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OFFICE OF WOODS, FORESTS, AND LAND REVENUES.

FORESTRY COMMISSION  
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## JOINT ANNUAL REPORT

OF THE

# FORESTRY BRANCHES

FOR THE

YEAR 1912-1913.

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Presented to both Houses of Parliament by Command of His Majesty.

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BOARD OF AGRICULTURE AND FISHERIES.  
OFFICE OF WOODS, FORESTS AND LAND REVENUES,

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Report of Forestry Branches, 1912-1913.

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June, 1914.

GENTLEMEN,

WE have the honour to submit the First Annual Report of the Forestry Branches recently constituted in the Board of Agriculture and Fisheries and the Office of Woods. The two Departments are closely associated and are engaged in developing Forestry on lines which, in part at least, run in parallel directions. An account of their work may, therefore, conveniently be presented in a Joint Report.

The Office of Woods is charged with the administration of the Forests and Woodlands belonging to the Crown and forming part of the Hereditary Revenues surrendered under the Civil List Act. An active interest in one phase of forestry education has been taken by the Office of Woods in order to secure properly trained woodmen for the Crown Forests, and a woodman's school was founded in the Forest of Dean in 1904. The scope of this school has been gradually extended so that at present it is training foresters for private estates and for the Crown Colonies, as well as prospective Crown woodmen. Experimental work has also received attention in several of the Crown Woods, and some years ago it was found to be desirable to utilise the Land Revenues of the Crown in purchasing the Inverliever Estate for an experiment in afforestation.

The Board of Agriculture and Fisheries were constituted the Statutory Forestry Authority for Great Britain by the Act of 1889 which created the Department. Later, however, the Board of Agriculture (Scotland) Act, 1911, restricted the sphere of the Board's administration to England and Wales.

Until the passing of the Development and Road Improvement Funds Act, 1909, the funds available for the improvement of forestry in this country were very limited. The Board's efforts were chiefly confined to the promotion of forestry education by means of small grants made to selected institutions. As soon, however, as it seemed probable that funds for the purpose of forestry development might become available, a careful review of the industry was made by the Board with the object of preparing schemes for the improvement of its position. In particular, attention was paid to the markedly different conditions under which agriculture and forestry are carried on in Great Britain. It was recognised that whereas the former industry was based on extensive and complete experience, and had reached a position in which further marked improvements in practice could only be expected as the results of careful investigation and systematic education, the latter, so far as Great Britain

was concerned, was relatively in a very backward state, and such principles as obtained among educated foresters depended mainly for their experimental bases on continental forestry.

Under these conditions it was obvious that a preliminary to any real advance in the practice of British forestry was an enquiry having as its object the examination of the best examples of British woodlands for the purpose of extracting such information as they might yield on the methods that have proved successful under local conditions. Especially, efforts were made to ascertain what quantity of timber per acre might be expected from well-managed woods, of which the history could be ascertained and growing on types of land available for afforestation. These enquiries at first extended over the whole of Great Britain, but since 1911 have been restricted to England and Wales. An account of certain of them has already been published.

The results of these investigations enabled the Board in 1911 to place before the Development Commissioners a Memorandum outlining specific proposals for afforestation and the improvement of forestry. Subsequently an Advisory Committee on Forestry was appointed by the Board under the President's Minute of 25th February, 1912, for the following purposes:—

- (1) To consider and advise upon proposals for a Forestry Survey;
- (2) To draw up plans for experiments in Sylviculture and to report upon questions relating to the selection and laying out of forestal demonstration areas;
- (3) To advise as to the provision required for the Instruction of Woodmen.

The Committee reported on the 31st October, 1912 [Cd. 6713], and the Board and the Office of Woods are now engaged in giving effect to their recommendations. References to this work will be found in Chapter II. within.

So soon as a forward movement was decided upon, the appointment of specially qualified foresters to the Board's staff became necessary, and, at different times since 1909, the following have been selected for the Inspectorate:—

Mr. R. L. Robinson, B.A., B.Sc., now Superintending Inspector on the Board's staff. Mr. Robinson is a Rhodes Scholar; he took his degree with first-class honours at Oxford in 1907, and first place in the Oxford Forestry Diploma Examination in 1908. Mr. Robinson was also first among the candidates for the Indian Forest Service, but withdrew his application:

Mr. G. H. Crosfield, M.A. Oxon. (honours in Natural Science), who took the Forestry Diploma at the University in 1909:

Mr. L. S. Osmaston, who took the Coopers Hill Forestry Diploma (first place on the list) in 1890, and has had twenty years' experience in the Indian Forest Service:

Mr. D. W. Young, B.A., P.A.S.I., who graduated at Oxford with honours in Natural Science in 1906, and secured the Forestry Diploma in 1908. Mr. Young had some experience with a firm of land agents before entering the Board's service.

The Office of Woods had already a staff for dealing with the administration of the Crown Forests and Woodlands. This staff

has since been increased under the direction of Mr. H. C. Eyles, first-class clerk, in order to cope with the additional work involved in the changes referred to below.

Since 1906 the President of the Board has been *ex officio* a Commissioner of Woods, and the two Departments have, for some years, been working in co-operation. It was fitting, therefore, that when the Board employed a staff of skilled foresters arrangements should be made whereby these officers could assist in the management of the extensive Crown Woods. A first step in this direction was made by the appointment of Mr. R. L. Robinson to be Consulting Forest Officer in the Office of Woods, a post which became vacant in 1912 on the retirement of Mr. Popert.

After the retirement of Sir Stafford Howard, K.C.B., the work of the Office of Woods was rearranged between the President of the Board and Mr. Leveson-Gower. It was then found to be convenient to concentrate most of the actual forestry work involved by the management of the Crown Woods under a distinct branch formed in Mr. Howlett's division of the Office, and this new branch was placed under Mr. Robinson's charge. Simultaneously, a Forestry Branch, also under Mr. Robinson, was constituted in the Intelligence Division of the Board. With the sanction of a Joint Secretary of the Office of Woods or the Secretary of the Board, the officers in either branch may be used to assist with the work of the other, it being understood that approximately equal services are rendered in return.

Certain of the Crown Woods which were formerly under the charge of local agents are now managed direct from the Office, the technical supervision being given by one or other of the Board's Forestry Inspectors.

