain the quantity of butter directed by the previous Act to be packed in the casks, and it was found impossible to restrict coopers to the making of casks of one and the same size. How easy it would be to reconstruct the caustic comments of the said coopers on this point!

10. The 8th Year of George I. Cap. V. 1721.

This is a sequel to item 3 above and is worth recording, as it gives a good idea of the specifications of many of the boundary ditches and fences which still exist. The title is: "An Act to oblige proprietors and tenants of neighbouring lands to make fences between their several lands and holdings." They were . . .

". . . obliged to be at equal expence in making good and sufficient ditches of six foot wide and five foot deep at least, where the same is practicable, well and sufficiently quicked in good husbandlike manner with white thorn, crab, or other quick sets, where the same will grow, and in ground where such quick-sets will not grow, with furz, and where furz will not grow, or where ditches cannot be made of the said depth and wideness, instead of a ditch with a dry stone wall, where stone can be conveniently had and where stone cannot conveniently be had with a clay or mud wall not under 5 feet high and 2½ feet thick at bottom, and 1½ feet thick at top and in wet low ground with sufficient trenches or drains, the banks whereof to be planted with sallows, alder or other aquatick trees, where such aquaticks will grow. . . ."

11. The 8th Year of George I. Cap. VIII. 1721.

The authorities had now come to the conclusion that the 10th of William III., XII. was really unworkable and ineffective and decided to repeal the main provisions of that Act, while at the same time trying to encourage planting by granting tenants some rights in the trees planted by them, or, as the title of the Act said to give "further encouragement to plant and preserve timber trees and woods"—a step in the right direction. Thus ended, after a period of twenty-three years the first attempt at compulsory afforestation.

The preamble confessed that the main Act in question—

"has in a great measure proved ineffectual and several persons who through inadvertence or want of ability have not complied with the directions in the said Act for planting and preserving timber trees

and woods, may have incurred great penalties and whereas . . . (etc.) . . . Sections I., II., III., XVI., XVII., XVIII. and XIX. are all repealed and all his Majesty's subjects discharged, released and forgiven all the fines, forfeitures, penalties, other than such as have already been paid. . . ."

Section XIII. in respect of bark, gadds, may-bushes and goats; Section XIV. in respect of use of bark for tanning and dying; Section XV. in respect of the cutting down of trees without the requisite authority between sunrise and sunset; and Section XVI. in respect of stealing or selling various commodities, were not, however, repealed at this stage. In fact, Section III. of the new Act enlarged somewhat on Section XVI. of the main Act.

In the meantime, an important and silviculturally interesting section, numbered II., enacted, for the better encouragement of plantations. . . .

". . . That where any tenant or tenants for life or lives or years, of any lands in this kingdom of Ireland shall during his, her or their term, plant in or upon the same any trees of oak, ash, beech, firr, wallnut, alder, elm, poplar, abeal or birch and shall preserve the same, such tenant or tenants or his, her or their executors, administrators or assigns respectively, shall at the expiration of such term or estate be intituled to, and shall have liberty, and is and are hereby authorized and impowered to fell and carry away for his and their use and benefit one-third part of the several kinds of such trees so by him, her or them planted and which shall at that time be standing and preserved on the lands so held in lease as aforesaid."

We should note the addition to the list of approved trees of beech and birch and that beech is given third place.

The third section complains that several saplings have been destroyed by making bows and back-bands for cars, and enacts:

". . . that from and after the 1st January, 1721, no person or persons shall presume to make use of any part of any sapplin or tree as or for a bow for a carr, or any sapplin, gad or any piece of stick or wood for or as a back-band for a carr, or scollops of oak or ash for thatching of houses, or shall presume to make use of any oak-sapplin or sapplins for walking sticks, handles of whipps or switches" . . . under penalty of forfeiting five shillings or being whipped.

12. The 10th Year of George I. Cap. IX. 1723.

This was another butter-cask statute and has a silvicultural interest for its mention of sycamore. Its Section VIII. enacted that—

". . . such cask shall be made of good seasoned oak, ash or sicamore, whereof no part to be bogg timber and made tight that they will hold pickle, with head and bottom equally dooled and set to the cross, with 12 good fresh sufficient hoops on each cask, all well twigged with good fresh ozier twiggs."

13. The 12th Year of George I. Cap. V. 1725.

Again on the subject of butter-casks, Section V. of this statute prescribed that after 25th April, 1726, it would be "lawful to make up and pack butter in any cask or casks of good seasoned beech, birch, willow or sally, whereof no part is of bogg timber, as well as of oak, ash or sycamore." This would seem to show that sycamore had been planted for some time, probably from before 1700.

14. The 5th Year of George II. Cap. IX. 1731.

Only two of the statutes of the second George were concerned with planting, but each represented a step forward. This statute was "An act to encourage the improvement of barren and waste land and

boggs, and planting of timber trees and orchards." Section IX., referring to Section II. of item 11 above, provided that:

". . . such tenant or person instead of such third part shall have an equal moiety of all such trees as he or she or they shall hereafter plant in pursuance of the said act."

A further sop was held out to tenants in respect of orchards and for each tree planted in an orchard by a tenant, he was entitled to receive one shilling from the reversioner, when his term was up.

15. The 9th Year of George II. Cap. VII. 1735.

This statute gave the executors or administrators of a tenant for life or tail title to a moiety of any timber the tenant had planted, except on an avenue or garden walks. He could leave his half share in any oak, ash, elm, firr or any other timber tree planted in his lifetime to his heirs on certain conditions. This was evidently done to round off the ninth section of the preceding Act.

16. The 5th Year of George III. Cap. XVII. 1766.

There is a wide gap of thirty-one years between the previous statute and this one. The reason for this may have been the enormous progress made during this period throughout the country in rural matters, to which Forbes has referred. The development and laying out of demesnes, which entailed a great deal of planting by landlords, must have done much to allay anxieties about a shortage of timber. No doubt timber imports also increased. From 1741 up to 1808 the Royal Dublin Society through its premium scheme for planting and the stocking of nurseries must also have helped on the good cause.

A number of important statutes were enacted in the reign of the third George which were very helpful and encouraging for forestry, because they set out to remove the remaining disabilities which prevented tenants who planted from reaping adequate rewards for their work. The one under consideration, entitled "An Act for encouraging the planting of timber trees" was the first to be so.

By its first section it relieved tenants from being "impeachable for waste" in timber trees or woods, which they themselves had planted; that is, accountable for all materials used from these woods. The section reads:

"Whereas the distress, this kingdom must soon be in for want of timber, is most obvious; and it is equal to inheritors, whether tenants do not plant, or have a property in what they plant; be it enacted by the King's most excellent Majesty . . . that from and after the 1st day of September, 1766, tenants for lives renewable for ever paying the rents and performing the other covenants in their leases, shall not be impeachable of waste in timber trees or woods which they shall hereafter plant, any covenants in leases or settlements heretofore made, law or usuage to the contrary notwithstanding."

The second section is of silvicultural interest because the following new species are added to the list of trees given—pine, chestnut, horse chestnut, quick or wild ash. It reads:

". . . from the time aforesaid, any tenant for life or lives by settlement, dower, courtesy, jointure, lease, or any office, civil, military or ecclesiastical, impeachable of waste, or any tenant for years exceeding 12 years unexpired, shall plant sally, ozier or willows, the sole property of such shall during the continuance of the term vest in the tenant and he may cut and fell the same under the restrictions hereinafter mentioned; and if such tenant shall plant any timber trees of oak, ash, elm, fir, pine, walnut, chesnut, horse chesnut, quick or wild ash, alder, poplar or other timber trees,

such tenant during the tenancy shall be intitled to house boot, plow boot, cart boot. and carr boot of such trees by him planted, and at the expiration of the term, or where such trees shall have attained maturity, which shall first happen, shall be intitled to the said trees or the value of them according to the directions hereinafter mentioned, any covenant, etc., notwithstanding. . . ."

The third section stipulated that the tenant must lodge a certificate with the clerk of the peace giving the numbers and kinds of trees planted, their height and years' growth at the time of planting and a clear description of the place and manner in which they shall be planted.

The tenant was allowed one year after expiration of his term to fell, coal, that is, convert into charcoal, or manufacture the trees to which he was entitled.

The reversioner had the right, however, one year before the term of the lease expired to make a claim to buy the trees, whose value had to be determined by a jury. Certain special cases were also provided for.

17. The 7th Year of George III. Cap. XXIII. 1768.

" An Act for the further preservation of Woods and timber trees " was another attempt to protect woods and plantations, but its chief interest lies in the method of valuation adopted for small trees. The initial section reads as follows:

" Whereas several acts passed for the preservation of woods and timber trees have been ineffectual . . . be it enacted that from and after the 1st August, 1768, every person or persons who shall grub up, saw or otherwise cut down any tree or trees not being authorised by the owner or owners, shall forfeit the value to the owner on conviction, as follows: . . . every ash, elm, beech, or sycamore tree of ½ inch diameter not less than 6½d.; of 1 inch, 1s.; 2 inches, 2s.; 3 inches 2s. 6d.; 4 inches, not less than 3s.; 5 inches, 4s.; 6 inches, 4s. 6d.; 7 inches, 6s.; 8 inches, 8s. . . . and every oak tree at double the value . . . over that size to be valued by two appraizers and the diameter of every such tree shall be measured at the butt end. . . ."

Other provisions of the Act were that receivers of stolen timber were to be gaoled; bark-stripping was to be penalised and the right of search for stolen goods granted. There was a right of appeal to the sessions.

18. The 15th and 16th Years of George III. Cap. XXVI. 1776-7.

This statute is obviously the result of a determination to tidy up existing legislation concerning forestry matters; to get rid of unnecessary and confusing material and to provide for the retention in a clearer form of the more essential enactments, with such amendments as were deemed desirable. This is made clear by the initial section, which reads:

" Whereas the several acts of parliament . . . have not had the desired effect, and to avoid confusion which may arise from the multitude of the laws relative to the same subject, it is thought expedient to repeal the said several acts and to make one new act containing all such parts of the said acts as are proper to be continued, with such alterations and additions as are herein after contained. . . ."

This Act, which was called " An Act for encouraging the cultivation, and for the better preservation of Trees, shrubs, plants and roots," therefore repealed the following statutes: 10th William 3, c. 12; 4th Anne, c. 9; 9th Anne, c. 5; 8th George 1, c. 8, and 5th George 2, c. 9; that is, items 4, 6, 7, 11 and 14 above. The important new Act

of 1766—5th George 3, c. 17—was not repealed but was, indeed, amplified in a subsequent statute.

Section II. was concerned with the question of protection of woods and contained a good deal of new matter. It provided:

". . . that from and after the first day of May, 1776, every person, who shall wilfully cut down or break down, bark, burn, pluck up, lop, top or otherwise damage, spoil or destroy any timber tree, or fruit tree, or any young trees or shoots, or any part thereof, without the consent of the owner or owners thereof first had and obtained, or who shall be aiding or assisting in so doing, or who shall have in his, her, or their possession any timber tree, or any kind of wood, underwood, poles, sticks of wood, shoots or young trees, shrubs,, plants or roots, and shall not give a satisfactory account, that he, she or they came fairly and honestly by the same, or who shall fix up in any church or chapel the green branches of any tree or shrub, or any part of tree or shrub, having the leaves on it, except holly, bay, laurastina, yew or ivy, and shall thereof be convicted . . . be fined an amount not exceeding £5 or imprisoned for six months."

Section III. purported to be a definition of the term "timber trees" and is of special interest because of crtain new items, namely, larix and sycamore—which come fifth and sixth respectively—cherry, lime, holly timber, sallow, asp and cedar. Nineteen species are now named, thus:

"Be it further enacted . . . That all oak, beech, ash, elm, larix, sycamore, walnut, chesnut, cherry, lime, poplar, quicken or mountain ash, holly timber, sallow, asp, birch, cedar, pine or fir trees shall be deemed and taken to be timber trees, within the meaning and provision of this act and of any other acts in force in this kingdom relative to timber trees."

Section IV. is more or less a repetition of previous statutes in respect of theft, the gist of it is that anyone may be fined forty shillings or get three months in jail who is convicted, if he . . .

". . . wilfully cut down, or break down, pluck up, or spoil, harm or destroy, or take, carry or convey away any shrub, plant or root, shrubs, plants or roots, out of the nurseries, gardens, woods or fields of any other person . . . or aid in so doing . . . or who shall make use of any gads, withs, bows or backbands, made of wood, on his or their plows, harrows, cars, carts, harness or tackle or . . . found in his possession . . . or shall make use of any scollops of oak or ash, or any other tree for thatching of houses . . . or set up any bush . . . or keep bark or rind of trees, not being a tanner. . ."

Section V. is of some importance. It prescribes a penalty against clerks of the peace for failing to file planting records in accordance with the provisions of the previous statute (item 16). This neglect led to the provision of very detailed instructions for registration in the following statute (item 19).

19. The 23rd and 24th Year of George III. Cap. XXXIX. 1784-5.

This statute, which may be regarded, as far as tenants were concerned, as the climax to which many of the preceding statutes had been leading step by step, greatly improved their position as tree planters. The first section, giving as the reason for the need of a further statute that "the laws for the encouragement of tenants to plant timber trees" had proved ineffectual, now provided that persons in the positions already defined in Section I. of item 16 (except that the unexpired term of a tenant for years was raised from 12 to 14 years), who not only planted, but caused to be planted any trees, was to be entitled, not only to cut and fell these for the provision of

materials for his own use, but also to dispose of the same, or any part of the same, not only at the expiration of his term or when the trees had attained maturity, but at any time during the term—subject to certain provisions.

Section II. dealt in great detail with the first of these provisions, namely, the registration of the planting, prescribing that—

"... any tenant so planting or causing to be planted, should, within twelve months after such planting, lodge with the clerk of the peace of the county, or county of a city where such plantations shall be made, an affidavit sworn before some justice of the peace of the said county, reciting the number and kinds of the trees planted, and the name of the lands, in form following:

I, A. B., do swear, that I have planted or caused to be planted, within twelve calendar months last past, on the lands of ..... in the parish of ..... held by me from ..... the following trees (here reciting the number and kinds of trees) and that I have given notice to the person or persons under whom I immediately derive, or his, her, or their agent, of my intention to register said trees, twenty days at the least previous to this day, and that I have given notice of my intention to register such trees, by publick advertisement in the DUBLIN GAZETTE, thirty days at the least previous to the date hereof, *or else*, and that I have also given notice of the same in writing to the head landlord, owner or owners of said ground or his, her or their agent, twenty days previous to the date hereof (as the case may be)."

It may be observed, that, in addition to giving notice to the immediate superior or his agent of intention to register, the tenant had also, either to give notice in writing to the head landlord or his agent, or, where that was not possible—presumably owing to the latter being an "absentee"—by public advertisement in the "Dublin Gazette." A very considerable number of these notices did appear in the "Dublin Gazette" for many years thereafter, and, while unfortunately they cannot be presumed to give a complete picture of all the planting carried out in the country, they do give some interesting silvicultural information, as will be described below. Evidently those plantings by the landlords themselves or by tenants where the landlord was not an absentee, were not recorded in the "Gazette."

The second section gave further detailed instructions as to how the county clerks of the peace were to keep the records of registered plantings, and what fees they were to receive and what penalties they incurred by failure to comply. The records were to be open to consultation by anyone on payment of a fee of threepence. It would be of great interest if some of these old record books could be unearthed, if they still exist.

Section III. was a new departure in forestry legislation and gave tenants the right to enclose any piece of ground containing coppice wood. The wording is as follows:

"And be it enacted, That if any tenant as aforesaid, shall inclose any piece of ground containing coppice wood, which he is not bound by his lease to inclose or preserve, and which has not been inclosed or preserved from cattle for five years preceding, the said tenant shall have power to cut, sell and dispose of the trees, which shall grow from said coppice at any time during his term, leaving one timber tree on every square perch of such coppice where timber trees are growing."

Section IV. provided for the giving of 12 months' notice in writing of intention to enclose to the landlord or his agent. Section V. provided that a map and a certificate should be lodged with the clerk of the peace within six months after enclosure. The gist of the notice was as follows:

"I, A. B., do swear, that I have inclosed ..... acres ..... roods ..... perches of the lands of ..... in the parish of ..... which I hold from ..... and that I have counted the number of trees exceeding six feet in height and which are now standing thereon, according to the best of my skill and judgment and that they amount to no more than ..... trees of the following kinds (here naming the kinds of trees and the number of each kind which they do not exceed) *or else* and that there are no trees exceeding six feet in height, growing upon said lands so inclosed by me (as the case may be) and that I intend to preserve said lands so inclosed from cattle, for the space of five years, that the copse may grow."

The trees left standing to the number apparently of 160 to the statute acre, remained the property of the landlord.

Later sections of this statute deal with the safeguarding of the landlord's position. He could appeal against a fraudulent registration and have it investigated and made ineffective. They make provision for the tenant selling his right to the standing trees planted by him to his landlord, such sale to be in writing and a copy lodged with the clerk of the peace. In cases of tenancy for life or of uncertain term, a year had to be allowed after the expiration of the lease for the removal of the tenant's trees, subject to payment of compensation for damage done in the process, amount to be settled by arbitration, if necessary. Any landlord wishing to purchase the trees of a tenant had to give the latter six months' notice to desist from cutting them. The value of the trees, allowance being made for expense of felling and damage likely to be done in the process, was to be determined in court. Failure of the landlord to pay the sum fixed before the next sessions resulted in the trees vesting in the tenant or his representative and he could then enter on the lands and remove them within six months' time without having to pay for damages unless they were wanton and unnecessary.

Provision was also made, on the surrender of a lease for renewal or on the granting of a new lease for the tenant's existing rights remaining in full force.

Section XIII. clears up a point which remained in doubt under previous statutes regarding action to be taken in the confiscation of stolen goods.

"And whereas it is usual with timber stealers to saw and work up as soon as possible the green timber they have illegally possessed themselves of; and it is not clearly understood that justices of the peace or those authorized by their warrant, have a power by any act now in force, to seize such wooden ware and wrought-up timber, as are offered to sale by suspected persons; be it enacted by the authority aforesaid, That any justice of the peace or person authorized under his hand and seal for that purpose, shall have power to seize all fresh wrought timber, whether wooden ware, cars, carts, fork or shovel handels, hoops, ploughs, harrows or rakes tails, when found in possession of any person or persons suspected of having become illegally possessed of the same; and if any such person or persons cannot give a satisfactory account of having procured them honestly, he or they shall be liable to such penalty, not exceeding triple the customary value of such goods, as the said justice shall adjudge, one half thereof to the use of the poor of the parish, and the other moiety to the informer; or if there be none, to such sub or petty constable or wood ranger, as shall appear to the justice before whom the offender is convicted, to have been the most active in carrying the law into execution."

The penalty in default of payment of the fine was first offence: three months; second, six months, and, for every subsequent offence, twelve months.

Section XVI. increases the penalties for offences by habitual timber thieves, and Section XVII. is a reminder that it is a felony to cut down trees between sunset and sunrise. The next clause announced that the provisions of the 7th of George III., c. 23, still remained in force.

Section XIX. was a new attempt to deal with the goat problem, as follows:

> " And whereas the keeping of goats either in woodlands or any unfenced country, greatly tends to the destruction of trees be it enacted, that owners of goats found trespassing may be fined 20s. on conviction, for every goat, to be paid to complainant or to the church-wardens for the poor of the parish. If any one find a goat trespass in his or her plantation he or she may take same and keep or dispose of it as his or her own property."

The last two clauses exempted trees planted under any special covenant of a lease and tenants evicted for non-payment of rent.

The Dublin Society.

Before going on to deal with certain information of forestry interest, derived from a perusal of several issues of the " Dublin Gazette," it may be mentioned that in addition to the nineteen items dealt with above, there were a number of statutes in the reign of the third George, which provided for the payment to the Dublin Society of grants from the exchequer, which usually amounted to sums of £5,000, one-half of which had to be applied to the encouragement of agriculture and planting. On one occasion in 1785 some of the money had to be used for the promotion of the importation of oak bark from countries whence it had not usually been imported.

Both Forbes (2) and Litton Falkiner (1) have dealt with the planting activities of the Royal Dublin Society between 1741 and 1808, and it is not proposed to go more closely into them here. Forbes tells us that 2,800 acres were planted over a period of 40 years and that nearly half the premiums awarded went to County Galway.

EFFECTS OF THE ACT OF 1784-1785

The proviso requiring registration in the "Dublin Gazette" of trees planted by tenants unable to notify their head landlords otherwise, had one fortunate consequence. It left a permanent record of a considerable proportion of all the tree-planting carried out between roughly 1785 and 1850. Detailed examination of all these records would show to what extent the Act was taken advantage of by tenants, but that would be a big task. Examination of the records for four years, namely, for 1805, 1810, 1829 and 1844, well scattered over the period mentioned, may, however, suffice to arrive at a fair estimate of the possible numbers of trees registered and, therefore, acreage planted, and from the result it is clear that very considerable advantage was taken of the Act and that, including planting done direct by landlords and planting by tenants, not advertised in the " Dublin Gazette," considerable areas must have been planted—very much greater than those under the Dublin Society's premium scheme.

In extracting details from the "Gazette" care has to be taken not to include repeat entries, as in many cases the same advertisement appears two or three times. The following table shows the number of registrations and the number of trees (and shrubs) included therein for the years mentioned, and, allowing a round number of 2,000 trees to the statute acre, the approximate acreage probably planted.

Year	Registrations	Number of Trees	Approximate Acreage
1805	... 57	360,177	180
1810	... 215	1,633,125	817
1829	... 117	986,258	493
1844	... 55	459,452	230
Total	... 444	3,439,012	1,720

Registrations went on, therefore, over a long period. There were still a few in 1854, and, in the sixty years from, say, 1791 to 1850, therefore, we may presume that some fifteen times the above totals were registered or a total of 6,660 registrations, involving some fifty million trees and some 25,000 acres.

It is important to realise that survivors of the trees planted during that period of sixty years would in 1940 be from 90 to 140 years of age and that, a very considerable proportion, therefore, of the old and mature trees which have been cut during the present emergency must have been planted under this Act. For that reason alone there should be some appreciation of the national service rendered by the framers of the Act and by the planters of those days. Absolute proof of the above conjecture can quite readily be obtained in perusing the record of registrations, as it is not unusual to find actual woods and townlands recorded where the old trees are standing even yet or from which they have recently been cut, for emergency firewood and other uses.

The distribution of registrations throughout the country is of some interest. For the years 1805 and 1829 it was as follows, the number for 1805 being given first:

Antrim	..	4	2	Kerry	...	1	3	Roscommon	...	1	3
Armagh	...	1	1	Kildare	...	2	6	Sligo	...	1	1
Carlow	...	0	2	Kilkenny	...	2	1	Tipperary	...	2	6
Cavan	...	0	5	King's Co.		0	0	Tyrone	...	0	1
Clare	...	1	7	Limerick	...	2	1	Waterford	...	1	1
Cork	...	12	24	Londonderry		4	1	West Meath	..	0	0
Donegal	...	1	2	Longford	...	1	1	Wexford	...	9	17
Down	...	1	1	Louth	...	3	0	Wicklow	...	0	4
Dublin	...	7	5	Mayo	...	0	7	Uncertain	...	1	2
Fermanagh	...	0	4	Meath	...	0	6				
Galway	...	0	2	Queen's Co.		0	1	Totals	...	57	117

Cork and Wexford seem to have been the counties where the scheme was most popular, which can possibly be explained as due to some difference in the system of land utilisation or land tenure. Galway, which showed up well under the Dublin Society's scheme, makes a poor showing here, while King's County, Leitrim, Monaghan and West Meath had no registrations.

INFORMATION OF SILVICULTURAL INTEREST

While these records are unable to supply information as to the absolute numbers and areas planted, they do provide interesting information concerning the silviculture of the time, especially regarding the relative popularity of the species which were planted and the trend of their popularity can also be seen.

The following is an example of a typical registration, showing the information which is available.

"Dublin Gazette." Saturday, 9th January, 1830.

"NOTICE. Take notice that I have planted or caused to be planted, within twelve months last past, on the lands of Cross in

the Parish of Ballyclay, Lower Half-Barony of Antrim, the County of Antrim, held by me from Henry Joy Tomb, of Belfast, Esq., the following trees, viz.: 3,000 Alder, 2,000 Beech, 2,000 Sycamore, 1,000 Elm, 2,000 Ash, 1,000 Mountain Ash, 1,000 Larch and 100 Silver Fir; and that I intend to register said trees, pursuant to the Statutes in that case made and provided—dated this 29th day of December, 1829. David Kirk.

"To Henry Joy Tomb, of Belfast, Esq., the Landlord of the Lands and Premises in the foregoing notice mentioned; and all others concerned."

From an analysis of the numbers of the various tree species planted in 1810, 1829 and 1844, the following percentages for these three years have been calculated. For comparison the proportion of species planted by the State Forestry Service in 1943, a century later is shown.

Species		1810	1829	1844	1943
Scots Pine	...	25.20%	25.30%	16.40%	26.50%
European larch	...	24.60	28.30	36.30	4.50
Norway Spruce	...	6.20	10.30	10.00	17.25
Silver fir	...	.80	.80	2.00	
Other conifers	...	.10	.30	.10	39.25
Total conifers	...	56.90	65.00	64.80	87.50
Ash	...	12.20	7.60	5.70	1.75
Beech	...	8.20	6.70	6.80	6.65
Oak	...	7.70	4.40	5.80	2.25
Sycamore	...	5.10	1.70	1.70	
Alder	...	3.10	6.90	4.55	
Elm	...	2.40	3.30	2.90	
Birch	...	1.90	1.80	1.15	
Horse Chestnut	...	.70	.10	.20	
Spanish Chestnut	...	.50	.05	—	
Willows	...	.50	1.90	1.55	1.85
Poplars	...	.40	1.20	4.60	
Hornbeam	...	.20	.10	.05	
Lime	...	.10	.05	.20	
Platanus	...	.10	—	—	
Walnut	...	—	.20	—	
Total Broadleaved Trees		43.10	35.00	35.20	12.50

The following points emerge from a scrutiny of the above table. The proportion of broadleaved trees used then was three times higher than it is now. As the percentage of the older coniferous species in 1943 is still some 48% as compared with 57% in 1810, the increased proportion of conifers is almost wholly accounted for by the use of more recently introduced species. In fact, Japanese larch, Sitka spruce and Corsican and Contorta pines account for nearly 38 of the 39¼% of other conifers used in 1943. It is interesting to see how Scots pine and beech have maintained, or rather recovered, their position in recent years. There was a steady rise in the popularity of larch—first mentioned in the 1776 statute—which replaced Scots pine as the most popular species by 1829 and had increased its lead by 1844. Norway spruce had also become more popular and Silver fir was three times more in favour in 1844 than in 1829. Sycamore fell off in favour after 1810, but trees suitable for wet ground or as nurses to more valuable trees, and incidentally of more rapid growth, increased in favour. Thus, Alder, willows and especially poplars had become more fashionable. The poplar proportion for 1844 is nearly twelve times higher than for 1810. Elm maintained its place very

well, while ash and hornbeam fell away. Oak fell away during 1829 but recovered ground by 1844, when the proportion was still double what it is nowadays.

Amongst the other conifers, one of the most interesting species mentioned is Weymouth pine. In 1810 this species was planted in twelve places, a total of 1,705 trees being used, but there were no records for 1829 or for 1844. In 1829, 1,500 "Pine Aster" were planted, and in 1844 310.

By 1844 considerable interest was being taken in different varieties of certain broad-leaved trees, especially of elms, of which the French, Cornish and Feather varieties were planted; of poplars, including the Carolina poplar, and the Ontario poplar, and of willows. At Ennismore in County Kerry, the Earl of Listowel planted varieties of elms and poplars. There is also a record in 1829 of Black Italian and Carolina poplars being planted in Armagh. Occasional locust trees, i.e., Robinias, are also recorded. Other rarer names recorded are Pearl birch, Gorgomel Sally or Gorgamill Sallow, Silver Abails and Norfolk Willow. In 1805 a few of the following were registered: Tulip tree, *Betula laciniata*, i.e., the Dalecarlian variety of the common birch, Black spruce, White spruce, Lote or Nettle trees (presumably *Celtis*), Cork trees, Deciduous Cypress, Virginia cedar, Judas tree, Scarlet hornbeam, and in 1829, Scorpion lime, Bloody lime, Turkey oak and Scarlet maple. This, however, does not exhaust the enterprise of these planters. At Kilmore in County Limerick the following extraordinary variety of species was planted and registered in 1829: Alder, Birch, Evergreen oak, Beech, Copper beech, Ash, Sycamore, French elm, Norway spruce, larch, Silver fir, Balm of Gilead fir, oak, holly, Arbutus, Philarea, Aleterna, Broom, Juniper, nut trees, bay, laurel, Acacia, Portugal laurel, lilac, Cittisis, Sweet briar, Lignum vitae, Cypress, quick, Cedar, pear, apple, plum and peach. This enterprising tenant, although he does not seem to have liked Scots pine, was leaving nothing to chance, so far as registration was concerned.

By far the greater number of plantings were of mixed conifers and broad-leaved trees in the form of a general mixture of the common hardwoods with nurses of conifers or alder and birch. A typical sample has already been quoted above. Here is another specimen taken at random from the 1810 "Gazette"—1,000 Scots pine, 1,000 Norway spruce, 2,000 larch, 2,000 Oak, 2,000 Ash, 500 Elm, 2,000 Beech, 2,000 Alder and 1,000 Horse Chesnut. Another example without the Alder and Birch comprised 5,000 Scots Pine, 1,000 Norway spruce, 1,000 Larch, 2,200 Oak, 1,000 Ash and 1,000 Beech. Planting of conifers alone or of one conifer alone were relatively rare. Instances of the valuable hardwoods being planted alone without nurses are extremely rare and it may safely be presumed that almost all the fine old hardwood trees still in existence, at least, before the present emergency, were grown originally in mixture with conifers which were taken out early on.

Records of the ages and sizes of trees used in planting are rare. Some of the remarks are "all four years old," "from two to four years old and one to four feet in height." One record for Galway gives four years for larch, ash, sycamore and horse chestnut and six years for Scots pine, beech and elm. A second record for Wexford gives three years for oak, and poplar and both three and four years for ash, pine and larch. A third from Cork registers five-year-old beech and four-year-old Norway spruce. Another for Kerry shows that sometimes quite large trees were used, the heights given being two feet for larch, one foot for pine, four feet for spruce and silver fir, 2½ feet for beech and sycamore, 4½ feet for lime, 5½ feet for alder and horse chestnut, 6½ feet for elm, 7 feet for hornbeam and 9½ feet for varieties of elm. There is no information given regarding planting distances and planting methods.

For the four years investigated, there is only one record of a registration of enclosure of coppice for preservation in accordance with Section IV. of the Act, as follows:

> " Grillagh, Ballymony, Co. Cork (Ash, Alder and Sycamore were planted); also I have copsed, or caused to be copsed, the Glins on said lands consisting of oak, heazle and birch; and that I intend to register the same. 11th February, 1830. E. H. Good, tenant of the Earl of Bantry."

The small area of woodland known as the Doctor's Glen, in Grillagh townland, about three miles east of Dunmanway, is probably the remnant of the "glins" here mentioned.

Some of the woodland planted and registered during the years examined has, in fact, passed into the possession of the Forestry Division of the Department of Lands and some of the trees still survive. This would appear to be true, for example, of certain areas of Ballymahon forest (Newcastle, Clonkeen and Forgney); Coolgreaney forest (Newtown); Delgany forest (Kindleston Upper); and Killeshandra forest (Gartinardress and Marahill), while one area was cleared of trees several years ago at Bree forest (Craan).

A complete examination of all the registrations for the whole period of years would certainly result in the discovery that many more of the old woodlands purchased by the Forestry Division when acquiring old demesne woodlands and still surviving—not to mention woodlands still in private hands—were planted under the influence of this Act, so that it is possible to see clearly how our own forestry work of to-day is closely linked up with the work of those earlier planters at the end of the 18th and beginning of the 19th century, and how forestry transcends politics. Collection of seed for the production of new trees goes on from some of the veterans then planted. There was a black period of depression for forestry from about 1850 until about 1920, not entirely unconnected with the operation of the various Land Purchase Acts, as Litton Falkiner pointed out, but also owing to the importation of cheap timber and other forest products from abroad. There is every reason to think, however, that the increase in forestry activity since 1920 will be maintained in view of the increasing value of forest products and the increasing competition for them.

This survey of the Irish Statutes does not, of course, present a complete picture of forestry history in Ireland, but it has brought out a number of points of interest and may serve to indicate how many of the problems are of a perennial nature. Since the first warning of the statute of 1698 the attempts of the various authorities to remedy the chaotic destruction and exploitation of woods, both natural and artificial, have been many and varied, culminating in the modern Forestry Act (1928). The history of these earlier efforts shows how closely the matter is bound up with the problem of land tenure. The lesson to be drawn by the forester seems to be to direct every effort to maintaining all areas now set aside and being utilised for forestry in the highest state of production possible, not only to justify their existence economically, but to discourage any future attempts at disafforestation in favour of some other land-using industry. That risk will always be present, to judge from past history.

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Irish Native Woodlands: Their Present Condition

By T. McEVOY, M.Agr.Sc.

The history of our natural woodland has received the attention of several authors, of whom Forbes (1), Henry (2), Falkiner (3) and Hore (4) are most notable. These have dealt with the extent and location of the ancient woodland area and with the historical references to clearances and utilization for charcoal-making, stave-making, shipbuilding, etc. So far no general description of their composition, ecology and sylviculture as gleaned from their scattered remnants has been published. Praeger (5, 6) has touched on the floristic as opposed to the ecological aspect. The intensive study of the Killarney woods by Turner and Watt (7) is by far the most important contribution, but is a gem that needs to be fitted into the setting of a more comprehensive but less detailed survey.

Extent Before Clearance

Before examining the natural woodlands still extant, it is necessary to refer to the controversial question of their extent before the activities of man restricted their spread or reduced their area. It has been suggested that large areas of lowland were never covered with forest but always supported a gramineous vegetation. The evidence of ecology and pollen analysis is otherwise. An examination of the growth of turf bogs and of pollen extracted from them shows the comparative stability of our plant population and climate since Sub-Atlantic times (c.500 B.C.). Consequently those plants which now tend to form climax communities must, before man's interference, have dominated the scene. There is ample evidence in neglected or undergrazed pasture of the ability of tree species to invade and oust grass communities. Most of our grassland must now be regarded not as a climatic but as a biotic climax, i.e., a more or less stable plant community whose continued existence is dependent on the activity of man and his domesticated herbivores.

We may now outline the probable maximum extent of the primeval forest. All the lowlands with the exception of marsh and bog and those areas on the west coast where wind pressure is too great, supported deciduous summer forest. The area over which Atlantic winds prevented the development of woodland probably varied considerably in depth. In Kerry, Connemara and Donegal, where mountain masses provide shelter, forest occurred and may still be seen on their sheltered slopes right up to the coast, e.g., Mulroy Bay (Donegal). Even Clare Island supports a scrub vegetation (8). In Clare, however, the treeless zone must have extended far inland due to lack of shelter and scanty soil. Observations in this county (9) show the ability of heath to maintain itself even against hazel scrub where exposure is severe, and Henry (2) has remarked on the absence of all reference to woodland in the townland names of West Clare. East Clare, of course, still bears remnants of sessile oakwood.

Connemara and much of Donegal form a region in which the climax vegetation is "blanket bog," and woodland occurs as part of a xerosere or progression from dry rock or well-drained soil to peat formed under conditions of high rainfall (over 60 inches) and constantly high atmospheric humidity.

The extent to which forest climbed the mountains varied considerably. As we have seen, the tree limit is at sea level on parts of the west coast, but, a short distance inland, in the Killarney-Glengariff area, still reaches 600–800 feet. This is considered the undisturbed

limit by Praeger (6), but Turner and Watt (7) regard it as artificially depressed. In large mountain masses and with increasing distance from the sea, the limits of all zones of vegetation are raised. In our largest mountain area, the Dublin-Wicklow massif, consequently, it is not surprising that the woodland limit, past and present, reaches its maximum. Although native woodland outside the shelter of gullies does not now occur above 1,000 ft., there is evidence of its recent existence to at least 1,200 ft. in the lee of the higher mountains. The 1841 Ordnance Survey 6" maps indicate open woodland above the 1,000 ft. contour in several localities, and I have found charcoal pits with oak and birch charcoal up to 1,200 ft. In many cases the woodland limit appeared to have been coterminous with the present limit of bracken dominance and reached the summit peat cap. It is possible that on more exposed westerly aspects a dry heath community intervened between the woodland zone of the lower slopes and the peat cap, the invasion of woody growth being inhibited by wind pressure.