The arrangements made between the two Departments, while of an unusual character, have advantages which are sufficiently obvious. Forestry is in a backward state in this country, and an improvement of its position by means of State action required the adoption of measures which will fully utilise the administrative and technical knowledge of both Departments. The Board's object is primarily the development of this industry which, there is good reason to believe, would be of great advantage to many districts in the country; the object of the Office of Woods is the successful management of the Crown Forests and Woods to which reference is made in the body of the report. It is clear that on the practical results achieved by the Office of Woods the success of the object which the Board have in view must largely depend. If the measures now being taken to place certain of the Crown Forests and Woods under systematic management are financially satisfactory, there will be further encouragement for planting.

Advantage has been taken of the fact that this is a first report to introduce a certain amount of material of historical interest bearing on the progress of British forestry and the development of the Crown Woods. This historical matter has been brought together in Chapters I. and III., which trace the relationship of the State to forestry and give an outline of the management of the Crown Forests and Woods. Chapter II. refers more especially

to the work that has been done since the passing of the Development and Road Improvement Funds Act, 1909. Chapter IV. contains a series of descriptive notes on the Crown Forests and Woods, which it is hoped may prove of considerable interest, no similar account of these woods having been published in recent times. The fifth chapter deals with the Woodman's School and Wood Distillation Works in the Forest of Dean, while the sixth chapter brings together data relating to the timber trade. In any discussion of the State's policy with regard to afforestation it is obviously necessary to examine closely figures bearing on our timber supply.

The report has been compiled by Mr. Robinson, who has had assistance from Messrs. Morton Evans and Richardson for those sections relating respectively to the Office of Woods and the Board of Agriculture.

We are indebted to the Ordnance Survey Department for the map which accompanies the report. It has been specially prepared to show the distribution of woodlands and "waste" lands in England and Wales. The "waste" lands are those areas which have been mapped by the Ordnance Survey as "rough grazing." Wastes have been classified as they occur below or above the 1,500 feet contour line; those less than 1 square mile in area have not been mapped.

It is proposed that future reports of this series should be for the year October 1st to September 30th. This period forms a natural "forest year." It also coincides with the academic year for which the Board's educational grants to teaching institutions are made.

We are, Gentlemen,

Your obedient Servants,

SYDNEY OLIVIER,

Secretary,

Board of Agriculture and Fisheries.

FREDK. HELLARD,	} Joint Secretaries,	Office of Woods, Forests and Land Revenues.
CHAS. E. HOWLETT,		

The President,  
Board of Agriculture and Fisheries.

The Commissioners of H.M.  
Woods, Forests and Land Revenues.

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## CHAPTER I.

## THE POSITION WITH REGARD TO FORESTRY AND AFFORESTATION.

*Attitude of the State towards Forestry.*

It may not be out of place in the first report of the Forestry Branches of the Board of Agriculture and the Office of Woods, which represent the most recent of public efforts to develop forestry in England and Wales, to recount briefly the attitude which the State has adopted towards forestry from period to period.

In the early Middle Ages the indigenous forests of hardwoods were in excess of the area necessary to supply the wants of a population which was mainly agricultural, and clearances with the substitution of a more intensive method of soil cultivation gradually took place over a large proportion of the land hitherto covered by timber.

With the increase in population, however, and the development of the metal industries, there was a tendency for the woodlands to become denuded, and for their conservation to become an object of solicitude with the Government. Although an Act (22 Edw. IV., c. 7) had been passed towards the close of the mediæval period having for its object the encouragement of the growing of coppice, the first Act of importance in regard to forestry (in the modern sense) was that of 1543 (35 Hen. VIII., c. 17) "for the Preservation of Woods." Besides endeavouring to ensure the natural regeneration of coppice by insisting upon its inclosure after cutting, and regulating the felling of standards, the statute prohibited (with some trivial exceptions) the conversion of coppice into pasture and tillage; the statute required too the ringing of swine when they were taken to the woods for pannage. A proviso was, however, inserted in the Act to the effect that felling might take place when timber was required for building, fencing, shipbuilding, &c. This Act was amended in 1571, and may be supposed to have had for a time a certain measure of success.\* It will be observed that the legislature was by the middle of the 16th century apprehensive of the encroachment of agriculture upon the woodlands. An Act of 1558 (1 Eliz., c. 15) was directed against another danger—the use of timber for iron-smelting: this enactment, entitled "An Act that Timber shall not be felled to make Coals for Burning of Iron," applied to any "Timber-tree or Timber-trees of Oak, Beech or Ash," growing within fourteen miles of the sea or of any navigable river or stream. In 1585 this was followed by another Act (27 Eliz., c. 19) "for the Preservation of Timber in the Weilds of the Counties of Sussex, Surrey and Kent," which sought to restrict the number of iron mills in those counties and prohibited the use of timber trees "one Foot square at the Stub" for the purpose of providing fuel for the iron industry. The destruction of woodlands for the purpose of supplying charcoal for metal-smelting

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\* Cf. Cunningham, *Growth of English Industry*, II, 523.

was indeed a more serious danger than that of the conversion of woodlands to pasture or tillage. The mills of the period were small and their output, judged by modern standards, insignificant, but their consumption of fuel was enormous. During 1547-1549 two iron mills, at Sheffield and Worth, in Sussex, appear to have consumed over two and a half million cubic feet of timber in a period of less than two years.\* In the early years of the 17th century it was stated that there were in Sussex alone about 140 forges, using two, three or four loads of charcoal apiece daily:† to meet the demands of a consumption such as that would probably require between 100,000 and 150,000 acres of woodland under systematic management: without systematic management it meant the denudation of the forests of Southern England, and actually the situation was only saved by the use of coal for smelting and the transference of the industry to the Midlands and the North.‡ From time to time during the 17th and 18th centuries legislation was directed against the destruction of young trees, and occasional Acts were passed with the object of encouraging the growth of timber. The point to which public attention was in the end chiefly directed was, however, the possibility that the supply of home-grown oak for the Navy might prove inadequate. The steps which were taken to avert the danger are set out in detail in Chapter III., but it is sufficient to note here that during the first half of the 19th century a very earnest interest was evinced by the State in this particular aspect of forestry.

As the public interest in oak timber for the Navy declined during the latter half of that century, so the welfare of forestry was neglected until about 1880. It then began to be realised that forestry as practised was capable of improvement, and ideas on modern methods of forest management began to be propagated by the establishment of an institution to train forest officers for the Indian Service at Cooper's Hill and at other institutions by lecturers who had studied the subject on the Continent.