On sheltered ground on the steep sides of Ben Bulben (Sligo-Leitrim border) at Lugnafaughery, alder-birch scrub still occurs slightly above the 1,000 ft. contour. This is due to excellent shelter and the prevention of peat growth by constant addition of alkaline detritus to the soil from limestone cliffs. On siliceous soils in the same district at L. Gill, oakwood is replaced by blanket bog at 500 ft. elevation, e.g., Slish Wood on Killery mountain. Thus on fertile soil over basic rocks the tree limit is raised.

Present Extent and Distribution

Of the vast extent of woodland which must have existed at the beginning of the Christian era, it is doubtful if 50,000 acres (or one-third per cent. of our land surface) still exists even in a semi-natural condition. A considerable area of shrub communities (principally hazel), in addition, survives on the limestone pavements of the West. Of the native woodland proper, practically all that survives occupies special habitats and not more than a few hundred acres is on normal, fertile, arable land. The largest part owes its survival to its position on steep rocky slopes incapable of cultivation. This is well seen from Arklow to Aughrim and Rathdrum, where the native vegetation has survived only on the steep sides of the river gorge. Extremely rocky soil, by making cultivation impossible and affording protection to tree seedlings, has helped also to preserve woodland. Small ungrazed islands and inaccessible hill terraces also provide sanctuary for native woodland. But more important than these topographical features in their preservation, has been their enclosure by estate owners to exclude stock. Up to about 1825 their value as coppice woods, estimated at £2 per acre per annum by Frazer (10), lead to more or less careful treatment and the exclusion of stock, but, with the sharp fall in value after the Napoleonic period, they were preserved mainly for game and amenity purposes (Nisbet, 11). Only estate owners could afford to enclose and to maintain the fences around woodland. On ordinary farmland on the shallow limestone soils of the West only poor hazel scrub with occasional ash is found, while under exactly similar soil conditions within demesne walls, ash- and ash-oakwood is well developed, e.g., Coole Park (Gort), Portumna, Ballykine Wood (Cong), and Clonbrock (Ballinasloe). The only remnants of native woodland on deep fertile soil in the central plain are also in demesnes, e.g., Lord de Vesci's at Abbeyleix. Historical data lead to the conclusion that the process of deforestation on the fertile plains was prolonged and steady. It must have been well advanced at the time of the Norman invasion, but was probably accelerated in the succeeding centuries and was probably fairly complete by the beginning of the 17th century. On the other hand, the considerable woods in the

wilder, mountainous regions do not appear to have much reduced until the introduction of charcoal burning for iron-smelting, and the export of pipe-staves, timber for shipbuilding, etc. The 17th and 18th centuries, when Ireland became the "home of timber adventurers," saw the rapid destruction of the forest that remained on hilly, broken, and infertile ground.

The largest compact areas of native woodland still extant are (1) in Central Wicklow, in the Vale of Clara and the neighbouring glens and valleys—Glendalough, Glenmalure, Avoca, Arklow to Aughrim, the Gold Mines Valley and between Rathdrum and Glenealy; (2) in Cork and Kerry around Killarney, Kenmare, Glengariff, Dunmanway, etc. A smaller area lies around Sligo—at Lough Gill, Collooney, Ballisodare and Glencar. Other notable areas are at Powerscourt Deerpark, Coolattin, Glencree Valley, and on the Slaney near Clonegal—all outliers of the Wicklow area; Portlaw, Slieve-na-muck Hills (Tipperary); Rockingham (Boyle); Virginia; the Rivers Nore and Barrow cuttings from a few miles below New Ross to Thomastown and Borris respectively; the Blackwater Valley, especially near Cappoquin (Glenshelane); Gort (Coole, Chevy Chase); Woodford district (Co. Galway); Pontoon (Mayo); Killoughim (Wexford); Abbeyleix; Ballykine (Cong); slopes by Lough Derevaragh; and islands in Lough Erne and many other lakes.

Recent Utilization and Its Effects on Ecological Character

A picture of recent utilization is best obtained from accounts by Young (12), Hayes (13), Wakefield (13), and authors of the R.D.S. County Surveys (1800-10) (10, 15).

The tradtional method of exploitation of English oakwoods, hazel coppice with oak standards, does not appear to have been widely practised in Ireland. The term "standard" does not occur in the literature, but "reserves" were sometimes left—although coppices were usually felled "smack smooth." The reason why coppice with standards was not in vogue is clear when the woods are examined. This type in England occurs on clay soils of only slightly acid or neutral reaction. On such soils, hazel is vigorous and under open canopy readily forms a continuous undergrowth. The Irish woods of the last three centuries, on the other hand, were mostly on light, siliceous soils of moderate to high acidity, and hazel was consequently less abundant while holly was often the dominant shrub. Where reserves were left, oak, not hazel, formed the coppice. One example of this system is given by Frazer in 1801 (10); 60 reserves per acre were left at the first coppicing at 30 years. At 60 years only 20 reserves remained, and at 90 years only a few remained for the final felling at 120 years. He remarks that the growth from 90 to 120 years showed little improvement. This practice appears to have been confined to the woods of Earl Fitzwilliam and of Symes at Ballyarthur. Tighe (15) also refers to reserves at Woodstock (Inistioge). That the practice was seldom followed is shown by Hayes (13) deploring "the absurd opinion that wherever a wood was felled, it was useless, if not detrimental, to leave a single reserve." The scarcity of large timber is also shown by the high prices then obtaining for big trees. Indeed large timber appears to have been generally confined to deerparks—the show places of estates. Many complaints were also voiced between 1770 and 1810 that, after felling, the woods were not "copsed," i.e., fenced against stock.

Coppicing was carried out every 20 to 40 years, and very little thinning appears to have been practised. This lack of thinning resulted in a crop of whips, none of which was suitable for a standard.

Hayes (13) gives the uses of coppice wood as: tan-bark, fencing, building, ploughs, handles, swingles, rustic work, stakes, lady's shoe

heels, chairs, firewood, charcoal. Felling was done by axe, as saws were considered injurious to coppice. He discusses the method of bark-stripping and advocates stripping as low as possible provided the roots are not laid bare. Felling, too, must be low, leaving no stub above ground so that the young shoots will grow straight up from the root.

Coppice continued to pay well, until prices for timber and bark fell after the Napoleonic wars. From about 1820 onwards oak coppice became uneconomic and many of the coppices were allowed to develop into high wood. The only treatment they received then was an occasional thinning until in most cases only one shoot per stool remained at 80 to 100 years. It is this last development that has given certain peculiarities to the oakwoods of to-day. Under constant coppicing on short rotations, the woods responded so that the stools were spaced at 8–12 ft. apart—much closer than in highwood. Consequently the stems are now tall and clean of branches, often for 40 to 50 feet, and the crowns are disproportionately restricted. This, combined with poor soil, has resulted in narrow annual rings and small girth for age, so that the woods have a deceptive appearance of youth. Actually, most of these woods are over 90 years old, and many exceed 120 years. There is also a typical irregularity of the butts—best seen in the cross-section provided by felling—due to coppice origin. Frequently, too, a cluster of weak sprouts or suckers arises from ground level. These peculiarities are most evident in younger woods and especially in those on poor soil, e.g., those with Vaccinium undergrowth. The most obvious peculiarity, of course, is the double or triple stems which occasionally remain even in old crops. In their even-aged character, too, these woods differ from virgin forest.

When hardwood coppice became uneconomic, many owners interplanted the coppice stools with Scots Pine and larch. The former was generally allowed to remain to form part of the high wood, but most of the larch was removed as thinnings. Examples of woodland so treated were studied and show the remarkable recuperative powers of oak coppice, little trace of the effects of the exotics being seen within 15–20 years of their removal.

The present emergency has gain brought the treatment of oak coppices to the fore. After a long period of neglect, they have now become the scenes of activity as sources of firewood, charcoal, and commercial timber. The problem of the best sylvicultural treatment has arisen and the answer must vary according to the local conditions. Broadly speaking, the woods may be classified into three types: (i) those on fertile sites ideal for the production of oak timber; (ii) those on intermediate sites on which growth is slow and on which a proportion of commercial timber can be produced but only on uneconomically long rotations, and (iii) "scrub" woods properly so called on poor or exposed sites which are incapable of producing commercial timber. On the fertile type normal thinnings in immature woods, and regeneration fellings—or more extensive fellings with provision for the artificial regeneration of oak—in the case of mature woods appears to be the appropriate treatment. On the intermediate types where the trees have not reached commercial timber dimensions, it appears advisable to retain at least a proportion of the more promising stems subject to opening up the crop sufficiently to allow the healthy development of the particular conifers which are the most economic crop for this type. Thus on dry Vaccinium ground the overstand should admit sufficient light for the growth of the intolerant Scots Pine, while on the moister Luzula type a heavier over-stand could be left with a view to underplanting spruces, Tsuga Albertiana, Abies Grandis and beech. On the "scrub" type only sufficient over-

stand should be left to provide the ideal shelter and moisture requirements of the conifers which are to replace the oak. In this case frequent shelterbelts on the convex contours and at right angles to the prevailing wind are advisable.

The present is an opportune time to consider the preservation quite untouched of carefully selected examples of every type of native woodlands now extant. These would be of considerable interest to the botanist as a harbourage for entirely natural vegetation, to the soil scientist as a locus for undisturbed soil profiles, and to the forester as a control in assessing the effects of exotics on soil fertility.

The Components of Our Natural Woodland: Tree Species

Oak.—The oak is easily the most important native species. The sessile variety, at least, extends from our southern shores to the north of Donegal and reaches altitudes of 1,125 ft. in Kerry (16) and 1,480 ft. in Derry (17). Both the sessile and pedunculate species occur in native woodland. Tansley (9) quotes Henry as stating that no specimens of pedunculate oak were received from native woods. This statement dates from 1908 (18, Vol. II), and Henry's view had altered by 1913 (18, Vol. VI) when he referred to the native pedunculate oakwood at Abbeyleix.

It is now impossible to map precisely the distribution of the two oaks. Pedunculate is generally considered the tree of the plains, of deep, fertile, non-acid soils, while sessile inhabits the shallow, siliceous soils of the hill-slopes. This differentiation of habitats appears, in general, to hold good here. Sessile oakwood is certainly the only type developed on the siliceous mountains of Cork, Kerry, Waterford, Tipperary, Clare, Connemara, Donegal, Dublin, Wicklow and Wexford. How far into the lowlands it extended, or where the pedunculate replaced it, is not so clear, due to the almost complete disappearance of recognisably native woods in the fertile plains and to the preference for the pedunculate species in plantations.

Native pedunculate woods still occur at Abbeyleix, Coole (Gort), Clonbrock (Ballinasloe), and a few other places, and are undoubtedly to be regarded as relics of the oak-ash woods which must once have been the principal feature of the limestone plain. In the valley of the Nore below Thomastown, and of the Barrow below Graiguenamanagh, both oaks occur in varying proportions in the areas recorded as native woodland in the 14th (19) and in the 18th centuries (12). No records of extensive oak planting are known for these areas, and the conclusion that both species are native appears justified. The district would appear to be one which lay between the zones of dominance of the two species and in which neither had gained complete supremacy. In the Sligo area, too, on the limestones around Lough Gill and in Glencar, these mixed woods occur, and their origin may be similarly accounted for. On the siliceous rocks in the Sligo area sessile oak alone occurs. On the whole, the sessile species appears to be the more vigorous and to spread beyond what are considered its normal soil types in the West. For instance, at Ballykine (Cong) sessile oak is found on limestone pavement in a district in which only pedunculate occurs in planted woods. This probably represents an extension of the Quercetum sessiliflorae of the nearby Connemara region into the pedunculate oak-ash woodland area of the central plain. Sessile oak also occurs on limestone near Killarney.

Birches.—The birches are amongst our hardiest trees, and are recorded up to 1,700 ft. (17). Like the oak, there are two segregates, *Betula alba L.* (Silver Birch) and *Betula pubescens Ehrh,* the common variety. Betula alba is regarded by Praeger as "typical" of the

limestone country, while the other accompanies the sessile oak in hill country. The Silver Birch, although "typical," is often quite rare in the central plain, Betula pubescens being much more frequent. Occasionally, as in the Rathdrum-Glendalough-Glenmalure area, on the Slaney below Enniscorthy, on the Barrow at St. Mullins, and in the Aughrim Valley, *Betula alba* occurs on siliceous soils where only *Betula pubescens* is expected. With a species the individuals of which are short-lived and which reproduces so freely from seed, planting is certain to have obscured the natural soil preferences. The silver birch is, of course, preferred for ornamental planting. Where both species occur together, hybrids are frequent.

Only *Betula pubescens* forms pure woodland (5, 6). It once formed a zone of climax woodland above the oaks, but no trace of this now remains although its increasing prominence in oakwood at high altitudes is well marked. Birch is the only important seral tree of heathy oakwoods. After coppicing, numerous seedlings establish themselves, and it is not unusual for the birch to occupy a larger area than the oak stool-shoots in a young coppice. The proportion of birch in the canopy steadily decreases and, in situations in which oak reaches 70 ft. or more in height, is negligible at 120 years wherever the oak stools are themselves sufficiently close to form a closed canopy. Dead and dying birches are frequent in oakwoods over 100 years old.

Pure birch societies within oakwoods may be due to the "filling up" of a depleted wood, but an apparently stable birch society usually occupies wet peaty hollows with a field layer dominated by Molinia. These wet birch societies usually consist of *Betula pubescens* even where the drier surrounding ground is occupied by *Betula alba*.

Ash.—Owing to the highly calcareous nature of about two-thirds of our soils, and to our high rainfall, ash is extremely vigorous and widespread. It is recorded up to 1,800 ft. (17). It is the constant associate of oak on the deeper limestone soils giving ash-oak woods and seral ash woods. On shallow limestone soils it may be the dominant tree, and on limestone pavements it is frequent, although unable to attain dominance, in the hazel scrub. In the sessile oak-woods it forms local societies in wet fertile ground, and also wherever the prevailing luzula and vaccinium undergrowth gives way to more exacting species such as Lesser Celandine, Wild Strawberry, Sanicle, Ground Ivy, Woodruff, Yellow Pimpernel and Garlic. Tansley (9) remarks that ash becomes general in our wet western woods.

Elm.—The commonest elm here is Wych Elm—*Ulmus glabra Huds.* or *U. Montana Stokes.* This is the only species of importance in native woodland. It is a frequent tree in ash and oak-ash woods on all limestone soils, and regenerates adequately from seed. On the western shallow limestone soils, it and ash are often the only hedgerow trees. In the siliceous oakwoods it is confined to the better soil types, on which ash is also frequent. Wakefield (14) mentions the use of elm bark as a dye in Wicklow, and this would suggest that it is native to that county.

Irish floristic botanists underestimate the range of this species. Cybele Hibernica (17) allows its nativity in only two northern districts out of the twelve into which the country is divided. Scully (16) does not admit its nativity in Kerry. Praeger (20) adds native stations on the River Barrow and in Galway. The picture of a restricted distribution with wide gaps thus obtained is misleading, and appears to be due to an ignoring of the evidence afforded by areas of native woodland in which planted trees also occur. The fact that elm exhibits well-defined soil preferences in these woods both in the East, South and West, and regenerates adequately, is sufficient

proof of its native status in these areas. This is a more rigorous test than that of floristic botanists (i.e., its occurrence in thoroughly wild situations), because it demonstrates its ability to survive in face of its primeval competitors.

Alder.—Alder pollen is very prominent in our peat deposits, and the species (*Alnus glutinosa Gaertn.*) must have occupied a large area before the drainage and clearance of river meadows and swamps. Both its water and mineral requirements are high. It is recorded up to 1,050 ft. (17). On acid peats it is short lived and height growth is poor. Where Molinia or poorer communities form the ground vegetation of wet land, birch replaces alder, the latter being usually associated with rush species (*Juncus communis* and *J. articulatus*).

Poplars; Willows.—Although several poplar and willow species of tree dimensions are thought to be native, only the Aspen (*Populus tremula L.*) now plays a part in native woods, and even it is comparatively rare. Its principal situation appears to be on cliffs—especially of limestone—and on the shores of turloughs and lakes in limestone country. In siliceous oakwood it is very rare, a few trees being noted at Annamoe and Clara (Co. Wicklow), and at Woodford (Co. Galway). Its inability to stand competition due to its high light demands and limited height growth is responsible for its disappearance from enclosed woodland. Its role is as a "pioneer" species on open ground.

Rowan.—The Rowan (*Sorbus aucuparia*) is rarely absent from any type of woodland, but is hardly gregarious and does not form pure woods, even of scrub type. It is frequent in seral birchwoods and in birch-ash woods (21) in the West, and maintains itself in the canopy in scrub oakwoods near the altitudinal limit. It is our hardiest tree species, being recorded up to 2,300 ft. (17). When exposed moorland is enclosed, isolated individuals appear, the parent trees often being at a considerable distance. It is said to have been the sacred tree of the Druids.

Yew.—The abundance of this species in the past is testified by the many place-names compounded with the tree's Irish names, "iubhar" and "eo." Now most of its native stations are in the South and West. It was once very abundant in Kerry, until iron smelting was introduced (22). It is still a constituent of the Kerry sessile oakwoods, and is occasional to frequent in similar woods at Woodford (Co. Galway). In siliceous oakwood in Wicklow it is rare and of local occurrence—near Glenealy, Rathdrum and Laragh—but appears to be derived from planted parents. Hayes (13), however, mentions its survival ("certainly indigenous") "in the mountainous districts of Wicklow." It still occurs in some quantity on cliffs over the Upper Lake, Glendalough, and as isolated bushes in Glenmalure.

Yew occurs also in native hazel scrub at Dysart (near Maryborough), and all over the limestone pavements of the West, in scrub, ash-wood and ash-oak wood. Yew woods occur on limestone pavement at Killarney, and the part yew plays in ashwood is well illustrated at Garryland, Gort. This wood is on shallow calcareous drift over limestone with occasional dry knolls bare of drift. Ash and oak (pedunculate) do not thrive on the knolls, reaching a maximum height of only 30–35 feet. Yew appears to be rapidly forming pure societies on the knolls, replacing ash and oak which cannot regenerate under its shade. Yews of mature, sapling, and seedling ages were noted, the oldest trees being on the crowns of the knolls and immature trees invading the ash and oak on the slopes. In these situations the yew equalled the replaced species in height growth, but remained only

occasional and sub-dominant (or in the shrub layer) throughout the remainder of the wood.

Sorbus Aria (agg).—The whitebeams are (with the exception of Arbutus) our rarest native trees. Nevertheless four segregate species have been distinguished (23), *S. porrigens Hedl.* being the prevailing type. The whitebeam is least rare on limestone or basalt, occurring in scrub on cliffs, pavements, or shallow soils, e.g., Ross Island (Kerry); shores of Lough Derg, near Portumna; cliffs over Lough Gill; Cong (Mayo); Garryland (Gort). On limestone cliffs it is often associated with aspen and yew. On siliceous strata it is very rare, but has been noted in scrub on the Barrow (near Poulmounty), near Rathdrum, and between Woodenbridge and Aughrim.

Arbutus.—*Arbutus unedo* has a very restricted Irish distribution, being confined to an area within a 25-mile radius of Glengariff and to the shores and cliffs at Lough Gill in Sligo. It is essentially a Mediterranean plant, and its presence in the West is the most striking indication of the mild oceanic climate. It reaches a height of 40 ft. here, much taller than is usual on the Mediterranean. It is a "pioneer" in succession towards woodland, colonising acid humus in rock clefts and being unable, apparently, to establish itself in woodland or even dwarf shrub communities (9).

The more widespread extension of Arbutus in ancient times is shown by the place-names in Kerry and Cork of which "cahney" (caithne), and, in the West from Clare to Mayo, of which "quin" (cuinche), form a part.

Cherries.—The bird cherry, *Prunus padus L.*, is so rare that it may be considered an indicator of native woodland. It occurs in the Devil's Glen (Wicklow); at Lough Gill; Woodford; Chevy Chase, near Gort; Clonbrock; Glenstall (Co. Limerick); and Knock Drin (Westmeath).

The gean, *Prunus avium L.*, however, is the only cherry of tree dimensions in native woods. It is most frequent and vigorous in our eastern sessile oakwoods, generally on the more fertile soils with ash and elm. It attains a height of up to 90 ft. and, when in flower or in autumn colours, is very beautiful. Its range may have been extended by planting. It appears to be native also in woods on limestone in the West.

Naturalised Introductions

Beech, sycamore and Scots pine are so much a part of our landscape that few realise their alien status.

Beech.—The beech, *Fagus sylvatica L.*, was probably introduced about the end of the 17th century (24). It is native in South-East England and in the Chilterns, and may once have extended into Wales (25). Why it failed to penetrate to Ireland is not clear. Possibly the cutting-off of Ireland from Britain by the formation of the Irish Sea formed a barrier to its advance. An explanation in support of which there is considerable evidence is that in our moist climate beech leaf-fall eventually forms a mat of raw humus which effectively prevents its own regeneration. A particularly good example of this phenomenon is seen on Church Island, Lough Gill, where the raw humus surface is coterminous with a beechwood. The raw humus is formed in this case on a calcareous soil—a type on which a peaty surface seldom develops.

On the other hand, the beech, in Eastern Ireland at least, is easily the most aggressive exotic, and is the only non-native tree which invades and replaces native climax oakwood under undisturbed conditions. Numerous examples are available of all stages of this succession. The complete extinction of oak over areas of an acre or

more may be seen at Shelton Abbey (where beech is said to have been first planted in this country). Three generations of beech occur and the species is still advancing. A gradual diminution in the proportion of beech to oak is noticed as we recede from the focus, i.e., the Lawn from which it spread.

Sycamore.—Sycamore (*Acer Pseudo-Platanus L.*) is recorded here since 1632 (24). The public are very familiar with its abundant and free regenerative powers, which are most marked on disturbed ground, e.g., gardens, cut-over woods. When the more rigorous test, ability to invade natural woodland unaided, is applied, however, it is much inferior to beech. Regeneration under deep shade suffers severely from the Tar-Spot fungus, *Rhytisma acerinum*, and its height growth is often less than that of its native competitors.

Scots Pine.—This erstwhile native has been re-introduced for several centuries, and we cannot now indicate with certainty any individuals of the native race. Examples of regeneration are frequent on the margins of lowland bogs and on Calluna-heath and drying Calluna moor. One good example of its regeneration with oak and birch was observed in an opening in a native wood at Curraghmore, Co. Waterford. On the slag-heaps of the copper and sulphur mines at Avoca, Scots pine is the first plant colonist, being followed by Calluna.

This article gives only an outline of the past extent, recent sylviculture, and present composition in regard to tree species of Irish native woodland. Space does not permit any classification of vegetational types, description of soil profiles, or discussion of regeneration and succession.

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Some Views on the Private Forests of Ireland, Past and Present

By LT.-COL. A. T. S. MAGAN, C.M.G.

When I received a letter from the Secretary announcing his intention of asking me to give an address at our General Meeting, my first inclination was at once to decline, because I should not think there is anybody in this room more profoundly ignorant of the technical side of the subject than I am myself, and so I must ask you to forbear with me as far as technicalities are concerned. Really, over the years, and they are long years now, in which I was born and brought up in this country, there is one thing which has always interested me enormously since the time I was a small child, and that is trees. All my stories, all my dreams as a youngster, had invariably something to do or say about trees. Trees were predominant. In after years when I was quite a young man this was further fostered by, first, my association as a colleague, and afterwards until his death as a very close personal friend, of a certain Irishman whose name may be familiar to some of you here, the late George Russell, more commonly known as "Æ." He, with that wonderful imagination of his, and he put a lot of it into poetry and a lot of it into paint, still further inspired me with an understanding of forests. They seemed to talk to him. They seemed to breathe to him. They seemed to tell him stories, and when I was married he gave me one of the most beautiful pictures which he ever painted, called "The Spirit of the Woods," which shows a nymph or fairy in a stand of Scots pine at night with the moon breaking through the clouds in a very heavy storm. That really gave one an idea of how close he came to them, though he knew nothing about the technical side of trees. What mattered was what they meant to him, and how they spoke to him.

What about the conifers which we are cutting to-day? As a young boy, shooting with my father, I saw a great many of these stands of conifers which we are now cutting, and which are so useful to us, growing at the best of the woodcock stage. I am going back now to when they were planted sixty or seventy years ago. Why were they planted, and who planted them? They were planted by the big landowners of the time, mainly with the idea of being cover for woodcock. That was the main idea. Each one wanted to have as good a woodcock shoot as the others, so they had to plant conifers, and it is these conifers which we are cutting to-day. That was the mainspring which encouraged them to plant these conifer stands. As time went on and as these trees grew to be large, they made a great mistake. They underplanted the cover with rhododendrons, dogwood and laurel, and made traffic impossible and thus defeated their own objects because they were never again much use as woodcock cover. Woodcock need clear opens in order to enable them to land and get away at night to feed.

As for the hardwoods—most of them were planted before I was born. They were generally planted from the decorative point of view, and in this respect I have some rather interesting data which refers to trees on the estate of Lord Ashtown at Woodlawn in the Co. Galway. There is a complete record in the form of diaries from the year 1702 until the year 1820, and reading through these we come across some very interesting items with regard to afforestation. From 1720 up to 1786 there seems to be no mention of the planting of conifers at all, but there is, every few years, mention of the planting of hardwoods, particularly beech—occasionally oak, but mostly beech. The two or three owners who covered that time

appear to have planted these purely from a decorative point of view. From the evidence available, it was during this period that the large quantity of beech was planted. Having eventually gone through all the formalities for felling, we obtained a licence for 998 beech which have been cut out during the last three years. All of these trees which I counted were round about 200 to 220 years old, and we cut them up in the mill. They had all practically to go for firewood, because 96 per cent. were rotten. This is a fact, for there was a record kept of any sound trees which were turned into baulks.

Another interesting place is Lord Crofton's estate at Mote Park, Co. Roscommon. This was a natural oak forest. Croftons came there about the year 1540 or 1550. It was a natural oak forest then, and had been for years and years before. The late Captain Sir Francis Crofton, in his private history of Mote Park, refers to this from the data which he had collected. That forest appears to have reproduced itself and to have kept on reproducing itself until a certain thing occurred. About the year 1800 the place became gradually full of ivy. At present every oak tree in it is covered with ivy. The whole of the ground is covered with ivy. There has been—as near as I could get to it from the specimens which I felled—no natural reproduction at all for about seventy or eighty years, or longer. It looks as though this parasite destroyed the chances of natural reproduction in the oak, but, strangely enough, it did not interefere with the other hardwod timbers, such as ash and sycamore. There is a forest of young saplings of both these species growing up, but there is no sign whatever of any oak reproduction except in one wood. It looks to me as though, with the advent of the ivy, the reproduction of the oak ceased. The first cutting of oak was in the year 1919, but when I dealt with the stand, which is between 400 and 500 acres, after the licence was granted, I cut out, of various sizes, about thirty trees and I made a close examination of them. The oldest tree I got was 342 years, as far as I could count. The youngest was 127. They varied in quarter girth at 4′ 6″ Hoppus from 15″ to 31″. Now, of these, two were very slightly decayed and they were not the oldest; eight of them were covered with ivy; two were free of ivy and these were much the best quality in timber value. The conifers, which I know were planted between seventy and eighty years ago, were planted on the lowlands where evidently there had been no oak before and generally consisted of Scots pine. These had not done so well—they were planted mostly on bog—and had only reached 11″ to 16″ quarter girth after eighty years. There is a curious feature in the silver fir on this estate. There was a certain amount of magnificent silver among the oak on the high ground. They were planted at an altitude of 420 ft. and the best of them had grown to a quarter girth of 44″ to 47″ Hoppus at 4′ 6″. There was no regeneration of them at all. The only regeneration that is going on there is ash saplings and sycamore, nothing else.

Another place is Kylemore Abbey. I inspected this with Mr. Grant, who was a very good friend of mine and one of your Inspectors. It is most interesting. All the trees at Kylemore were planted by the late Mitchell Henry round about eighty years ago. They did magnificently on the slopes of the mountains up to 300 ft. above the lakes. Once you get over 300 to 400 ft. they go into rubbish, are crooked and stunted. There are some rather good conifers in places. The silver had done exteremely well, Scots well, larch moderately well, but really best of all was the Pinus insignis. Some of these had grown to an enormous size and there were huge trees up to 48″ and 49″ quarter girth, but any of them which he had planted above 300 to 350 ft. had never developed at all. There was a certain amount of first-rate rare pines, Himalayan spruce, Abies

nobilis and Pinus peuke along by the lakes, but the hardwoods have done very badly.

Loughcrew in Co. Meath has some interesting woods. Here we had larch mostly, which I know were planted seventy-five years ago. At the stage when I looked at it, it was one of the finest stands of larch left in Ireland. They are cutting it now. Some of the trees are measuring, when cut, up to 190 cubic feet of commercial timber. In one particular wood the larch which were planted on eskers are mostly unsound for 15 ft. of the trunk, while trees planted at the same time on the lower or wet ground are sound as bells. Generally however, the larch thrived here in the most extraordinary way. I do not suppose there are many other stands of larch in Ireland equal to the size and quality of this. Scots and silver matured extremely well here also. The spruce is rather rough and small, and did not do well. I am talking now about Meath land, of really good quality.

With regard to the present, to my mind the future of afforestation in this country depends entirely upon the Forestry Division. The days of the big landowners are gone. The days of the big estates are gone, and it was on these big estates that we found our timber and on which our timber was planted, and unless the matter comes entirely into the hands of a Government Department, unless it becomes a State matter, I cannot see that there is any hope of the private individual doing very much more for forestry in this country. I think the private owner, taken as a whole, is a thing of the past. Either the big estates are being broken up or have been broken up, and the costs at the present time of managing these estates are out of the range of a private individual. As a basis of comparison, in 1898 the average rate of income tax was 6d. in the £, rates amounted to 1s. 3d. The average valuation of the woodlands which I have taken was 6s. per acre, some being low bog, some high land, some ordinary demesne land. Rates average to-day 15s. 9d. in the £, income tax—under the headings of A and B—is approximately 8s. 6d. in the £, so that there is a total of 7s. 6d. an acre to be paid out every year in rates and income tax, and I do not think there is very much chance of any individual being able to afford this in the future.

Then there is the question of costs of replanting. The Department give a grant of £4 an acre for a block of 5 acres. In the last two years the cost of any replanting which I have done has worked out at £16 an acre. With the present cost of wages, fencing, draining, £4 an acre is of very little assistance, though of course it is of some. If £4 an acre was adequate when the grant was struck, it was either a great deal too much then or it is a great deal too little to-day. You may have noticed that the landowners in England and Scotland, through their various Associations, came the other day to an arrangement with the Forestry Commissioners that the grant was to be £7 10s. an acre from this on, and, in addition to that, that there was a yearly allowance for every acre planted of half a crown an acre. This is very different from our grant of £4 an acre here.

How is this going to work out from the economic point of view in future? If timber from the purely commercial point of view is going to be an economic proposition, there will want to be a very, very great difference to what there was in the past between the price of imported timber and the price of the home-grown. In August 1939 you could buy white deal C.I.F. Dublin of much the same quality as our own, except that it was a great deal drier than our spruce, at a cost of 1s. 3d. per cubic foot. It is rather interesting to note that at the same time there was one small cargo of Californian redwood imported into Liverpool and it fetched 7s. 3d. a cubic foot. But I will come to that later.

Can we grow redwood in this country? I wonder. We have some

fine specimens of it. There are two trees in Somerville, in Co. Meath, the age of which I know. They are seventy years old. I worked them out, measured them carefully. They came to 160 cubic feet per tree; this for the seventy years. The age of the trees is correct. There are a few similar specimens at Corbalton Hall, and one magnificent parent tree there from which the others have come. I measured this and, over bark, it amounted to 540 cubic feet. What I do not know, but what somebody here to-night can say, is whether that will be of the same quality, grown in this country, as it is in the Great Redwood Belt in California. If it is, if we can grow redwood and grow it in that time, there is no question of doubt the commercial problem is solved; but whether it will be the quality of the Californian stock is another question. I do not know.

The question of the sale of timber at the present time now crops up. This is not quite so easy. I think I can say what I like on this matter. I cannot make out why we did not leave this entirely under the control of the Forestry Division. Why we split it up among other Departments I do not know. The Forestry Division knew all about it. The prices, as compared with the English prices, are some 22 per cent. less. The owners, as far as I know, were never consulted. Prices were fixed, without consulting the owners at all, between the Ministry of Supplies and the timber merchants, and personally I think that the owners of timber in Ireland have got to thank the Forestry Division, themselves probably the largest sellers of timber in the whole of Ireland, that the prices are as equitable as they are, because there is no doubt in my mind that the Forestry Division must have made a very good case indeed to have obtained the prices we have to-day.

In order to sell this timber at the present time, what have we got to do? We have got to get through three Departments—apply to the Forestry Division for our licence, to the Department of Supplies for kerosene to convert it, and to the Department of Industry and Commerce to arrange about the sale of it. Then everything is all right and in order, but as soon as we set about felling we may be stopped by the Department of Defence, who need the trees as shelter for possible ambushes or something of the like, and there you are! What with the cumbersomeness of the control and the number of the Departments which you have got to get through, it would seem as if you never could get anything done, nor do I believe would you, but for one thing, and that is the amount of courtesy, attention, help and advice which you get in every one of these Departments from the people who put the business through for you. My experience is that everything that can possibly be done in the various Departments to get one's business through is done, and one is given every possible help. And that is speaking of that much-abused body—the Civil Service.

I read with much interest Mr. Petrie's paper in the Journal about the planting of hardwoods, and it was very good indeed as a sample of what could be done in this line by the small farmers. But in my opinion isolated little plantings such as this would not amount to anything in the reafforestation of Ireland. For the reafforestation of this country we have got to look entirely to the State.

With regard to forests in other countries. I have had a small amount of experience. In West Africa the chief tree we have is mahogany, which runs to an enormous size. It is most interesting to watch them being felled. They fell most of them about eight to ten feet from the ground, and the logs are cut and drawn out by native manpower.

In New Zealand, where I studied the forests, we have a very sad thing. The beautiful forests of New Zealand are all dead or dying.

The end of them is coming. The reason is that, about sixty years ago, some idiot—I can hardly believe he was a Scotsman—brought in about four stags and six does into the South Island, and two stags and four does into the North Island. When I was in New Zealand in 1937 the chief Government stalker told me that they had destroyed 128,000 red deer in the Pembroke area alone, and that that was going to be nothing compared to one season's reproduction. They have largely destroyed the forests. As fast as the natural reproduction comes on, the deer destroy it. The forests are still there, but they have no chance now except by artificial replanting. People did three most in-understandable things in New Zealand. They brought in deer, which reproduced themselves at an extraordinary rate; the brought in rabbits, which destroyed what the deer left; and the last disastrous importation is called by the somewhat peculiar name of "bloody missioner." A newly-arrived missioner had a longing for his favourite sweetbriar, and got it sent from home, and it has since gone mad through the whole island and cannot be destroyed. Sweetbriar is ever since known as "bloody missioner."

I have been through a good deal of the Canadian forests. They are beautiful. Not as impressive as New Zealand, perhaps, conifers all the time. They do not seem to be as majestic or to blend with the landscape in the same way as the trees of New Zealand, but there are thousands of miles of them untouched as yet—Douglas, Spruce and Red Cedar.

The country which impressed me most was California. I spent three months in the Great Redwood Forests in the year 1939, and during that time lived in a cottage in the woods, first with a farmer and secondly with a woodsman. The effect it has on you is very remarkable. In the Yosemite Valley, which is 150 miles east of San Francisco, you have the biggest Redwood trees in the world. They reach 33 feet in diameter and 220 to 235 feet high. As to their age, authorities say that the oldest of them are 3,800 years. Sherwood in his "Forest to Furniture" puts them older, up to 7,000 years, but I do not think that this is authentic. The effect of these trees on you is perfectly extraordinary. You feel a most insignificant creature. No fungus or creeper grows on them, no parasite attacks them. They seem masters of themselves, masters of the forest. The area which they cover stretches about 250 miles along the northern end of California, from just above San Francisco up to the Oregon border, and stretches inland for about 50 to 70 miles. They have been burnt over and over again. Forest fires have swept through them for goodness knows how many years, and still they go on. The timber itself is absolutely beautiful. Most areas are preserved now and cannot be cut. The Tuolumne Valley and the Great Mariposa Grove are all giants, none of them under 22 feet in diameter. All are preserved, but there is still an amount of cutting amongst the younger trees.

The early settlers who came about 70 years ago built all their houses of this redwood. They have never been painted and are as sound to-day as the day they went up. It struck me it would be worth while examining this to see if we can grow it here. Wherever they cut one of these trees, generally three trees sprang up. They grow about the same pace as did those at Somerville, that is, about 70 feet in sixty-five years, and run about 150 to 160 cubic feet in that time.