About this time the State began to evince some interest in the matter. The Select Committee of 1885-7 were chiefly concerned with the promotion of forestry education, which, they recommended, should be placed under the control of a Forest Board in a Government Department. These suggested powers were conferred on the Board of Agriculture under their Act of 1889. The Departmental Committee on British Forestry, appointed in 1902, recommended considerable extensions in the existing facilities for forestry education, their most important proposal in this respect being the establishment of two demonstration forests, the one in England and the other in Scotland. Certain suggestions were also made with regard to the levy of estate duty on timber, the protection of woods against sparks from locomotives, the collection of statistics as to the

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\* Salzman, *English Industries of the Middle Ages*, pp. 36-7: the figure for total consumption there given does not, however, agree with the detailed figures: the quantity stated above appears to be approximately correct.

† *Ibid.*

‡ *Cf. Cunningham, loc. cit.*

area and composition of woodlands, and especially with regard to the afforestation of water-catchment areas by Corporations and Municipalities. In 1908, however, the Departmental Committee on Irish Forestry advanced a step further by recommending the acquisition and planting of some 200,000 acres of undeveloped land: and the Report of this Committee was followed in 1909 by the Report of the Royal Commission on Coast Erosion and Afforestation, in which the planting of 150,000 acres, or alternatively, 75,000 acres yearly was recommended.

It will thus be seen that in the first decade of the 20th century forestry was the centre of a great deal of public attention; but the actual steps taken by the State were mainly academic in character. No possibility of giving effect to a practical policy by means of funds voted by Parliament arose until the Development Fund was established in 1909. It is true that certain steps, which are referred to more fully in Chapter III., had been taken to utilise the Land Revenues of the Crown for the purchase and afforestation of estates, but such action had been isolated in character and apart from any considered policy of general development.

In reviewing the attitude of the State until quite recently the outstanding feature has been the absence of any form of encouragement of what, in distinction from the cultivation of oak, may be termed general forestry. The introduction of the larch, for example, and later the trial of valuable exotic species such as the Douglas fir, was the work of private individuals. State forestry, as conducted in the Crown Forests, has been handicapped by the steps taken to grow naval timber in the first half of the 19th century, and, in consequence, has failed to respond to changing economic conditions. The absence of State Forests producing, as on the Continent, a high revenue, and supplying local markets and industries, is a distinct hindrance to any rapid advance. In the first place there have been no ideals of management nor tangible results to encourage private owners of woodlands, and in the second place the public have not yet come to regard afforestation as a natural duty which the State is far better fitted than the individual to undertake. These difficulties, perhaps, are slowly disappearing, but in the meantime the position must be regarded as mainly experimental. The arguments which were advanced during the passage of the Development Act through Parliament will sufficiently illustrate this contention.

#### *Considerations in favour of an active Forest Policy.*

It is not proposed to enter here with any great detail into the considerations in favour of an active afforestation policy by the State, but it is desirable to mention briefly some of the chief arguments which can be advanced.

It is known, in the first place, that there are very large areas of uncultivated land which would produce better results, financially, from the growth of timber than from the present

methods of utilisation. This may be stated as the business basis of afforestation. Secondly, there are a group of social economic considerations of considerable weight, such as the provision of adequate supplies of those timbers which are essential in every way to the industrial prosperity of this country, and such as the settlement of a larger population on the land.

The question of the demands of this country on external sources for timber supplies is treated at some length in Chapter VI., but attention may be drawn to a few of the leading facts. The total value of timber and wood-pulp imported into the United Kingdom in 1912 was over £36,000,000, of which certainly more than 80 per cent. was derived from coniferous timber. This is precisely the type of timber for the growth of which the waste land of the country is best adapted. Since about 1880, when modern means of transport were more thoroughly developed, there has been a steady all-round rise in the price of timber, and when existing prices are considered in relation to sources of supply, it will be found that there is every probability of this rise continuing. It is well known that the increase in price has been accompanied by a deterioration in quality. Whether the value of timber will ever rise to so-called "famine" price it is, of course, impossible to predict, but one disquieting fact is that, as definite surveys are made one by one into the extent of virgin forests in various parts of the world, the results disclose that the reserves are by no means as large as had been anticipated. Again, the close connection between consumption of timber and industrial progress is illustrated by the fact that the import of the principal kinds of unmanufactured timber per head of population has risen from 0·09 load in 1861 to 0·17 load in 1891 and 0·21 load in 1911. Another feature is the increase in volume and still more in value of imported pit-props and pulp-wood during the last decade. There were imported in 1901, 1,880,000 loads of pitwood, valued at £2,053,000, against 2,896,000 loads, valued at £3,376,000 in 1911. It is clear that a ready market for small thinnings suitable for pit-props or for pulp-wood is of great importance from the financial side of the afforestation question.

With regard to the settlement of a larger population on the soil it is shown later (p. 51) that on a grazing estate such as Inverliever the amount of employment is increased by about 60 per cent. on beginning afforestation operations. Gradually, as the plantations fall to be thinned and the produce converted, the increase must become much greater.

#### *Proposals for the Development of Forestry.*

The fundamental consideration at this early stage in the history of the movement is to lay a firm foundation on which a sound system of procedure can be developed. Such a foundation can only be obtained by the collection of accurate knowledge as to the production of timber under varying conditions, by experiments designed to solve doubtful questions, by actual participation by the State in afforestation operations, and finally by the training of such foresters as may be necessary to meet the special needs of the situation. It is clear that the existing Crown Woods

form a ready nucleus on which to begin, and it is proposed to utilise them as far as possible for the above purposes. For the rest, two fairly distinct lines of advance are opened up: the first is to encourage the improvement of existing woodlands and the second is to promote the afforestation of rough, uncultivated land.

*The improvement of existing woodlands.*—The total area of woodlands in England and Wales is given in the returns of 1913 at 1,884,100 acres.\* Over 95 per cent. of this area is privately owned, and it is probably producing not more than one-half of its maximum yield. It is not possible to make an accurate estimate of the value of this property, but a conservative estimate would be between twenty-five and thirty million pounds sterling. The detailed treatment of this woodland lies in the hands of woodmen who work for the most part under the direction of land agents. At the present time there are no indications that the academically-trained forester will participate to any extent in their direct management.

As far as the State is concerned, the only possible means of advance at present lies in placing before the owner information which will show that it is worth while to manage woods well, in providing educational facilities for the owner, the agent, and the woodman, and finally in supplying the best possible technical advice.

The improvement of existing woodlands is an important matter. If it were possible to raise the production by even 10 per cent. an effect equivalent to the afforestation of at least 100,000 acres would be obtained.