There is one very remarkable thing about it, and that is the cultural effect which these great trees have, and indeed all forests have, upon us poor humans. I lived, as I said, first with a farmer and then with a lumberman. They were dignified, quiet people, very

different from what one's knowledge of the American in the town and of the plains is. The great trees seemed to have had a cultural effect upon their character and their minds, and I am not sure but that this is a side which has in itself a great importance. Progress and culture have got to run hand in hand, and there is no question or doubt of it that the beauty of the forest, if we only appreciate it from the pure "beautiful" point of view, has got, and will have if we learn readily and if we look upon it rightly, a cultural effect upon the minds of all of us. The shrill doctors and the pageant wars go down into ultimate emptiness and silence, but out of the windows of our homes, if we only have vision and plan with vision, we may behold in the future, or posterity may behold, much of the waste land of this country, much of the waste hillsides, clothed in forests which not only have a highly beneficial effect on both our soil and our climate, but, if we appreciate them properly, will, and must, have a cultural effect upon us and on our characters.

The Role of Mixed Woods in Irish Silviculture

By T. CLEAR, B.Agr.Sc.

Foresters the world over are recognising more and more the value of a proper mixture as a factor in the successful establishment and management of tree crops. While the practice of raising mixed crops is very long established in this country and while most of the timber felled here in recent times has come from mixed stands, there has been a tendency to depart from this old and well-tried system and to lay down extensive areas under pure spruce or pine. This practice is, no doubt, dictated by financial considerations and the exigencies of large scale afforestation, but if we are to judge by the consequences of similar practices abroad there is a danger that serious losses or disappointment may be experienced.

In Saxony the craze for financial yields and short pulp wood rotations led to the extensive use of Norway Spruce on soils outside the natural range of the species. This practice was carried out successfully for two rotations owing to the fact that the extension of spruce planting was usually at the expense of beech, silver fir or pine on woodland soils. Two crops were sufficient to produce serious soil deterioration and this, accompanied by epidemics of insect and fungoid pests, caused complete failure in the third rotation. Similar experiences in other countries have led to a great reversion in many parts of Europe to a more natural form of silviculture. There has been an ever-growing interest in the rôle of "good companion" and pioneer species in the maintenance of healthy conditions in the forest.

Hayes On Mixed Woods

The value of mixtures has long been recognised here as can be seen by the composition of the greater proportion of our mature plantations. On this aspect of afforestation in 1822 Hayes, of Avondale, in his "Practical treatise on the planting and the management of Woods and Coppices," writes: "Providence has wisely scattered the food of each plant over the surface of the earth, so that many trees, of different species, will grow well in an acre of ground, where the same number of one kind would actually starve for want of nourishment; and we have only to view a grove of the last age, consisting of one species of trees, to be convinced of the inferiority

of each tree which composes it, to one of the same age growing amongst plants of different species though equally close and numerous." Dealing with the planting of scrub land he writes: "Experience has proved that where hazel and whitethorn grow with vigour almost every species of tree may be planted to advantage: it will only be found necessary to prevent the branches of the shrubs from over-topping or interfering with the young shoots of the plantation"; or further: "in the spaces which they (the planted trees) may fill amongst the shrubs and underwood they will certainly succeed and make good trees." Since this was written forest practice has seen the adoption of large scale afforestation of pure conifers on bare ground and the practice of clear felling and entirely removing all shrubs and woody growths before planting. We are now, after more than 100 years, back to Hayes's way of thinking again. For example, with regard to the planting of hardwoods such as oak, ash, etc., he recommends planting "at about twenty feet as under . . . the plantation should then be thickened up with any other sort of trees." This surely reads like some recent instruction to foresters urging them to adopt this "new" way of establishing hardwoods in a matrix of conifers.

In making these remarks I do not wish to convey that the value of mixtures was entirely overlooked at any period here, but the extensive afforesting of bare land made it impossible to follow rules which apply to establishing under a shelterwood. The introduction of exotic conifers, whose silvicultural requirement or comparative growth rates were to a large extent unknown, made it a difficult matter to select suitable mixtures. It is to the credit of the older generation of foresters that in early experimental plantings of exotics here, mixtures were the rule rather than the exception. However, experiences with such mixtures were not always too happy.

Mixtures at Avondale

Mr. Forbes, in laying down the experimental plots at Avondale gave considerable attention to mixtures and, as a rule, pure crops of all important species were planted side by side with the same species in mixture, with a view to noting their development under both conditions. In view of the importance of this particular aspect of afforestation work and to illustrate the main difficulties which arise in the handling of mixed stands, the experiences with some of these experimental mixtures in the Avondale experimental plots might be considered.

Mixtures of Hardwoods

The most favourable mixture from a silvicultural point of view is a mixture of tolerant or shade bearing species with intolerant or light demanding species. Several such mixtures were initiated at Avondale, of which the following are the most important:

(a) Mixtures of light demander with shade bearer . . . sessile oak and beech.

A successful mixture of oak and beech has much to recommend it. The oak being an intolerant species is incapable of keeping full canopy after the thicket stage is passed. The gradual opening of the canopy, after the pole stage has been reached, leads to a deterioration in surface conditions and also to the development of epicormic branches on the boles of the trees. A mixture of beech helps to keep the forest floor free from grass and weeds and also, by its relatively dense shade, prevents the development of "water shoots" in the oak. It allows more freedom in thinning. The crowns of the better boled oak can be freed and girth increment encouraged without fear of deterioration in quality of bole or ground conditions.

The development of this mixture at Avondale (Plot 2, Section IV) leaves much to be desired. The beech, which proved a more vigorous grower in the early stages, out-topped the oak and suppressed it over most of the plot. This illustrates one of the most troublesome aspects of mixtures; the tendency for the tolerant species to outgrow the more valuable intolerant species.

A mixture of pedunculate oak and beech suffered the same fate (Plot 9, Section IV).

It might be considered that hornbeam and oak would be a more suitable mixture, but here again (Plot 6, Section IV) we find the tolerant hornbeam outpacing and completely suppressing the oak before the crop was in its thirtieth year.

It appears, therefore, that intolerant hardwoods such as oak and ash should be planted some years in advance of the tolerant species. Oak and beech are usually grown as a two-storied mixture in Europe. The oak is initiated by sowing or close planting. A dense canopy is thus maintained on into the small pole stage. When the better shaped dominants begin to pull away from the general crop and show a clean length of bole of 30 feet or so, heavy thinning is commenced to allow the crowns of the dominants to build out so that rapid growth is maintained. Beech comes in naturally or is planted at this stage and develops readily under the light shade of the opening under canopy. The beech soon reaches the lower crown of the oak and helps to prevent the eruption of epicormic branches. When the crop is ready for felling both species are removed together, the beech selling as firewood and the oak as high-class veneer or furniture wood.

(b) Mixtures of intolerant or light demanding hardwoods.

It is a fundamental principle of silviculture that intolerant species are unsuitable to crown mixing. Such a mixture, oak and ash (Plot 1, Section IV) illustrates this nicely. The ash outgrew the oak, leaving it as a stunted understory. The ash itself is of very poor quality and owing to the low stocking of dominants, there are not sufficient good stems for selection for a final crop. The ground is a wilderness of briars and filth.

(c) Temporary Mixtures.

The rapid growth and high value of European larch, Japanese larch, Norway spruce in the early pole stage make it economically desirable to mix them with species which, though valuable as timber, yield worthless thinnings. Larch and Scots pine is a common mixture in Irish silviculture. Although this is a mixture of intolerant species and has little to recommend it silviculturally, it is approved on financial grounds wherever the soil conditions are sufficiently good to merit its trial. However, there are few instances of successful crops being raised with this mixture. On good ground the larch gets away and unless carefully watched will suppress the pine; on poor pine ground it fails to thrive and is suppressed by the pine. With careful watching, however, good crops can be raised, especially where, on moderately dry soils, over Silurian rocks with a proportion of Erica cinerea in the ground vegetation, the two species come away fairly evenly. The larch is able to suppress side branches on the pine and draw it up nicely, but the crop tends to develop into a mixture by groups as the ground varies to favour the larch or the pine.

There is no plot representative of this mixture at Avondale, but, as the soil is somewhat rich and loamy, it can be assumed that the larch would have proved too vigorous for the Scots pine. This has happened in the case of the Corsican pine, European larch mixture (Plot 2, Section VIII). The pines were all killed out before the crop was 30 years old.

Other mixtures coming into this category are oaks and larch, oaks and spruce, maples and larch. In the case of all these mixtures the larches and spruces, which were to play a temporary rôle, succeeded in suppressing the other species and forming pure crops in a relatively short time. It would have been much less expensive in each case to plant larch or spruce pure, so these mixtures, really unsound silviculturally have not proved themselves to be financially desirable either. It is not suggested that temporary mixtures may not be successfully managed and made to yield the results desired, but it does seem that mixture by individuals is seldom really successful and the beneficial results from mixtures might be more cheaply and easily obtained by other methods. Mixture by lines is just as difficult to control as mixing by single trees, but may be cheaper to plant and thin.

(d) Temporary Mixtures to reduce planting costs.

Crops of rare exotics and certain hardwoods are costly to establish if the full complement of plants is used all over the area. Considerable saving might result from the use of common, inexpensive species as fillers; these latter to help cover the ground and provide for the cleaning of the main crop trees. There are many examples of this type of mixture in Irish silviculture. In the Avondale plots this type of temporary mixture was adopted with all the expensive species. The results obtained have been variable. Abies grandis and nobilis planted 8' by 8' and fillers of abies pectinata used to give 4' by 4' planting rate over the ground resulted in early and complete elimination of the pectinata. The main crop species developed as if planted at 8' by 8'. The fillers used in this case were of little value in providing a temporary mixture and better results might have been more cheaply attained with 6' by 6' planting of the main crop.

Similar results were obtained with a mixture of pinus insignis and European larch, the latter being suppressed too early to have had any silvicultural significance. Larch as a filler suppressed pinus strobus. Japanese larch suppressed Norway spruce in a mixture in which the latter was to play the rôle of a filler; the larch, however, was planted close enough for normal stocking and a good, pure crop resulted.

(e) Mixtures to protect tender species against frost.

In view of the importance of frost as a site factor affecting the establishment of such tender species as Sitka spruce, silver fir, ash and beech, and the attempts being made to raise crops of these species by mixing with frost hardy nurses, it is interesting to find a fairly thorough account of the behaviour of such a mixture in Avondale. Japanese larch was mixed in 1905 with Sitka spruce in alternate rows with 4' spacing. The Sitka spruce suffered during the first five or six years after planting from spring frost and aphid damage and by 1914 the Japanese larch was dominating the spruce and suppressing it. In 1917 a careful inspection of this plot led to the conclusion that the Sitka spruce were past recovery, many of them being completely leaderless and resembling bushes rather than trees. The idea was favoured of growing a mixed crop of larch and spruce, side pruning or removing the former in places where the spruce was most promising and allowing the latter to die out in the least flourishing parts. The result of this thinning and pruning was so striking, however, that it gradually extended from year to year, the spruce recovering, as soon as light had been admitted, in the most remarkable manner. Numbers of trees which appeared to have lost all trace of leaders at one time began to form them about an inch in length. In the second year these dwarf leaders developed into 6" to 12" growths and in the third year after thinning a normal growth of

2' to 3' was being made. 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.

If any conclusions can be drawn from this record it is: that the Japanese nurse might best have been established pure at 8' by 8' as an advance crop and thinning resorted to when the crop was 12 to 15 years old, when the Sitka spruce could have been introduced with equally good results.

The Japanese larch has many qualities of a good nurse being a rapid grower and easily and profitably disposed of in the pole stage. It, however, sheds a fairly heavy shade and only fairly tolerant species can be raised successfully under it. Sitka spruce seems to have many of the characteristics of a moderately tolerant species and might well be raised under an open pole crop of Japanese larch. Another lesson to be drawn from this plot is that the nurse species had little or no effect in mitigating frost damage until it formed canopy, but when the crop was thinned in the pole stage, the newly revived spruce suffered no longer from frost on a site where damaging spring frosts were a regular factor.

If one considers the value of mixtures as shown by the results cited above it would seem that their disadvantages far outweigh the advantages. In all cases in Avondale pure crops have been satisfactorily established at much cheaper rates and in very few cases have they spoiled for lack of attention. It appears then that on good soils little advantage and much waste results from even-aged mixtures by individuals or lines, and unless skilled and timely attention can be given, poor crops result.

The easiest and most natural form of even-aged mixture to establish is one composed of small pure groups. This method is specially suitable where an intolerant species, such as oak, is to be grown in a matrix with more vigorous trees such as spruce or larch. In recent years this method of mixing is coming more and more into vogue. Oak, ash, sycamore and other hardwoods are now usually initiated here in pure groups of closely planted trees, spaced 21' or so from centre to centre, and the remainder of the ground stocked with fillers such as Japanese larch, Norway spruce, beech, European larch, Lawson's cypress. Most of these mixed crops are still in the prethicket stage and while they are developing satisfactorily so far, it is too early to pronounce on the merits of this method of establishing mixed crops under Irish conditions.

So far, all the examples chosen refer to good sites for planting: that is, old woodland soils or good old pasture, well supplied with good humus and plant food, and well aerated. The reasons for choosing mixtures on such sites are purely financial and aim at early returns or cheap establishment. There are, however, large areas of degraded soils overlying the acidic Old Red Sandstone or granite rocks of our mountain ranges, where crop establishment is decidedly difficult. It is on such soils that mixtures are really of immense, and in some cases, of vital importance. Most of our commercial forest trees are exacting in their demands on site and will not thrive when planted pure on poor ground or under unfavourable climatic conditions. The value of nurse, or "pioneer" species in helping the establishment of exacting species has long been recognised. In Sweden, the birch is regarded with great reverence owing to its important rôle as a "pioneer" species on deforested land. I will always remember the fervour of a Swedish forester as he told of the wondrous "mothering" qualities of the birch. He pointed out an area where fire had destroyed a large section of spruce forest many years previously. Artificial regeneration was immediately resorted to, but

repeated plantings of spruce failed and the attempt was abandoned in despair. By degrees the bare, abandoned ground was colonised by birch and when, a canopy formed, natural spruce seedlings began to spring up in quantity. When we visited the area there was a complete understory of vigorous spruce, some well up in the now-lightening birch canopy.

In the reafforestation of the Jutland heaths it was found impossible to establish Norway spruce without first growing mountain pine as a " pioneer."

The value of "pioneer" species is now being recognised here and in Great Britain. In many plantations the beneficial effects of such species as contorta pine, Japanese and European larch, Scots pine on the development of spruce, Douglas fir and Tsuga can be illustrated. Plantings of spruce on light soils where heather is a normal, though sometimes temporarily insignificant component of the vegetation, usually go through a stage of check after planting which may last for years. It has been observed that where contorta or Scots pine has been introduced in beating up or was present from the first planting, the spruce nearest the pine come earlier out of check than is the case with those unmixed with pine. Similarly Sitka spruce mixed with European or Japanese larch show greater freedom from aphid attack or are more vigorous and healthy than pure crops on similar sites. Ecologists and mycologists have been busy trying to elucidate these phenomena and while much has come to light we are still far from a full explanation. We can, however, agree that Hayes of Avondale put the matter fairly concisely when he wrote that " Providence had wisely scattered the food of each plant over the surface of the earth, so that many trees of different species will grow well on an acre of ground where the same number of one kind would actually starve for want of nourishment.

Some Methods of Estimating the Volume of Timber in Woods and Plantations

By H. M. FITZPATRICK, B.Agr.Sc.

General Principles

All methods of estimating the cubic contents of woods and plantations have as their basic principle an accurate count of all the trees and an accurate measurement of one or more sample trees. The numerous recognised " Methods " vary only in the way the sample trees are selected.

Explanation of Terms

Sample Plot.—When the area is too large for a total count, a plot which is representative of the whole is demarcated and is referred to as the Sample Plot.

Quarter-Girth Volume.—The volume of round timber is calculated from measurements of girth and length. In a uniformly tapering stem the girth is taken at mid-length; in an irregular stem it is taken at the middle point of each regular section. The quarter of the girth in inches is squared, divided by 144 and multiplied by the length of the stem or section in feet. The result is the volume in cubic feet.

Basal Area.—Trees may be conveniently classified according to their quarter girths at breast height, 4′ 3″ above ground level. This quarter girth is presumed to be the same as that at the base of the tree. It is squared, divided by 144, and is spoken of as the Basal Area of the tree in square feet. The total basal area of a group of trees is the sum of the basal areas of the individual trees, and the

mean basal area is this sum divided by the number of trees in the group. The mean basal area tree is that tree with a quarter girth corresponding to the mean basal area, i.e., multiply the M.B.A. by 144 and extract the square root.

Forest mensuration tables may be used to find the B.A. of any Q.G. and vice versa.

The Sample Plot

The area of the sample plot depends on the nature of the crop and the purpose for which the estimation of volume is needed. In an even-aged, fully or regularly stocked stand of even growth, 1/10 acre will usually be enough for management statistics. In an irregular or unevenly grown stand, or for purposes of purchase or sale, a larger area would be desirable. The larger the plot the greater the accuracy, and the size depends on the degree of accuracy needed and the time and assistance at the disposal of the estimator. For many reasons a strip 1 chain wide is convenient. It may be 1, 2, 3, 4, 5 or more chains in length, giving areas of 1/10, 1/5, 3/10, 2/5 and 1/2 acre respectively (10 sq. chains=1 acre).

The enumerator and his assistant first walk through the entire wood before picking on a representative area for the plot or strip. A base line 1 chain long is marked with a stake at each end, and two sides lines 1 chain long are laid off at right angles and marked with stakes. These four stakes enclose 1 square chain=1/10 acre. The strip is extended as desired by continuing the side lines to 2 or more chains, with a stake at each chain length. The boundaries should be marked by lightly blazing the marginal trees or in some other way.

On a hillside it is usual to run the strip up hill. When the trees are in lines it is well to run the strip diagonally across the rows to avoid a large number of stems actually on the boundary line and therefore not wholly growing on the plot. In girthing or counting every second such tree is omitted.

Girthing the Stems

The assistant measures the girth of each tree at 4′ 3″, using a quarter-girth tape from which the quarter of the girth can be read directly, and as he proceeds marks each tree with a scribe or knife. The enumerator enters the quarter girths in appropriately headed columns in his notebook by means of strokes or dots for each tree.

It is important that the tape should be placed horizontally around the stem. The Q.G. is read to the nearest ¼ inch below.

Working Up the Figures

When all the stems on the plot have been girthed and booked, a form headed as follows is drawn up:

Q.G. Class	B.A.	No. of Stems	B.A. of Class	No. in Group	B.A. of Group	Mean B.A.	Q.G. Sample
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)

These columns are filled-in in this way:

(a) The range of quarter girths which occur, e.g., 4″, 4¼″, 4½″ . . . . . 10″.

(b) The corresponding basal area, e.g., 4″ Q.G. gives 4 × 4 divided by 144 = 1/9 = .1111 sq. feet basal area. Can be found by tables.

(c) No. of stems in each class; found by summarising the ¼″ classes in the notebook.

(d) Basal area of class; is found by multiplying (b) by (c), e.g., in 4″ Q.G. class the basal area is .1111 and if number of stems is 10 the B.A. of class is 1.111 sq. feet.

The next step depends on the method to be adopted in the selection of sample trees.

Selection of Sample Trees

The methods to be described presume that the basal areas of the trees in the sample plot are directly proportional to their volumes and that the mean basal area tree of a group, found arithmetically by dividing the total basal area of the group by the number of trees in it, is the mean volume tree of that group.

Arithmetical Mean Sample Tree Method

The sample plot is treated as one group, and its total basal area is divided by the total number of stems to get the mean basal area tree for the plot.

The form is filled in this way:

Column (e)—The total of column (c) is entered.
" (f) " " " " (d) " "
" (g)—The mean basal area is found by dividing (f) by (e).
" (h)—The quarter girth corresponding to the mean basal area is entered. This is the Q.G. of the Sample Tree.

Urich's Method

In this method the trees in adjacent girth classes are put in groups, each with the same number of trees, and the sample tree is calculated for each group.

The number of groups is first decided and the total number of trees, column (c), is divided by this to get the number of trees which will be put in each group. Any remainder can go in a group by themselves or be added to the last group. The first group is formed by entering in column (e) the number of trees in it and adding up the class basal areas, column (d), until the basal area of this number of trees is reached. This area is entered in column (f). It often happens that the final Q.G. class dealt with must be split in order to get the correct number for the group, and in such cases only the basal area of the trees actually taken for the group are included. The trees remaining and the balance of the basal area go to the next group. The mean basal area of the group is found by dividing the group basal area, column (f) by the number of trees in the group, column (e), and this quotient is entered in column (g). The corresponding quarter girth goes in column (h) and is the quarter girth of the Sample Tree of the first group.

This procedure is repeated for each group into which the stems on the plot have been divided.

Hartig's Method

This is another "group" method and is considered to be better than Urich's. The trees in adjacent girth classes are placed in groups each of which contains an equal basal area. The procedure followed is, first, to decide on the number of groups and then to divide the total basal area, column (d), by this figure. The quotient is entered in column (f). The class basal area, column (d), is added up until the group basal area figure is reached and the number of stems, column (c), needed to reach that area is the number in the first group and is entered in column (e). It may be necessary to split up the final class basal area to get the correct group area, and in such cases the balance of the area and the trees remaining over in the corresponding classes, are carried forward to the next group. The mean basal area of the group is found in the usual way by dividing the

group basal area, column (f), by the number of trees in the group, column (e), and it is entered in column (g). The corresponding quarter girth goes in column (h). It is the quarter girth of the Sample Tree of the first group.

The other groups are dealt with in the same way. It usually happens that there is a remainder of basal area when all the groups have been formed. This may be treated as a group basal area in itself or added to the last group.

Measuring the Sample Trees

A second form is drawn up with headings as follows:

No. in Group (i)	Q.G. Sample (j)	Length Sample (k)	Mid Q.G. Sample (l)	Mid S.A. Sample (m)	Vol. Sample (n)	Vol. Group (o)

Column (i) is the same as column (e) on other form and gives number of stems in each group.

Column (j) is also taken from the other form, column (h), and shows the quarter girth of the Sample Tree of the group.

The next step is to find trees with these quarter girths at breast height. These trees may be in the plot or in the surrounding plantation, and it is convenient to select trees about to be cut down as thinnings. One or more stems may be measured for each sample and an average found.

The best way to get an accurate volume is to fell the trees and measure the length and the mid-length quarter girth on the ground. If felling is not permissible, volume may be estimated by height measuring instruments and form factors, or by climbing to mid-height.

The length of each sample goes in column (k) opposite the group to which it belongs. The quarter girth at mid-length goes in column (l) and the corresponding sectional area in the next column, (m). The sectional area is found in the same way as the basal area. The volume of the sample is got by multiplying this sectional area by the length. It is entered in column (n). When there is more than one sample tree for a group, the average volume is calculated.

Total Volume of Groups

The volume of the group is the volume of the average sample tree multiplied by the number of trees in the group. It goes in column (o).

Total Volume of Plot

The sum of the group volumes, column (o), is the volume of the sample plot.

Volume of Whole Wood

The volume estimated for the sample plot is brought to volume on one acre, and from this the volume contained in the whole area of the wood or plantations is calculated.

Obituary

The Late Alexander McInnes
March 19, 1877—May 7, 1944

The death of Mr. Alexander McInnes, Managing Director of Messrs. McAinsh and Co., in Dublin, on the 7th May, 1944, after a trying illness, removes one who, in recent years, has played a notable part in the development of the home timber trade in Eire and also deprives our society of one of our keenest members.

He was a native of Crieff, Perthshire, Scotland, and was marked out at an early age for responsible work in the firm which he served all his life. After a short time spent in the North of Scotland he came to Ireland in 1904 as manager for P. McAinsh when timber in the country was cheap owing to great destruction caused by a severe gale shortly before that time. After spending many years in Westport the firm moved its headquarters to Tourmakeady, County Mayo, where, in addition to his normal timber cutting activities, Mr. McInnes did quite a lot of planting, notably of Hybrid Larch. The firm later removed to Galway and finally to Dublin in 1935.

Mr. McInnes took an active part in 1939 in the formation of the Home Grown Timber Merchants Association of Eire, of which he was President and, acting in that capacity, his long experiences of both war and peace conditions and his sound judgment and foresight proved of great value in all matters affecting the Home Timber Trade, concerning which he was frequently consulted by the responsible authorities. The concern for which he was responsible had in the meantime developed from one saw mill to no less than fourteen mills widely scattered throughout the country and, apart from the useful productive work carried out by his firm, there is no doubt that he had a valuable steadying influence upon the trade at a very difficult time. One of the special features of the trade developed by Mr. McInnes was the production of railway keys from second-class oak.

Everyone who had any dealings with him came to appreciate his directness, honesty, uprightness and cheerful disposition. His whole mind was in his work and he had a high sense of value, caring little for outward show or cheap advertisement. It was his belief that a sound job of work, the satisfaction of his customers and of all those with whom he had dealings were the best form of advertisement. Many will remember him for his many unobtrusive acts of kindness and consideration, which he could extend even to his competitors. Even on his death-bed his thoughts were not of himself, but of his work and others.

He was an enthusiastic fisherman and at one time a keen golfer. One of the most remarkable aspects of his character was his ability to look at woods not only from the timber merchant's point of view, but also the forester's and, apart from his own efforts at planting, he was always ready, even at a sacrifice, to co-operate in any special effort to improve woods purchased by his firm by surrendering trees specially desirable for retention. He was held in high esteem and affection not only by his own staff, but by a wide circle of friends all over Eire, and his departure leaves a gap which will be filled only with difficulty. He lived a cheerful life, had a keen sense of humour, a fund of apt and pithy phrases which enlivened his conversation and an alert enthusiasm which belied his age.

Annual General Meeting, 1944

The second Annual General Meeting of the Society was held at Jury's Hotel, Dublin, on Tuesday, the 8th February, 1944, at 7 p.m. The attendance numbered 50 people.

The minutes of the First General Meeting, 1943, having been read and signed, the President said he proposed to leave the address until the business had been disposed of and proceeded to read the report of the Council.

COUNCIL'S REPORT

Council Meetings.—Four meetings of the Council were held—three in Dublin and one in Clonmel. The strength of the Council was 12 and the average attendance was 8. I should like to pay a tribute to the enthusiasm of those members who have attended in these difficult times, often at great inconvenience.

Membership.—At the beginning of the year the membership was 136 in all, consisting of 37 Grade I technical, 78 Grade II teachnical and 21 Associate members. The membership at the end of the year had risen to 156, of which 39 were Grade I technical, 83 Grade II technical and 34 Associate members. There was one loss by death, so that new members elected amounted to 21, 14 of which were Associates. I think that there could and should be a considerable increase in membership in spite of difficult times, especially in Associate membership, and I hope everyone will do his or her best to help in this matter.

The Treasurer wishes me to say that there has been delay over the payment of subscriptions. Sixteen members elected cannot be enrolled until they have paid their subscriptions. If they fail to do so before the expiry of 1944 they will cease to be eligible for enrolment. In addition nine subscriptions are due for the year 1943 from members already enrolled, and the Secretary is being asked to send reminders in future, as such omissions are usually due to forgetfulness. May I remind all members that fees are due for payment on the first of January.

Finance.—This will be dealt with in more detail later. The audited abstract of accounts has been distributed to you. The credit balance has risen from £10 0s. 10d. to £54 8s. 7d. Our position is, therefore, financially sound.

Journal.—After a certain amount of delay and difficulty over supplies, etc., the Editor succeeded in producing the first issue of the Journal, somewhat later than expected. An opportunity is being given later for a discussion on the Journal, and I need not say more now except that I believe it has had a very favourable reception generally.

Excursion.—The first excursion of the Society, held in June, 1943, in the Suir valley, was, on the whole, very successful, being attended by 30 members. A very able and full report of the Excursion has appeared in the Journal, from which members who did not attend obtain an idea of what such an excursion is like. If we are to continue this activity, as is expected, it is hoped that the attendance will be at least maintained.

Mr. Ryan proposed the adoption of the report.

Mr. Petrie seconded.

The President said that the Council would like to have the views of the meeting on (a) whether we should hold an excursion this summer and (b) on where it should be held. The meeting was unanimous that an excursion should be held.

Dr. Anderson proposed that Wicklow would be a suitable venue in these times for an excursion.

Mr. Swords seconded.

The proposal was passed unanimously.

Mr. Donovan proposed the adoption of the abstract of accounts for the year eending 31st December, 1943.

Mr. Cleary seconded.

The abstract of accounts was adopted.

The meeting approved of the election of the following Office-bearers and officials (for the year 1944):

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

Vice-President: H. M. Fitzpatrick, Kendalstown Hill, Delgany, Wicklow.

Secretary and Treasurer: Thomas Clear, Albert Agricultural College, Glasnevin.

Editor: J. A. K. Meldrum, Ben Wyvis, Lakelands Park, Terenure.

Business Editor: T. McEvoy, Avondale House, Rathdrum, Co. Wicklow.

Auditor: Duncan Craig, 102/103 Grafton Street, Dublin.

Councillors (1944-'45): P. Barry, 94 Malahide Road, Dublin; S. M. Petrie, 1 Glandore Road, Griffith Avenue, Dublin; Felix McMahon, Annagh Bay, Hazelwood, Co. Sligo.

ELECTION OF MR. J. CROZIER TO HONORARY MEMBERSHIP

Mr. H. M. Fitzpatrick, the proposer, referred to Mr. Crozier's long experience in Scottish forestry, particularly at Durris in Kincardineshire. For many years he had made an extensive study of the adaptability of North American species of commercial timber trees to conditions in Scotland. Plantations which he formed at Durris of Douglas fir and Sitka spruce were an outstanding success and served as an example to be followed in establishing similar plantations elsewhere.

His accumulation of knowledge and experience became available to Ireland when Mr. Crozier came to this country in 1910. His innate Scottish caution would not permit him to embark on any planting operations which did not hold promise of complete success, and the results of his work were to be seen to-day. Many of our most promising plantations were due to Mr. Crozier's care and foresight in selecting species most suitable to the sites. The present returns from thinnings were an augury of profitable final crops.

Irish forestry owed much to Mr. Crozier and some mark of appreciation and acknowledgment should be accorded to him. The Society of Irish Foresters could do a little in that direction by electing him to Honorary Membership. It was, therefore, with very great pleasure that he submitted the proposal for adoption by the meeting.

Mr. Forbes seconded this proposal and said when, in 1910, he was asked to find someone to give a hand he looked around and one man stood out—John Crozier. He went to Durris and brought him back, and he never regretted it. Mr. Crozier was a very straightforward man and always said what he thought. He had a fondness for North American conifers and had a wider knowledge of these trees than any other man. Douglas fir and Sitka spruce were his special favourites

and he showed a keen appreciation of their good and bad points. He had a fine sense of justice and was always a man with whom one could deal.

Mr. Forbes said he had much pleasure in seconding the resolution and was sorry that Mr. Crozier's state of health had prevented him from attending the meeting.

Dr. Anderson put it to the meeting that Mr. Crozier was worthy to become an honorary member of the Society. The motion was carried with acclamation. The Secretary was instructed to duly enrol Mr. Crozier as an Honorary Member of the Society.

APPOINTMENT OF TRUSTEES

The President having read the article (Article XII of the Constitution) dealing with the appointment of trustees, Mr. O'Beirne proposed that Dr. Anderson, Mr. Meldrum and Mr. Donovan be appointed as trustees to the Society.

Mr. Fitzpatrick seconded and the proposal was passed unanimously.

DISCUSSION ON JOURNAL

During a discussion on the subject matter and format of the Journal, Mr. McEvoy pointed out that some printing errors were not corrected and said that proofs should go out to the various writers for correction before going to print.

Mr. O'Beirne said that he thought the subject matter met with general approval, but the appearance of the cover was cheap and the paper of poor quality. He suggested that these might be improved in the next issue.

Mr. Meldrum, in replying to these points, said that he agreed with Mr. O'Beirne with regard to the quality of the paper, but that he had to take what was available. The Department of Industry and Commerce limited strictly the amount of paper to be used. The type was rather small, larger type could have been used only by sacrificing space.

With regard to the policy of publishing entirely in English, Mr. Meldrum said that Gaelic script is much more expensive and takes up more room. He would welcome suggestions the members might care to make and asked that these suggestions be sent in in writing.

The President then read his address.

PRESIDENT'S ADDRESS

While I do not wish to shirk my duty as President in respect of Rule 5, I feel that there are few important Forestry happenings in the past year which call for special comment.

As regards Eire, the process of consumption of the little that is left of commercial timber in the country has continued, while the demands for fuel-wood have fallen off, if they have fallen off, solely on account of transport difficulties. The production of charcoal for producer-gas driven vehicles has expanded and is welcome in so far as it is a means of utilising small waste material. The means of manufacture vary considerably from highly-skilled open pit burning, long obsolete in this country, to the crudest of so-called kilns. New uses have been found for certain timbers, such as beech in the boot and shoe-making industry, pine in match-making, lime for pencil and match-making, etc.

Stocks of best quality oak, which are likely to be in strong demand for railway reconstruction work after the emergency are becoming

scarce. A few landowners, who were sufficiently wise to give serious attention to their woodlands before the emergency, still have some stocks of commercial timber available and are reaping their reward.

Difficulties in the way of replanting are still serious, and little progress is to be expected until stocks of fencing materials, tools and plants become more abundant and cheaper. There are some indications, however, that a number of people are alive to the possibility of developing the forest nursery trade, one of the main obstacles to which is the supply of forest tree seeds. There is no doubt that a little enterprise in this direction now will be well repaid in the future when the general position eases.

In general, it seems clear that the present world difficulties will have resulted in a greatly increased demand for the raw materials produced by the forest. Considerable technical advances have been made and are being made abroad in the chemical treatment of wood as a raw material for the production of a wide and varied range of products. While the greater demand for forest produce which will result from these advances will be met to some extent by the use of much of what has hitherto been allowed to go to waste, it seems certain that the total demand for forest produce will show a marked rise. Moreover, the requirements of constructional timber, not processed chemically, for the post-war reconstruction will be enormous. Prices of timber, wood-fuel and other forest products are likely, therefore, to be higher for many years to come. Forestry prospects are, therefore, good and the demand for sound silviculture and forest management must remain urgent, and any expansion of the forest area, however small, is to be encouraged and welcomed.

Mr. Chisholm said that a hearty vote of thanks to the Council should be recorded.

Mr. Diver seconded.

This concluded the private business.

The President then called upon Lt.-Col. A. T. S. Magan to read his address on Private Forestry in Ireland, of which a report appears elsewhere in this issue.

Mr. A. C. Forbes proposed a vote of thanks to Lt.-Col. Magan for his most interesting address, and Mr. J. A. K. Meldrum seconded.

STATEMENT OF ACCOUNTS TO 31st DECEMBER, 1943

Receipts	£	s.	d.	£	s.	d.
To Balance from last A/c						
On Sec. hands ...	0	0	10			
At Bank Deposit Receipt ...	10	0	0			
				10	0	10
To Subscriptions:						
32, 1st Grade Technical ...	32	0	0			
67, 2nd Grade Technical ...	33	10	0			
28 Associate ...	21	0	0			
1 Associate, 1944...	0	15	0			
				87	5	0
To Enrolment Fees, Excursion				0	17	0
				£98	2	10

Expenditure	£	s.	d.
By Stationery	7	18	5
„ Printing of Journal ...	19	11	9
„ Postages	3	0	5
„ Hire of rooms for meetings	1	8	6
„ Bank Charges	1	5	2
„ Secretary's Honorarium ...	10	10	0
„ Balance:			
In Sec.'s hands £1 7 5			
At Bank, Current 3 1 1			
At Bank, Deposit 50 0 0			
	54	8	7
	£98	2	10

I have examined the above account, have compared same with vouchers and certify it to be correct, the balance to credit of the Society being £54 8s. 7d., of which £3 1s. 1d. is on Current Account and £50 is on Deposit Receipt with the Ulster Bank, Ltd. Credit has not been taken for subscriptions unpaid at the end of the year amounting to £6 10s. 0d.

(Signed) D. M. CRAIG, Auditor and Accountant,

7th January, 1944. 102/103 Grafton Street, Dublin.

SPECIAL MEETING, JUNE 7, 1944

Owing to transport difficulties the proposed Annual Excursion had to be abandoned and it was decided to hold a meeting at Jury's Hotel, Dublin, in order to hear an address by Mr. G. F. Mitchell, M.A., F.T.C.D., on The influence of the Ice Age on Irish Forests.