*Afforestation.*—The Royal Commission on Coast Erosion and Afforestation estimated that there might be 2,500,000 acres of afforestable land in England and Wales, and although this may be an over-estimate, the information in the Board's possession shows that there is a very large area which might with advantage be afforested; an area, in fact, far in excess of the State's immediate capacity for attacking.

In regarding the problem from an economic point of view, the outstanding feature is the absence of accurate information as to the actual afforestable area and of the productive capacity of the land in question. To meet these difficulties the Board propose to take two steps—in the first instance to collect accurate information by means of organised enquiries or surveys, and secondly, to secure land for commercial planting in typical districts where there is a large area of uncultivated land and where a *prima facie* case for afforestation has been established. Such procedure should, in the course of time, place the State, at relatively small cost, in possession of all the information necessary to decide on the desirability of carrying out a systematic scheme of afforesting the uncultivated land of the country.

A special phase of the afforestation question is the planting up of water-catchment areas, and in this connection the Board have

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\* Detailed figures for each county are given in Appendix II., the material for which has been supplied by the Statistical Branch of the Board.

rendered and desire to render in the future to Local Authorities such assistance as lies in their power.

Having outlined above what may be termed the practical ends which the Board seek, it remains to mention briefly the steps which it is desirable to take in order to give effect to that policy. This leads to a consideration of the problems connected with education, experiment and research, and the provision of technical advice.

*Education, Experiment and Research and Advisory Work.*—It is desirable to adjust the measures to be taken under this head strictly to the somewhat peculiar needs of the case, since a misunderstanding of the position will lead inevitably to waste and disappointment. It has been pointed out above that there is no demand, in England and Wales, for academically-trained foresters in private service, nor does the immediate forest policy of the State suggest the employment of a large staff. Recognising this fact, the Board have in the past subsidised forestry education at five centres in the expectation that forestry courses would be attended by students interested as well in other forms of land management. Much remains, however, to be done in providing better educational facilities for the woodman, who is essential for the proper management of woods in every phase of development.

The chief difficulty in the past with regard to the development of forestry education has been the absence of a well-managed area, or *Demonstration Forest*, where students could resort in order to observe the practical application of theories of silviculture and forest management which they had studied under their lecturers. Hitherto a certain number of students have managed to overcome this difficulty by going abroad for practical training, but a local institution is needed for those who have not the means and time to go abroad, and who are interested more particularly in local conditions rather than in the broader aspects of forest management.

At the present time an elaborate scheme of laboratory research is not called for. There are certain lines of investigation which should give results of immediate value; on the other hand, there is a distinct possibility in the present state of British forestry that the most convincing results may be wholly ignored. Under these circumstances there would appear to be no necessity to establish a special institute to deal with forestry research: such work should proceed principally at the teaching centres where facilities are already to be found and the atmosphere is congenial. In this connection the *Demonstration Forest* should, of course, rank with the existing teaching institutions.

One promising line of advance to begin with appears to lie in the institution of experiments which will produce tangible results and so stimulate an active interest in improved management. As regards permanency and freedom of action, such experiments can best be conducted in the Crown Woods, but the widest results will only be obtainable if the work is carried on also under the observation of the private landowner in his own woods. To obtain satisfactory results forestry experiments must be instituted

and controlled by the State; no other body possesses that permanency necessary to carry them to a successful conclusion.

With regard to advisory work the position is somewhat different. The fact cannot be disguised that many agents and owners are sceptical as to the benefits of improved management, and for the moment the movement has an educational as well as a practical end. For the position of advisory officers men are required who can command confidence by their thorough knowledge of local conditions of tree-growth, markets, and so on. For the present, therefore, the double end can best be met by attaching the advisory officers to the teaching centres, where their presence should undoubtedly prove advantageous as well to the institution.

## CHAPTER II.

### WORK OF THE BRANCHES.

#### *In the Board of Agriculture and Fisheries.*

Shortly after the passing of the Development Act the Board presented to the Commissioners (in February, 1911) a Memorandum setting forth in detail their proposals for the development of forestry. This Memorandum has already been published as an appendix to the Report\* of the Advisory Committee set up by the Board to consider in further detail certain of their proposals relating to surveys of waste land, the provision of a Demonstration Forest, the conduct of experiments, and the education of woodmen. It will be seen on reference to the above report that the main recommendations of the Committee are in accord with the Board's original proposals and with the policy outlined in Chapter I.

In addition to their general administrative work and the control of work entailed by grants for various purposes to teaching institutions, the Board issued in August, 1912, as a supplement to their Journal, an article† dealing in detail with methods of collecting statistics for survey purposes. During the summer of 1912 a detailed survey of some 20,000 acres of land on the Birmingham Corporation's waterworks in the Elan and Claerwen Valleys was carried out. The results of this enquiry are interesting in view of the fact that it has often been assumed that waste land under the 1,500 feet contour line is all afforestable. It was found that of 12,360 acres under that elevation 5,990 acres, or 47 per cent., was certainly adapted for economic planting, while a considerable area in addition had to be characterised as doubtful owing to the absence of any data in the district as to the productive capacity of such

\* Cd. 6713, pp. 35 *et seq.*

† Notes on Kerry Woods, Journal of the Board of Agriculture, Supplement, No. 9.

land. In the summer of 1912 also, inspections and reports were made on schemes for afforesting the Torquay water-catchment area and part of the Madryn Castle Estate.

The work which has been engaging the attention of the Branch during the year 1912-13 is as follows:—

*Education.*—Visits have been paid to the institutions providing instruction in forestry, and in two cases detailed inspections have been made in conjunction with “team” inspections of the agricultural sections.

The total expenditure on education amounted to £1,000, divided equally among the forestry schools at Oxford, Cambridge, Bangor and Newcastle, that amount being exclusive of a proportion of a sum of £1,200 which was granted to the Royal Agricultural College, Cirencester, in respect both of agriculture and forestry.

To arrive at the total expenditure by the State on Forestry Education in England and Wales, there must be added the cost of the woodman’s school in the Forest of Dean (*see* Chapter V.). The total amount is approximately £1,700.

The total number of students receiving instruction during the period was as follows:—

Name of Institution.	Students taking full academic forestry Course.	Students taking forestry as subsidiary subject.	Woodman's 2-year Course.	Woodman's 1-year or shorter courses.	Total.
University of Oxford ...	35	—	—	—	35
„ Cambridge	6	4	—	—	10
University College of North Wales (Bangor)	5	12	—	—	17
Armstrong College (Newcastle).	—	9	—	6	15
Royal Agricultural College (Cirencester).	—	35	—	—	35
Woodman's School, Dean Forest.	—	—	21	—	21
Woodman's School, Chopwell Woods.	—	—	—	6	6
Totals ... ..	46	60	21	12	139

Exclusive of the Indian forest probationers and similar students at Oxford (7) and Cambridge (4), it would therefore appear that there were undergoing instruction 35 academically trained students, 60 part-time forestry students, and 33 woodmen. It is clear that the numbers in the first of the above classes are more than sufficient for any possible demand in this country.

*Research.*—Under the terms of a grant of £1,200 per annum for two years from the Development Fund, the sum of £500 has been allotted to each of the Universities of Oxford and Cambridge, and a total sum of £200 to Bangor, Armstrong and Cirencester Colleges for the purposes of forestry research.



The work under this head has been distributed as follows:—Oxford, insect and fungus pests; Cambridge, structure of home-grown timbers; Bangor, seed research; Newcastle, creosote and the preservation of timber; while at Cirencester the question of an investigation into the coppice problem has been under consideration.

The total expenditure on research incurred in respect of the year amounted to £533, the actual payments during that period being £200.

*Experimental Work.*—The Board are in receipt of a grant of £1,000 per annum from the Development Fund for the purpose of conducting “Minor Forestry Experiments.” The proposed experiments have been worked out in considerable detail in the Branch and suitable sites for the establishment of plots have been marked down, but owing to the lack of staff it was found impracticable to proceed with the field work, and no expenditure was incurred during the year. A special inspector has, however, now been provided for the work, and it is hoped to push on vigorously during the year 1913-14.

*Advisory Work.*—By means of a grant of £2,500 per annum for three years from the Development Fund, the sum of £500 has been placed at the disposal of each of the teaching institutions at Oxford, Cambridge, Bangor, Newcastle and Cirencester, in order to provide for the salary and expenses of an advisory officer.

The total expenditure incurred in respect of the year amounted to £1,630, while the actual payments amounted to £558.

The advisory officers have been kept uniformly busy visiting woods and advising owners. It is not easy to judge of the results of such a scheme as this, but on the whole it promises to be successful, since, in addition to the actual good done by the attempt to bring specific woods under improved management, there is the indirect advantage of stimulation of interest in all subjects relating to forestry. It must be borne in mind, however, that the real test of the scheme will be not so much the number of owners who seek advice as the number who act continuously on the plans of operation which are submitted. It will be realised by those who are conversant with the many influences which render difficult the continuous management of private woods on a set plan, that this will present the hardest task to the advisory officers.

The districts which have been allotted to each institution, the conditions on which the grants are made, and an analysis of the work conducted from each centre are given in Appendix I.

*Surveys.*—A rapid survey and report to the Development Commission on some 6,000 acres of land in the Liverpool Corporation's catchment area at Lake Vyrnwy was made in the summer of 1913.

A flying survey of an area in Wales extending to 333,000 acres and containing some 142,000 acres of uncultivated land was also carried out. The result showed 73,800 acres, or 52 per cent., of the total area of uncultivated land to be afforestable, or, if

land comparatively remote from railways and villages be excluded, 65,300 acres, or 46 per cent.

Considerable progress has also been made in locating and marking down on the ordnance sheets the uncultivated land in the country. The map appended to this Report, which has kindly been prepared by the Ordnance Survey Department, shows the location of this land and of the existing woodlands. Land over the 1,500 feet contour line is also indicated. It may be urged that this line has little significance as regards afforestation, and this is actually the fact with regard to individual areas. Nevertheless it forms a convenient datum line which can be easily taken from the ordnance sheets in the absence of any other line between it and the 1,250 feet line. It is convenient, therefore, for comparative purposes to estimate the afforestable area in percentage of the total area under 1,500 feet elevation.

*Miscellaneous.*—Numerous enquiries dealing with all phases of forestry at home and abroad have been received in the Branch, and have either been dealt with direct or referred to the local advisory officers.

*In the Office of Woods, etc.*

In addition to the routine work connected with the management of the Crown Forests and Woodlands a considerable amount of time has been spent in re-arranging the system of accounting. It is hoped that this will lead to economy in management and allow of the preparation of concise accounts showing the results obtained year by year in the various forests. The resumption of woods formerly managed by Crown Receivers and the abstraction of the information contained in Chapters III., IV., and V. has also entailed a considerable amount of detailed work.

With regard to outdoor work it has been necessary, in the first instance, to become familiar with the conditions obtaining in the various woods which have recently come under the direct control of the Office. In the second place a beginning has been made to prepare working plans for the various woods and to systematise the treatment. Working plans are at present in course of preparation for the Windsor and the Tintern Woods.

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### CHAPTER III.

#### HISTORICAL NOTE ON THE MANAGEMENT OF THE CROWN FORESTS AND WOODS.

The forests and woods under the charge of the Commissioners of Woods consist partly of the ancient hereditary estates of the Crown and partly of estates which have been acquired by the Commissioners from time to time. To the first of these sections belong the Royal Forests, which still form the greater portion of the wooded area under their charge. It is important, in order to reconcile the present condition of these forests with the

ideas of modern forest management, to set out briefly their general history.

The term "forest" and kindred words such as "afforest" have of recent years acquired a meaning other than the ancient sense. The present meaning of "forest," which has only come into general use during the last 30 or 40 years, is a wooded area managed for the production of timber. A "forest" is defined, however, in Manwood's *Forest Laws*\* as "a certain Territory of woody Grounds and fruitful Pastures, privileged for wild Beasts and Fowls of Forest, Chase, and Warren, to rest and abide there in the safe Protection of the King, for his Delight and Pleasure; which Territory of Ground so privileged is meered and bounded with unremovable Marks, Meers and Boundaries, either known by Matter of Record or by Prescription; and also replenished with wild Beasts of Venery or Chase, and with great Coverts of Vert, for the succour of the said Beasts there to abide; for the Preservation and Continuance of which said Place, together with the Vert and Venison, there are particular Officers, Laws, and Privileges belonging to the same, requisite for the purpose, and proper only to a Forest, and to no other Place." The essential feature, therefore, in a forest was the preservation of game. The production of timber was more or less incidental, since woods were a necessity for the protection of the beasts and fowls of the forest. Subsequently, when interest in the chase subsided and the need for providing supplies of naval timber grew pressing, the Royal Forests assumed increased importance for the production of timber.