About seventy members were in attendance, and the proceedings were opened by the President, Dr. M. L. Anderson, reading a letter of congratulation on the establishment of the Society from the Secretary of the Society of American Foresters. He also read the context of a letter in reply, which was cordially approved by the meeting. This correspondence appears elsewhere in this issue.

Dr. Anderson apologised for the disappointment occasioned by the abandonment of the Annual Excursion and said this was the fourth meeting of the Society at which papers had been read. He introduced Mr. Mitchell, Lecturer in Geology at Trinity College, Dublin, since 1940, and in the course of his remarks stressed the important bearing of geology, particularly glacial geology, on Forestry problems in this country.

Mr. Mitchell, in the course of his address, said that one of the most remarkable features of the Irish flora is the small number of timber-bearing trees that are native in the country. This poverty is the result of the climatic changes that took place in north-west Europe during the later part of geological time. At the beginning of the Tertiary Era, in the Eocene period (perhaps seventy million years ago), the area we now know as Great Britain and Ireland enjoyed a sub-tropical climate and was covered by forests in which the Redwood, the Plane and the Magnolia were prominent. Throughout the Tertiary the climate grew cooler and most of the warmth-loving trees disappeared, while more modern species of temperate trees increased in importance. Continued cooling caused large ice-sheets to develop and these invaded north-west Europe, driving the trees before them. In England at Cromer a deposit containing plant remains which is thought to have been formed just before the first advance of the ice has been studied. It shows that by this time (the end of the Pliocene, perhaps half a million years ago) most of the warmth-loving plants had gone, and of the trees present only the Spruce is not found in England to-day.

Ice was the most spectacular feature of the ensuing Pleistocene period and during the advances of the ice tree-growth was probably impossible within the limits of the Ireland of to-day. But the advances (or glacial periods) alternated with retreats (or inter-glacial periods) when the temperature was as warm as it is at the present day. During at least one of these inter-glacial periods trees, including species not found in Ireland to-day, grew freely for in deposits in Clare and Waterford remains of Fir and Spruce nave been found.

When the ice finally disappeared (about ten thousand years ago) Ireland was joined to Great Britain, which was itself joined to Europe. Into this complex peninsula the returning plants gradually found their way. Open grasslands with patches of Birch, Pine and Willow developed first, then Hazel, Elm and Oak appeared and the Irish forests were re-established. Alder entered later, but only just in time, for shortly afterwards Ireland was severed from Britain. Immigration continued into England, and the Lime, Hornbeam and Beech had all entered that country before it was cut off from the Continent.

The Pleistocene ice-sheets, which marked the maximum of the refrigeration experienced by north-west Europe in recent geological time, had a double effect on the trees of Ireland. The ice drove out the warmth-loving trees, many of which are to-day only to be found

in refuges in China and North America. And the later changes of sea-level and coast-line that followed the disappearance of the ice only allowed a very limited number of trees to enter post-glacial Ireland. Successful plantations of many foreign trees have shown that it was limited conditions of post-glacial entry rather than factors of soil or climate that restricted the variety of native Irish trees.

Mr. H. M. Fitzpatrick proposed the vote of thanks and was seconded by Mr. A. C. Forbes. Captain Hamilton, Mr. McEvoy and Mr. Clear also spoke.

SOCIETY OF AMERICAN FORESTERS

Mills Building,
Washington, D.C

January 24, 1944.

Dr. M. L. Anderson,
16 St. Stephen's Green, Dublin, Ireland.

Dear Mr. Anderson,

I have just read with the greatest interest Volume 1, Number 1, of the official publication of the Society of Irish Foresters.

May I take this opportunity to extend to the Society of Irish Foresters the best wishes of the Society of American Foresters and to express the hope that the relationship between our two organizations may always be pleasant and mutually beneficial?

Please convey to your membership our congratulations on your most successful first annual meeting.

Cordially yours,
HENRY SCHMITZ, President.

Henry Schmitz/o.

SOCIETY OF IRISH FORESTERS
(Cumann Foraoiseóirí na hEireann)

16 St. Stephen's Green,
Dublin.

8th June, 1944.

Dear Dr. Schmitz,

Your letter of the 24th January last, conveying a message of congratulations, together with the best wishes of the American Society of Foresters and the hope of pleasant and beneficial relationship between our two organisations, has given the greatest pleasure to our members and I am asked to convey to you our thanks for your kindly interest and wishes for the future.

May I add that we are always interested in the Journal of your Society which keeps us well informed of Forestry matters in America and that, so far as our resources will allow, it is our hope to be able to make some similar contribution, however small, towards the advancement of our profession.

Yours sincerely,
MARK L. ANDERSON, President.

Dr. Henry Schmitz, President,
Society of American Foresters,
Mills Building, Washington, D.C.

Report of the Minister for Lands on Forestry for the Period 1st April, 1938 to 31st March, 1943

The report, which covers the activities of the Forestry Division for the five years from April 1, 1938, to March 31, 1943, is by far the largest report yet issued, running as it does to 65 pages. This increase in bulk is an indication not only of the steady growth of the Forestry Division, but also of the ever-widening scope of the activities of this important service. The format is the same as that followed in previous reports. On page 1 we find a map of Ireland, and here it is heartening to see the increase in the number of tiny circles which dot the map. The new circles have a very important significance indicating the opening of new areas for forestry work. These new nuclei have a snowball-like habit of growing as the years go by, as can be seen by reference to pages 10 and 11, showing the propaganda value of new centres on land acquisition in the locality.

The material in the report, in spite of the absence of a table of contents, is easy of reference and is presented under thirteen major headings. Under I, Legislation, no fundamental changes are reported. Important amendments and improvements in the Forestry Act, 1928, are foreshadowed and, if the recent press announcement that the "Planting Grant" is to be raised from £4 to £10 per acre and is to apply to areas of 1 acre and over, is a foretaste of the provisions embodied in the new Bill, it bodes well for the future of private forestry in the country.

Under II, Forest Policy, the report states: "It has been estimated that the national objective of both State and private woodlands should be 700,000 acres of afforested land, including 100,000 acres of protection forest and 600,000 of fully productive forest." It would be interesting to have the data on which this forecast of our future forest requirement is based. The future per capita consumption cannot be accurately foretold and will, to a large extent, depend on the cheapness and availability of supplies. With increased industrialisation and development, timber consumption is likely to increase. At the same time it would be unwise to calculate on replacing more than 70 per cent. of our imports of softwoods by home-grown timber. Denmark with a population of 3,386,274 and a forest area of approximately 900,000 acres still imports almost 50 per cent. of its timber requirements. The transference to forestry of land from the older methods of utilisation, namely, grazing or agriculture, cannot be speeded up unduly without causing hardship and friction and, perhaps, 10,000 acres per annum is the maximum rate of transference possible at the moment. There are other aspects of national forest policy which might deserve mention in a report of this kind. Many look to forestry to provide, in the future, in addition to supplies of an essential commodity, employment for a considerable body of rural labour, new industries, a means of using certain lands more effectively, etc. There is little in this report to indicate the Minister's views on these aspects of Forest Policy.

The average planting rate of 6,000 acres per annum (State and private) appears to be insufficient to produce the calculated acreage of 700,000 acres. In fact, the total area of 60,499 acres planted over the period 1933-'43 falls short of the fixed objective for the period by 40,000 acres. The period under review was, of course, exceptional and the Forestry Division is to be congratulated on maintaining a fine planting effort in face of every difficulty. It is also heartening and somewhat surprising to see how well land acquisition has been maintained in the emergency period, 48,926 acres having been acquired. That the State planting programme is largely one of reafforestation can be seen by a study of the tables given on page

7. Fully 43 per cent. of the land acquired for planting is old woodland, stocked or unstocked. The remainder is bare land, of which 14 per cent. is unproductive.

The record of weather conditions illustrates clearly the vagaries of a climate which, on the whole, is not unkind to the forester in his main task of afforestation. The regular occurrence of spring droughts and May frosts is a factor of some importance. The utility of weather records in relation to successful forestry practice needs stressing. We know very little about the general climatic conditions which prevail above the 800' contour in this country and any observations or records dealing with mean summer temperatures, rainfall, wind veolcity, frost, etc., help in assessing the value of sites for afforestation. The failure of Scots pine, Sitka, Douglas fir and Japanese larch (page 24) at high elevations gives some cause for alarm and shows how important it is to have an understanding of the effects of soil and climate on the various tree species used in large scale afforestation work. Co-operation with the meteorological service (page 54) is, therefore, a step in the right direction.

There are some interesting notes on the tree species in common use (page 24 et seq.). Broadleaved trees are more than maintaining their 10 per cent. representation in the planting programme, but are apparently troublesome to establish. It is desirable that more information on the technique of establishing broadleaved trees be made available. They will, it is to be hoped, figure large in the post-war planting programme especially on private lands and hints on their establishment might be made available in leaflet form.

Scots pine, in spite of its poor showing in many areas, appears to be still in favour, 25 per cent. of the total trees planted being of this species. It is being replaced on high ground by Contorta and Austrian pine. The pines, especially the latter two, are ideal pioneer trees and nurses and they figure largely in the plant list (45 per cent.).

Sitka spruce seems to be falling from favour (27 per cent. in 1933, 14 per cent. in 1943). It is not truly a pioneer species and any disappointment that has been experienced is due to the ignoring of that fact. Sitka does best as a successor species or on mature soils. On immature or degraded soils it requires nurses like pine, larch, alder or birch. It is good to see a revival of interest in such, of late totally neglected, trees as abies pectinata, Thuja plicata and Douglas (page 23).

Thinning operations "which must ultimately greatly exceed the annual planting programme" in area and in demands on labour, reached a new high level (2,085½ acres) in 1942-43 and the disposal of a rapidly increasing body of material will give many a problem in the years to come.

A serious increase for the period in the number of fires (265) as compared with the 1933-38 period (49) is recorded. The damage is estimated at £27,169 13s. 1d.; the figure for the 1933-38 period is given as £2,085 0s. 7d. The fires "are undoubtedly most often caused by mountain burnings getting out of hand, by careless picnic parties or careless individuals, especially people lighting dinner fires in turf bogs and smokers. . . . One appears to have been malicious." It thus appears that this great wastage of national wealth is the result of sheer carelessness, particularly by that part of the community (rural population) most likely to benefit by a successful afforestation scheme. Every effort should be made by propaganda in the Press, by means of the radio and in the schools to arrest this serious trend of affairs.

The space devoted to Utilisation, VI, has had to be increased many times over and this, in itself, is a sign of the times. One can get in these pages some idea of the part which Forestry in general and the

Forestry Department in particular have played in helping the nation throughout the emergency. Timber of all kinds soared in prices because it was in short supply. The many "emergency control orders" relating to timber and which appear under legislation show one side of the picture, namely, the efforts made to make the most of the little we had. On the other hand, the huge increase in the output of material of every kind, large timber, telegraph poles, pitwood, fencing material, firewood, charcoal, shows the response of the Forestry Division to the nation's call in time of need. It only remains to say in this connection that had the present State forestry organisation been in existence over the last 60 years or so, there would have been less need for "emergency timber orders."

To those interested in the labour content of Forestry, figures given in the table on page 46 are very interesting. One would expect greater fluctuations in the number employed throughout the year in such a seasonal occupation as Forestry. From the table it would appear that (expressed in terms of wooded area) the employment given in State Forestry work here is at the rate of 1 man full time per 60 acres. As most of the plantations are in the pre-thinning stage the employment rate may be said to be at its minimum and may be expected to rise steadily as the thinning programme expands. The expected shrinkage of employment on emergency fuel schemes after the war may, however, affect this tendency.

The work involved in the Forestry Act has been greatly increased. The total number of felling notices lodged during the period under review was 32,898 compared with 13,159 in the period 1933-38, and involved 2,695,287 trees. This, at the usual rate of stocking of mature woods here, would be equivalent to the clearing of 20,000 acres of mature timber. The number of trees to be planted as replacements is given at 14,057,909 or sufficient for the adequate replanting of about 7,000 acres. The table on page 51 which gives the species to be replanted, should indeed be very helpful to nurserymen in planting to meet the increased demand for forest trees which is bound to arise after the emergency. The planting of broadleaved trees should receive more encouragement. The prejudice of people in favour of conifers may be due to the policy of the nursery trade or to the Department's own policy of favouring conifers, and could be changed by propaganda and by giving preferential treatment to hardwoods in the planting grant scheme.

An analysis of the table of Expenditure on Forestry given under the heading XII, Forestry Vote, shows that over 75 per cent. of the Forestry Vote is spent on labour alone. This is important in that it shows the high labour content and relief value of forestry work. The amount expended on Forestry Education over the period averages about 0.5 per cent. of the total expenditure as compared with 1.7 per cent. spent by the British Forestry Commission under the same heading.

The heading of the first table on page 57 seems to be somewhat misleading. If the figures given are indeed Nursery and Planting costs it would appear that for 1942-43 the cost of planting (including plants) done was over £28 per acre, a truly alarming figure. These costs probably cover all cultural operations such as nursery work, planting, fencing, drainage, thinning, pruning, preparation and sale of produce, etc. It might be less misleading if these various costs were given under special sub-heads.

A spectacular increase in sales and receipts over those of the previous period is recorded. This is attributed to the abnormal economic conditions prevailing. While the next report will, it may be hoped, record a return to more normal conditions, we trust the promised slump in native timber prices will not materialise.

Report by H.M. Forestry Commissioners Great Britain, June, 1943

This report appears opportunely, so far as forestry in Great Britain is concerned, when the second world crisis has again thrown a severe strain upon the woods and forests of that country and when the Forestry Commissioners are, as a result of almost twenty-three years of experience in the acquisition and afforestation of land by the State, in a better position to realise what the development of a forest estate, under the general social and economic conditions prevailing in that island, involves. They are in a position to consider what mistakes in general policy have been made, if any, and to remedy these and also, at the same time, to bring forward stronger arguments to support any plan for forestry development.

The report is full of excellent material and ably drafted and well worthy of the importance of the occasion.

There are seven main sections under the following headings: Historical; Considerations basic to British Forestry Policy; Private Woodlands; Technical Services; Amenity and Recreational Facilities; Forest Policy and Progress; The Forest Authority.

There are also thirteen appendices. The report should be read with discrimination by all those interested in forestry generally and in the development of forestry in this country in particular.

In comparing the forestry position in Eire with that in Great Britain as indicated by the report, it is clear that in many respects there are several striking similarities, especially as regards silvicultural problems, education of the public in forestry matters, the development of markets for home produce, necessary technical measures to meet emergency conditions and other technical matters.

On the other hand, there are also very wide differences, especially in respect of general policy, relations between the State Forest Service and the rest of the community, supply of forest labour and other matters directly affected by the general social and economic backgrounds of the two countries, the one being predominantly an industrial country and the other predominantly agricultural. The very marked differences in respect of land tenure in the two countries is, of course, a matter of paramount importance.

It would be impossible to deal fully in a brief review with all the subject matter handled in the report, but one or two remarks which have equal importance in both countries may be selected for special emphasis, as they are an indication of certain difficulties common to both countries.

"There has been a tendency among those inexperienced in afforestation to exaggerate greatly the extent of afforestable land." In Great Britain, as here, no systematic survey of afforestable land has been completed, but according to an estimate made by the Commission's technical officers, it has been computed that 4.2 million acres of afforestable land exist in Great Britain. If we assume that the same proportion is afforestable in Eire we get an area of 1¼ million acres. The assumption may or may not be correct, but the figure has at least a more substantial basis than some of the wild guesses that have been made.

"We regard the employment which is afforded as only incidental to and not the main object of afforestation." Needless to say this is the normal attitude in all forest services. Some figures are given, however, based on German experience, of the amount of employment

which could be given both directly and indirectly. This works out at 10,000 men full time in the forest and 40,000 in forest industries for an area of one million acres under productive forest, making a total of 50,000 men.

"A widespread idea is that small trees are planted and that nothing of any consequence happens until they are cut down as large trees some 80 or more years later. It is important to remove that conception which is quite inaccurate." In this country, too, the need to remove such a conception is an urgent one and, probably, in view of the greater age of some of the State-owned plantations, it is even more important that the point should be stressed.

"Trees do not seed to order and we are dependent on overseas supplies of some species. This is a position which cannot be forced. It is better to wait a year or two than to plant the second best or wrong kind of tree on a given site." Some of the enthusiastic amateur planners would do well to consider this point seriously.

"The essential duty of the Forestry Commission is to grow timber and encourage others to do the same." There can be no denying this and one might also emphasise that the duty is to grow timber and not merely to plant trees.

"It is necessary to ensure that sound technical procedure is never sacrificed to large programmes." Here again any experienced forester must agree.

"We think that education in 'Rural Manners' has been neglected, and that both the necessity and opportunity for improvement will arise after the war. It is of great importance that the British people should learn better respect for forests and trees." The same applies, it is to be feared, to Eire, but the attitude of the rural population in Eire is in most districts helpful and appreciative.

Speaking of fires, which are very serious in Great Britain, the report says: "Damage has been caused because adjoining graziers have persisted, in spite of warnings, to burn under hazardous conditions. We consider that it should be an offence to start a moor fire unless there is a force of men present to keep it within bounds." In this matter legislation in this country seems to be in advance of that in Great Britain.

"In most places it is still a waste of money to plant without netting." This needs no comment.

"As regards sylviculture, we consider that the best results will be secured by growing those species whether softwoods or hardwoods, which are best suited to the local environment, that is to say, that there should be no artificial 'forcing' on preconceived lines." This is in entire agreement with the sylvicultural policy in Eire.

"There is room for both small and large forests in this country. Small forests are of great service if easily accessible to road and rail; locally housed labour is easily organised and supplies of standing timber are more evenly distributed about the countryside." This statement is extremely interesting, in view of the line of devolopment which economic conditions compel forestry to take in Eire.

Enough has been said to show where there are obvious resemblances between the two countries and how conditions compel the same attitude to be adopted in certain respects. It is, however, probably more important to stress the differences and also to refer to one or two weaknesses in the report.