The origin of none of the forests belonging to the Crown is known with certainty. The New Forest, which was reconstituted by William the Conqueror, is called by Manwood "the newest forest in England." It is probable, however, that it had always been a forest, as the greater part of it was quite unsuited for any other purpose. The bounds of many of the forests were enlarged by Henry II., Richard I. and King John, but they were reduced to their ancient limits by the provisions of the *Charta de Foresta* in the reign of Edward I.

In the reign of Elizabeth, the forests were already producing some revenue by sales of timber, and the value of this income increased considerably in the succeeding reign, so much so that James I. proposed in 1608 to sell off all surplus timber not required for naval uses.

The peculiar constitution of the Royal Forests has called forth in the past many inquiries as to management, and much legislation to meet changing conditions. As early as 1668, in consequence of the scarcity of timber, an Act (20 Car. II., c. 3) was passed to inclose 11,000 acres for "the increase and preservation of Timber within the Forest of Dean" and for "the future supply of His Majesty's Royal Navy, and the Maintenance of Shipping for the Trade of this Nation." A similar Act (9 &

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\* Nelson's Edition, 1717.

10 Will. III., c. 36) to inclose 2,000 acres in the New Forest was passed in 1698. Under the Act 26 Geo. III., c. 87 (1786), Commissioners were appointed to enquire into the state and condition of the Woods, Forests and Land Revenues of the Crown, and a series of detailed reports on the forests was made between the years 1787 and 1793.

The supervision of the Crown Forests was, at that time, vested in a Surveyor-General of Woods. The Surveyor-General was assisted by two deputy-surveyors in London and by six local deputies for various forests or groups of forests. It may be mentioned here that the position of Surveyor-General of Woods was continued until 1810, when the management of the Forests and Land Revenues of the Crown was vested in Commissioners: a system of control which has been continued down to the present time.

The Surveyor-General and the local officials were paid partly by salaries but chiefly by perquisites, which took such forms as a percentage on timber sales and on expenditure. Under this system the Royal forests had been so seriously depleted of large oak timber that they were only supplying at the end of the 18th century about one-twelfth part of the annual supply of 25,000 tons or loads required for the use of the Navy. As the Commissioners pointed out, a system more conducive to extravagance and over-cutting could scarcely have been devised.

In criticising generally the system of management it was remarked "On every change in the Office of Surveyor-General of the Woods which has occurred during the present [18th] century, the Surveyors-General, or their representatives, have retained all the official books and documents which the Office happened to be possessed of. Thus all benefit arising from past experience has been lost; no consistency of proceeding has been observed; and each new Surveyor beginning without information or guide has adopted whatever plan of management happened to suit his fancy." The latter part of this criticism might have been applied with some show of reason to the management of the Crown Forests for the greater part of the century succeeding the report under consideration.

The Commissioners went into the question of the better administration of the forests in great detail, chiefly from the point of view of securing an adequate supply of timber for the Navy. They showed that in the time of James I. the supply of timber was apparently equal to the demand, but that consequent on the expansion of trade on the one hand and the devastation caused by the Civil Wars and such causes as the area of woodland being converted for tillage and the increased price of small timber on the other hand, there was every prospect of a shortage occurring. They estimated that an oak on an average was of a size sufficient for shipbuilding at 100 years of age, and that the produce of 1,000 acres would be sufficient for one year's supply for the Navy. Consequently a total area of 100,000 acres would be required. The gross area of the forests considered

suitable for this purpose was 115,595 acres, made up as follows:—

	Acres.
New Forest ... ..	66,943
Dean Forest ... ..	23,016
Alice Holt and Woolmer Forests	8,694
Whittlewood Forest ... ..	4,851
Salcey Forest ... ..	1,847
Whichwood Forest ... ..	3,710
Waltham Forest ... ..	3,279
Sherwood Forest ... ..	1,467
Bere Forest ... ..	927
Sulehay Walk (Rockingham Forest)	861
Total	115,595

The Commissioners recommended, therefore, that these forests should be disafforested, and they estimated that out of the allotments which the Crown would then receive, some 60-70,000 acres might be suitable for the growth of oak.

These recommendations are of very considerable importance in the history of the Crown Forests, since a decided effort was made to carry them out, and the policy then initiated has exercised a very powerful influence on the present condition of those forests which still remain in the possession of the Crown.

From 1809 onwards a vigorous policy of disafforestation (in the old sense), inclosure and planting was carried out. The formula requiring 100,000 acres for the growth of Navy timber was accepted by the Commissioners of Woods in their Report of 1812. It was there proposed to make up the available area of 60,000 acres in the Royal Forests to the above area in the following ways:—

1. From forest land in the Duchy of Lancaster.
2. By allotments in the Crown wastes, and from wastes in the Duchies of Cornwall and Lancaster.
3. By acquiring freehold in and encroachments from the Royal Forests and by purchase of private estates.
4. By resuming and planting Crown lands then on lease.

As will be seen from the detailed accounts in Chapter IV. of the various forests most of these methods of securing land were put into operation.

It is interesting to note that proposals were considered for disafforesting the forests of Brecknock (40,000 acres) and Exmoor (20,000 acres) and planting the Crown's allotments, where suitable for the purpose, with oak. These forests were in fact disafforested, but it was judged advisable to sell the Crown's allotments in Exmoor Forest (10,262 acres) in 1818 for £50,122 and the allotments in Brecknock Forest (13,760 acres) for £16,330. These sums were utilised in defraying the cost of inclosure and planting in the Royal Forests.

In 1814 an Act was passed (54 Geo. III., c. 70) establishing a "Navy Timber Nursery Fund," into which were to be paid the proceeds of the sale of certain Crown properties. The fund

was to be devoted to the purchase of land, &c., suitable for the growth of Navy timber.

In 1823 the Commissioners of Woods, Forests and Land Revenues were able to report that young plantations to the extent of about 51,627 acres existed in the Crown estates, the details being as follows:—

*Royal Forests.*

	No. of acres in each forest.	No. of acres inclosed for the growth of timber.
New Forest ... ..	66,942	6,000
Dean Forest ... ..	23,015	11,000
Alice Holt Forest ... ..	1,892	1,892
Woolmer Forest ... ..	5,949	1,700
Bere Forest ... ..	1,417	1,417
Whittlewood Forest ... ..	5,424	3,895
Salcey Forest ... ..	1,847	1,121
Whichwood Forest ... ..	3,709	1,841
Waltham Forest ... ..	3,278	—
Windsor Forest ... ..	4,402	4,402
Delamere Forest ... ..	3,847	3,847
Parkhurst Forest ... ..	900	900
<b>Acres</b> ... ..	<b>122,622</b>	<b>38,015</b>

*Other Lands.*

Freehold lands in New Forest ... ..	974
Freehold lands in Dean Forest ... ..	300
Freehold lands in Woolmer Forest ... ..	40
High Meadow Woods, Gloucestershire, and lands adjoining ... ..	3,064
Woodlands at Meopham, Kent ... ..	228
Parcels of Crown estate at Gillingham, Kent, and lands purchased adjoining ... ..	414
Parcels of the Crown estate at Eltham, Kent...	295
Parcels of the Crown estate at Eckington, Derby ... ..	238
Parcels of the Crown estate at Chopwell, Durham ... ..	896
Parcels of the Crown estate at Hampton in Arden, Warwick ... ..	163
	<hr/>
	6,612
“ And the uninclosed lands, consisting partly of inclosures thrown open, and partly of Woods of spontaneous growth, which are so stocked with trees as to be reckoned in the quantity productive of timber, have been estimated at ” ... ..	7,000
<b>Acres</b> ... ..	<b>51,627</b>

It was estimated also that a further area of 11,000 acres could be obtained in Dean and New Forests by throwing open in course of time inclosures recently made and inclosing a like area. The total area, however, still fell short of the total required. It was proposed by the Commissioners that the purchase of estates be continued, but it was stated that the funds available for the purpose were exhausted. It may be noted that the funds were derived solely from sales, &c., of the Crown estates, and that no money was ever voted by Parliament for the purpose.

From 1823 onwards, in fact, comparatively little was done in the way of securing fresh areas, but the planting of available land was pushed on steadily. One or two interesting notes are available as to the sylvicultural methods employed in forming these extensive oak plantations. When operations were first begun on a large scale, about 1808, the system was to sow acorns in prepared plats and to plant oaks and a small proportion of Spanish chestnuts with the acorns. It was found, however, that sowing was not a success, and one- or two-year seedling oaks were tried. This method was found to succeed better on loamy soils, but was a failure on heavy clays. Subsequently three- or four-year transplants were used with greater success, and the method was continued. About the year 1819 the practice of using Scotch pine nurses was begun, and the effect of such nurses in promoting the growth of oak was so satisfactory that in some cases the pines were even planted a year or two in advance of the oaks. It was fully realised, however, that the pines were to be removed as soon as they began to threaten the oaks. In the effort to plant the area required by the 100,000-acre formula considerable areas unsuitable for the purpose were planted with oak and pine nurses, and in such cases the Scotch pine alone survived to form the final crop.

The woods and forests again came under public review in 1833-4, when a Select Committee considered them in conjunction with the Land Revenues of the Crown. It was not until 1848-9, however, that they received a thorough overhauling by a Committee of the House of Commons.\* This Committee furnished the following table, which indicates the progress which had been made.

Name of Forest Act.	State in 1808.			The Extent of Inclosed Plantations in 1808.			The Extent of Inclosed Plantations made between 1808 and 1848.		
	a.	r.	p.	a.	r.	p.	a.	r.	p.
Dean Forest. Act 48 Geo. 3, c. 72; 18 June 1808.	20,727	2	3 (open forest) ...	676	1	13	12,827	3	37
	676	1	13 (inclosures) ...						
	1,358	0	6 (encroachments)				676	1	13†
	478	2	5 (Crown freehold occupied with lodges)						
	1,185	3	18 (land belonging to individuals)				13,504	1	10

\* Select Committee on the Woods, Forests and Land Revenues of the Crown.

† This quantity was inclosed prior to 1808; but a great portion of it, which had been imperfectly planted, has been re-planted since that year.

Name of Forest Act.	State in 1808.			The Extent of Inclosed Plantations in 1808.			The Extent of Inclosed Plantations made between 1808 and 1848.		
	a.	r.	p.	a.	r.	p.	a.	r.	p.
New Forest. Same Act.	62,745	0	2 (open forest) ...	1,100	0	0	8,179	0	0
	1,100	0	0 (inclosures) ...						
	876	1	39 (encroachments)						
	2,181	2	11 (Crown freehold on lease, and held with lodges)						
	21,861	0	13 (land belonging to individuals)						
	601	0	29 (copyhold land)...						
Alice Holt Forest 52 Geo. 3, c. 72 ; 20 June 1812.	2,427	1	17 (open forest) ...	nil.			1,862	0	32
	226	0	32 (Crown freehold)						
Woolmer Forest. 52 Geo. 3, c. 71 ; same date.	5,786	0	1 (open forest) ...	nil.			1,847	0	0
	163	2	7 (Crown freehold)						
Bere Forest. 50 Geo. 3, c. 218 ; 21 June 1810.	8,000	0	0 (open forest) ...	nil.			1,250	0	0
	135	1	17 (Crown freehold)						
Parkhurst Forest. 52 Geo. 3, c. 171 ; 20 June 1812.	2,085	0	0 (open forest) ...	nil.			870	0	0
	415	0	0 (Crown freehold)						
Salcey Forest. 6 Geo. 4, c. 132 ; 6 July 1825.	1,502	3	31 (open forest and coppices).	nil.			1,250	3	27
	254	1	2 (Crown freehold)						
Hazleborough Walk in Whittlewood Forest. 5 Geo. 4, c. 99 ; 21 June 1824.	1,381	1	37 (open forest and coppices).	nil.			486	0	18
	31	3	0 (Crown freehold)						
Delamere Forest. 52 Geo. 3, c. 136 ; 9 June 1812.	8,000	0	0 (open forest) ...	nil.			4,022	3	18
	755	1	23 (Crown freehold)						

NOTE.—The above Order and Return do not comprise extensive Plantations made in Windsor Forest, under the Act 53 Geo. 3, c. 158, nor the Plantations made since 1808, on the High Meadow and other Crown Estates, and in the Royal Parks. No Acts have been passed [*i.e.* to 1848] since 1808 for making Inclosures and Plantations in Whychwood, Waltham or Hainault Forest, or (except as to Hazleborough Walk), in Whittlewood Forest.

If this return be read with that furnished in 1823 (*see* page 20) it will be found that comparatively little progress had been made in the interval; neither could the Committee report any progress in the inclosure and allotment of the New and Dean Forests, Whittlewood (except as regarded Hazleborough Walk), Waltham and Whichwood Forests. They showed also that there had been serious irregularities in the allotment and selling of timber in the New Forest.