The main differences are due to the difference in general land policy in the two countries during the past half-century, approximately. In Great Britain there is no body comparable to the Irish

Land Commission specially concerned with land settlement. There has been no policy of State acquisition and sub-division of large estates. This means, in the first place, that quite a considerable area of private woodlands and land suitable for afforestation is still held by private owners and that private forestry still occupies an important place in the rural economy of the country. The position here is very different, although a few private owners have been able to carry on forestry with commendable efficiency. The relationship between the Forestry Commission and those directly interested in private forestry would appear to be a somewhat unhappy one. The Commission have been accused of negligence, and part of the report is concerned with answering this charge. As a result of recent agitation a change of policy is proposed and a special chapter deals with private woodlands and with the scheme which is intended to rectify matters. A somewhat cumbrous method of providing financial assistance to private owners is proposed, the administration of which seems likely to be expensive and troublesome. The substance of the scheme is, briefly, this: owners of woodlands judged to be suitable and necessary for timber production must so use them for that purpose. The Forestry authority is to select those woodlands coming into this category and the owner is to decide whether he will "dedicate" such woodlands for forestry purposes. If so, he will receive State assistance. If owners are unable or unwilling to do the work, the State will acquire the land. The system of Felling Licences imposed during the emergency is to be continued.

The attitude taken up in respect of what are called "small woods" seems extraordinary. A small wood is not defined. Apparently, it may be up to 30 acres in extent, but in any event it is proposed that no direct State assistance is to be provided in respect of these. It is stated, quite wrongly, that the outlay of replanting such small units is relatively small. Relative to what? If relative to larger areas, the contrary is true. It is then suggested that good advice given free by the State in respect of these areas will more than make up for a planting agreement of £2 to £4 per acre. In this case, presumably, the horse will drink. The extraordinary point about these small woods, however, which are much more difficult and expensive to deal with than large areas, is that they are estimated to amount to one million acres. The policy, therefore, appears to be to let these one million acres, admitted elsewhere in the report to be capable of great service, to go to waste. Their owners are to be left unaided to deal with them. One wonders whether it is a wise policy for a country to exclude entirely one million acres of good timber-producing land while, at the same time, the transfer of three million acres of grazing land to forestry purposes is advocated.

The report devotes considerable space and an appendix in an effort, which is far from convincing, to show that the replacement of sheep stocks by afforestation is a sound procedure. The Commissioners, however, are wise not to carry their argument beyond the volume stage and to avoid considering the question of value. It is unfortunate, from a forestry point of view, that, unlike wool and mutton, timber cannot be walked off the ground on which it is produced. As a result, the cost of putting the timber so produced on the market is very much increased, per unit of volume, compared with mutton and wool. The Commissioners seem to think that the accumulation of timber on sheep runs, which are usually difficult of access, is an advantage. In another part of the report, however, they stress the advantage of growing the timber as near to the markets as possible. It has not, therefore, been shown just at what stage and under what conditions forestry is more advantageous nationally than sheep grazing. This section of the report is reminiscent, therefore,

of the arguments of certain amateur "forestry authorities," who quote the price per ton obtained in the London market for wood-pulp and assume that the same price can be got per ton for standing timber in the forest, having failed to take into account the cost of felling, extraction, transport to the pulping mill, pulping and transport of the pulp to the London market.

In the second place the existing system of land tenure in Eire has resulted in the creation of a large number of small holdings from which is provided the labour necessary for widespread forestry operations. There is, therefore, no need for the Forestry Service in Eire to undertake the construction of forest workers' holdings, which forms an important part of the Forestry Commission's work. In this country such work falls on the Irish Land Commission and the acquisition of 59,000 acres of agricultural land by the Forestry Service would quickly be called in question.

It is interesting to note that the proportion of unplantable land acquired in Great Britain is as high as 38 per cent. compared with 17½ per cent. in Eire. It is from this large area of unplantable land that it has been possible to establish three National Forest Parks.

It is interesting to refer to what are described as the pre-requisites for the success of British forestry, and to see how far the five essential conditions mentioned apply to the position in Eire.

The first essential condition is recognition by Government of the importance of timber production at home. This recognition exists fully in Eire amongst all sections of the community, with the possible exception of individual sheep graziers. There is not, therefore, the same need for propaganda as appears to be necessary in Great Britain.

The second essential is continuity of national policy including finance. In this country forestry has shown steady progress for the past twenty-five years at least and the necessary means have been forthcoming.

The third essential is an *ad hoc* Forest Authority with the main duties of formulating policy for government and ensuring that the approved policy is carried out. This represents a belief that the Forest Authority should be independent of any other Government Department. The success of forestry in Eire shows that the attachment of the Forestry Service to another Department does not necessarily mean that forestry must suffer. It may.

The fourth essential is a unified Forest Service, highly qualified in professional sense and imbued with a keen *esprit de corps*. The difficulty here is to find an outside standard of comparison in respect of qualification, but the service in Eire is imbued with keeness in its work and is, no doubt, anxious to attain the highest professional qualifications.

The fifth essential is the presence of adequate service for research, education and information. In respect of this matter improvements are, doubtless, desirable, but that is a development which must be held over until the Forest Service begins to pay its way. It is possible to improve technique considerably without indulging in heavy special expenditure which is not yet absolutely necessary.

It is interesting to note that the report says that there is no escape from a single Forest Authority for Great Britain in order to attain the third, fourth and fifth essentials. It is suggested that it is impossible to build up an efficient Forest Service otherwise. This must be doubted or are we to accept it as a truism that our own Forest Service can never be effective? It is quite certain, at least, that if the Forest Service in Eire had not escaped from the

control of the Forest Authority for Great Britain and Ireland it would have been impossible to acquire and afforest satisfactorily the extent of land which has been dealt with in the past 20 years. Very few, indeed, of the forests in Eire were originally large enough to be suitable for acquisition according to British standards. The machinery for acquiring land and for building up the forestry organisation in Eire is, and must be, quite different from what it is in Great Britain. In other words, timber supply in Eire is both a national problem and a sectional problem which can best be solved nationally and sectionally.

To illustrate how different the position is, the report stresses that the reserve of plantable land necessary to carry out a State afforestation programme should, for comfortable working, be ten times the annual planting programme. When it is as low as eight times difficulties arise which lead to inefficiency. How uncomfortable the Forest Service in Eire and how great the difficulties of working it must have been during the past twenty years will be appreciated when it is known that the reserve of plantable land has seldom exceeded twice the area of the annual planting programme. In spite of these disabilities, the area planted at September, 1939, in Eire was 65,000 acres compared with 361,000 acres planted in Great Britain at the same date. Forest policy in Great Britain aims at growing approximately one-third of the probable peace-time needs of timber. Consumption of timber *per capita* is, of course, much higher in Great Britain than in Eire. Five million acres are estimated to be required for this purpose.

In Eire the present policy appears to be to grow the whole of the peace-time needs of the country, for which it is estimated that a forest area of 700,000 acres approximately will be necessary. In 1939, therefore, whereas about one-tenth of this programme had been completed in Eire only one-fourteenth of the comtemplated British programme had been completed. Relatively, therefore, progress in this country is not behind that in Great Britain.

The necessity for maintaining the home timber trade in a healthy condition is stressed; special and exceptional reasons why the Commission should carry out timber conversion are mentioned and the possibility of having to subsidise thinning as well as planting is envisaged.

An important chapter is devoted to National Requirements of timber and wood products. It would probably be wrong, however, to assume that Russia will not be in a position to export timber until eight years after this war and it may be assumed that forestry and the home timber trade will still have the same battle to fight against imported timber and the same difficulty in convincing the general public of the good quality of timber produced at home.

As regards sylviculture, which is a matter specially interesting to us, the statement is made that the general level of sylviculture in private woodlands has not improved. It is claimed, however, that there have been improvements in the Commission's own technique. The fact is that it is extremely difficult to assess the standard of sylvicultural technique or to say whether it has improved or deteriorated. The Commission are their own judges in this respect and, therefore, not altogether unprejudiced. While the Commission's own technique has undoubtedly improved since its inception, it is very doubtful whether it has yet reached the standard of all-round efficiency which private forestry technique had at one time reached in these islands. This is only to be expected, as the Commission have in effect been engaged, not in the whole business of forestry—

as it is put in the report—but merely in tree planting. It has been one of the most unfortunate aspects of the Commission's policy, perhaps, that it has not had to concern itself with the whole range of forestry activities and that there has not been closer touch between the Commission and those private interests who did have, and still have, a high standard of forestry technique.

There are welcome signs, however, in this report that the Commission has retraced its steps some way back along the road leading towards the slavish imitation of Continental methods, inapplicable to British conditions, and that it is beginning to take a line more in harmony with these conditions. As an instance of this, one may quote the new attitude towards the value of small woods, the evidences of a change of the attitude of the State towards private forestry; the evidence of a sounder appreciation of the possibility of species other than exotic species; the need for maintaining the home timber trade in a healthy condition and so on. Further progress along this line is not only desirable but inevitable, and it will be hastened by the better support of private forestry, provided the latter is allowed to exercise its reasoning power and judgment and is not compelled merely to imitate the methods of the Commission, which, one feels bound to point out, are not necessarily superhumanly infallible. As a next step in the Commission's progress, one would expect less emphasis to be placed on the value of the "outstanding qualities of suitability to British conditions, rapidity of growth and timber quality of Douglas Fir, Sitka Spruce and Japanese Larch," particularly in the southern half of that island where the development of proper sylvicultural technique is perhaps to a large extent hampered by its close association with the northern half of the island, where conditions are more favourable for the development of a different forestry technique. A still better appreciation of the value of small woods and less emphasis on that of "forest regions" may also be confidently predicted in the future and a better harmony between the State forest policy and the general policy in respect of other national activities.

One important advantage of "sectional" forestry in these islands, which the Commissioners have not appreciated, is that it allows of more than one method of procedure and line of development, and of comparisons between methods. This report should be valued by us because of the comparison it affords.

Afforestation and the National Plan

By JAMES M. AIKEN, A.M.T.P.

The author of this pamphlet is to be congratulated on a very fine job of work. He has spared no pains in collecting material and data bearing on the much-discussed subject of Irish afforestation. Unlike most pamphleteers he has tried to state the case for Forestry fairly and without any trace of hysteria. He introduces his subject well and shows how the forest "through the development of its products, has given a fuller meaning to life in music, sculpture, architecture, painting, writing and the thousand and one conveniences of our modern civilization." He goes on to show the rôle that timber and timber products are playing in the industrial life of the timber-producing nations and says: "there seems to be no limit to the application of timber in the provision of things necessary to the civilization of to-day."

With 0.66 per cent. total land area under forest, Ireland stands as "Very poorly, indeed" when compared with other European countries. "We suffer from timber starvation," says Mr. Aitken. The effects of chronic timber starvation can indeed be seen in every walk of rural life. The old houses were built with a minimum of wood, being largely of mud and straw or corballed according to the locality, illustrating the effects of a shortage of timber on the building habits of the people. Compare this with the beautiful wooden churches and timbered houses of Sweden and Norway and the half-timbered houses of Germany and eastern England. It is only in recent times that timber has replaced straw and wicker work in doors and partitions. The glass of windows was at one time set in the mud of the cabin wall without any wooden frame. The straw roof required a minimum of timber and most of that used had to be excavated laboriously from the bog. No wonder then that we have the lowest per capita consumption of timber in Europe. According to Mr. Aitken, "our official forest policy (700,000 acres) would give an annual timber yield of approximately 8 cubic feet per head as compared with Switzerland's 28, Germany's 27, Denmark's 24 and Britain's 19.3." Mr. Aitken does not compare our timber consumption with that of heavily-timbered countries such as Finland, Sweden and Canada, and his figures are all the more telling on that account.

The author is inclined to overdraw the picture with regard to future timber supplies from abroad. If the average Irishman can get along, though poorly it must be admitted, with 8 cubic feet of timber every year, the Finns and Swedes can certainly cut down on their enormous home consumption to have more for export, especially if prices tend to soar. The law of supply and demand will act as a brake on prices to a certain extent.

The importance of "forest influences" is stressed but not overdone, and there is much evidence to support the claim that "with sheep grazing on mountain pastures we are mining the land" of its fertility.

An imposing array of authorities are quoted to substantiate the claim that 2,000,000 acres should be available for afforestation in Ireland. The opinions of such renowned foresters as Dr. Schlich, Professor Fischer, A. C. Forbes and the Report of the Departmental Committee on Irish Forestry cannot be dismissed lightly. It appears, however, that A. C. Forbes has been misquoted and that his figure of 7,000,000 acres included Great Britain as well as Ireland. With regard to the present official policy, Mr. Aitken remarks, "it would be interesting to learn on what data was fixed the 700,000 acres of mixed forest which is said to be the official aim."

The need for a national forest policy aiming at the ultimate establishment of 2,000,000 acres, three-quarter million to be planted in the next 40 years to avoid thinning difficulties, is stressed. This relieves the present Forestry Service of bearing the brunt of the "normal" planting programme which such a policy would involve. An *ad hoc* forest authority, a great increase in grants for research and education, an overhaul of our land acquisition machinery are among the recommendations made.

The influence of Forestry on the development of Agriculture, Industry, Arterial Drainage, Electrification, Recreation and Inland Fisheries is touched on. In fact, Mr. Aitken has ranged over a very wide field and his well-written pamphlet is indeed a noteworthy contribution to the "lay" literature on Irish Forestry.

"Planned Forestry"

By the REV. B. KROMER, C.S.Sp., Rockwell College

(The Handbook of National Planning and Reconstruction)

The object of this article is to bring to the notice of those interested in national reconstruction the need and value of large scale state afforestation. The author, in his opening paragraph, rightly stresses the importance of dealing with forestry as an economic question which "has therefore to be treated in its different aspects and in its connections with the whole of economic and social life."

The main argument is that two million acres of mountainsides, now put to the primitive, wasteful and unproductive purpose of grazing, could be profitably afforested in Eire and by so doing the evils of drought, erosion, bad drainage, silting up of rivers and unemployment would be automatically cured.

Every Irishman is aware of the existence of the vast stretches of poorly productive bog and mountain land in the country and there are few who would not wish to see those acres turned to better account. There seems, however, to be little foundation for the author's sweeping statement that grass is the most dangerous and insidious enemy of this country. Truth to tell, it is the shrubby growths, such as furze, heather, briars, etc., the precursors of the forest, which tend to replace the true grasses on permanent pastures, that really are the insidious enemy of this country. It is only by exercising great skill in the management of the grazing and by occasional cultivation, that these forerunners of the forest can be kept out and the yield capacity of the pasture maintained. There is a growing volume of evidence to show that if our most important industry, stock-raising, is to thrive, a change from the older methods of husbandry is necessary.

Forestry is, of course, an alternative to grazing as a method of utilising our upland soils, but it is not sufficient to state that, because our "perennial meadows," owing to the development of a strong and matted root system, are unable to absorb more than 25 per cent. of the rain water they should be replaced by forest. It is generally recognised that a thick sward of lowly herbaceous or woody vegetation such as grass or heath, can approximate in value the effects of a forest in preventing run-off and erosion. In fact, in times of drought, the water table under forests may be lower than in areas under grass. In South Africa the "new" plantations laid down on the "veld" are suspect of upsetting the moisture balance, drying up streams and accentuating the effects of drought. The forest soil is indeed a fine water storage medium, but it is far from certain that it is the best or only means of providing against drought, floods, erosion, etc. Ley farming and the frequent breaking of hill land could, however, readily lead to serious erosion and all the attendant evils. This whole problem of the utilisation of mountain land has never been tackled seriously in this country, and it is high time that the matter should be taken up. It is a task, however, requiring team work and we must hear all sides—the stock-breeder, grassland experts, foresters, soil scientists—before driving the stock off the hill sides. The replacing of an age-old and traditional form of rural economy by a new one is a thing that can be only gradually done even after it has been shown to be highly desirable.

The writer, while stressing the importance of state action in matters of large-scale afforestation, rightly states that "private initiative, additional to the re-afforestation by the state, is not less important." There is a danger that lack of interest in tree planting on the part of the individual landowner may eventually react unfavourably on Irish Forestry in general and state forestry in particular.

According to the recent report of the Minister for Lands on Forestry the present planting programme aims at creating a national forest estate of 700,000 acres, not 200,000 as stated by Father Kromer. Whether this is sufficient or not is another question. The Forestry Division seems to be encountering great difficulties in their attempts to achieve their annual planting programme of 10,000 acres.

Unfortunately a good many figures given in support of the author's argument for a nation-wide, large scale programme are wide open to question. The writer states: "the net return of a re-afforested area of two million acres to the State would amount to about £9,000,000 a year based on pre-war price levels." This is equivalent to £4 10s. per acre. At present maximum prices, an annual increment of 100 cubic feet of timber (a yield possible only on the best hill sites) would bring a gross return of less than £4 per acre. When production costs are subtracted the best nett return one could expect is £1 per acre, and the average for all land might be as low as 10s. 6d. To quote still further, "the pre-war price of a well-managed acre of spruce forest, 40 years old, was about £800 for third-class timber and about £1,200 for first-class timber." Now, a fully-stocked 40-year-old stand of spruce would carry about 4,000 cubic feet of timber to the acre, so that, at the present maximum price of 10d. per cubic foot, the most one could legally get is £150 per acre. The price obtainable for pulp wood would be much less than for saw timber.

While it is very desirable that every effort should be made by means of propaganda to awaken a "forest" sense in the people and to win new friends for Forestry, no lasting gain will be achieved by an over-statement of the case. We are fighting in a good cause. The case for forestry is good and when fairly and repeatedly stated will eventually win a large body of solid and steadfast supporters among the Irish people.

BRITISH WOODLAND TREES. By H. L. Edlin, B.Sc. (London: B. T. Batsford. 12s. 6d.)

There can be nothing but praise for this book. It is attractively written, profusely illustrated, well printed and contains a mass of information about trees, their identification, history, botany and growth as well as notes on the quality and uses of their timbers. Forestry is a diffuse subject and even the professional forester may well be appalled at the array of treatises in a forestry library which confront the seeker of knowledge. Here we have in a handy volume information which could only be found by much delving in large and expensive works, making this a useful book for students, practising foresters and all nature lovers.

A chapter is devoted to each tree genus and in it are set down the botanical description of each species, its cultivation in nursery and forest, its sylvicultural characteristics and the economic uses of its wood. All the trees grown in woods, parks and gardens are treated. An account is given of the origin of exotics and their introduction into cultivation.

Mr. Edlin gives a full account of the growing of common species. He describes methods of collecting and sowing seed, treatment in the nursery, planting out and thinning. The needs of the species in soil and situation are mentioned. Nothing is said, however, about their behaviour when exposed to persistent wind. In most parts of Great Britain and Ireland the stunting effects of constant wind on certain species is an important factor and it seems strange that this point should be omitted.

There are useful keys to the identification of species, based on buds, leaves, flowers, fruits and bark. These are a valuable guide at all seasons and, used in conjunction with the admirable plates, photographs and line drawings, enable accurate identifications to be made.

There is a glossary of botanical and technical terms.

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