By about the year 1850, therefore, practically all the available land which was suitable for the growth of timber had been planted up, with the exception of such inclosures as might be made in the Dean and New Forests by throwing open an equivalent area, and from that time forward forestry operations were restricted mainly to the treatment of the existing plantations.

This treatment is of importance from our point of view, since it explains the present condition of such large areas of the Crown Forests. The ultimate crop of Navy oak was to be from 40 to 60



stems per acre (according to different authorities). This necessitated frequent and heavy thinnings in order to permit the crowns of the best trees to develop freely. In most cases the cuttings appear to have been made at intervals of five years, though in some cases they were made more frequently, and in one case the officer in charge expressed the opinion that it would be desirable, if possible, to thin every second year. The tendency to overthin was encouraged also by the high prices of oak bark and small timber, and there is evidence that in some cases the interests of the final crop were disregarded altogether in the desire to procure a high revenue. At all events, the system of local management led to some drastic changes at about this time, and in 1854-5 a Select Committee was again appointed to inquire into the management of the Crown Forests and Woodlands. This Committee went into the question in considerable detail, but it does not appear that the report produced any lasting effect on the management of the forests.

We enter now on a period in which the importance of oak for the Navy began to diminish, and with it public interest in the forests. The system of heavy thinnings was continued with excellent results from the contemporary point of view. Unfortunately it is not possible to show in detail for the whole of the forests the financial results of this planting for Navy timber, since in most cases income and expenditure relating to plantations are not clearly separated from the estate and general accounts. In two cases, however, viz., Salcey Forest and Hazelborough Wood, accounts are purely forestal, and it appears that from 1853, when the oldest woods were then twenty-three years old, until 1903, when clear-felling and replanting was begun, the nett returns have been, for Salcey, 10*s.* 7*d.* and, for Hazelborough, 14*s.* per acre per annum. During the period 1823-1853 also thinnings to the value of £134,244 were sold from Dean Forest. The method of treatment, however, has had, and will continue to have, a very serious effect on the returns from the forests. In the first place, the value of the final crop has been greatly reduced both as regards quantity and quality of timber. In the second place, no further receipts from thinnings can be expected over very large areas; and, finally, regeneration has been rendered difficult owing to the excessive growth of weeds under the open canopy produced by the system of thinning.

The policy pursued up to this stage in the history of the Crown Woods had one sole object in view, viz., to provide an adequate supply of oak timber for the Navy, and business-like forest management and economy of production were of secondary importance. The purveyors of timber to the Admiralty exercised the right, for example, to select any oak timber from fellings at a fixed price per load, and it not unfrequently arose that one purveyor would accept timber which another had already rejected. The attitude towards the forests is well expressed in correspondence which passed between the Admiralty and the Office of Woods in 1833. It was then suggested that no oak timber should be cut in the forests save such as was actually deteriorating. In this way an ample supply would be made available for cheap shipbuilding in time of war.

When interest in forestry again revived, the subject had assumed a new phase. The question of Navy timber had now disappeared, and it became desirable to manage to the best advantage those areas which had been devoted to the production of oak. Forestry as a means of developing semi-waste land also began to come into prominence. In 1883 the Commissioners of Woods started an afforestation scheme on the Crown lands in the Isle of Man, and between 1883 and 1891 some 800 acres of barren mountain land were planted up. Sir Stafford Howard became Commissioner of Woods in 1893, and during his period of office an increasing amount of attention was paid to the systematic management of the Crown Forests and Woodlands and to forestry generally. The position then was that there were many thousands of acres of oak woods all of which had been planted about the same time and thinned to a point beyond which the stock could not possibly be reduced. Added to this there was no demand for oak for the Navy; the price of bark had fallen so that the cost of stripping was barely covered; and the system of thinning had produced timber which, while suitable for shipbuilding, was of less value for modern purposes. In view of these facts it was decided to proceed on the following general lines:—Further thinning was to be suspended. The poorer parts of the oak woods were to be clear cut and planted with conifers, and when this was finished the moderate class oak was to be taken in hand and replaced by whatever crop was considered advisable at the time. The best oak was to be left to grow on for a considerable period and finally brought into regular rotation with the rest of the crop. It is clear that this procedure must result in a large increase in the stock of growing timber, from which considerable revenues may be expected in the course of time, but that during the transition period returns must of necessity be small. Preliminary schemes of management on the above lines were prepared in the first instance for Dean Forest and the High Meadow Woods.

In 1899 the Hafod Fawr Estate (1,184 acres), in Wales, was purchased for afforestation purposes, and in 1900-1901 the Crown acquired the Tintern Woods (3,000 acres) along with the estate and Tintern Abbey. In 1907 the Inverliever Estate (Argyll, 12,600 acres) was purchased, also, for afforestation purposes.

In 1899 Mr. Popert was appointed superintendent forester in Dean Forest and subsequently consulting forest officer. He was the first technically-trained forester to enter the Crown's employment.

In 1904 a school for woodmen was started in the Forest of Dean, and in 1908 the management of the Chopwell Woods was placed in the hands of the Forestry Department of the Armstrong College for instructional purposes.

In 1912 there was begun in the Dean Forest the erection of a plant to deal with the distillation of the large quantities of rough oak timber which are saleable only with difficulty. Arrangements have been begun also with the object of utilising the Forest as a Demonstration Area, in accordance with the recommendations of the recent Advisory Committee on Forestry.

## CHAPTER IV.

## NOTES ON THE CROWN FORESTS AND WOODS.

The extent of the Crown Forests and Woodlands on the 30th September, 1913, was as follows:—

Name.	Area of inclosed forest and plantations.	Area of open forest under timber.	Total area.
	Acres.	Acres.	Acres.
(1.) New Forest ... ..	13,092	10,666	23,758
(2.) Alice Holt Woods ... ..	1,884	—	1,884
(3.) Woolmer Forest ... ..	856	—	856
(4.) Bere Woods ... ..	1,413	—	1,413
(5.) Parkhurst Woods... ..	1,056	—	1,056
(6.) Forest of Dean ... ..	9,630	5,554	15,184
(7.) High Meadow Woods ... ..	3,349	—	3,349
(8.) Abbot's Wood ... ..	618	—	618
(9.) Clearwell Woods ... ..	298	—	298
(10.) Tintern Woods ... ..	3,154	—	3,154
(11.) Delamere Woods ... ..	2,105	—	2,105
(12.) Salcey Forest ... ..	1,258	—	1,258
(13.) Hazelborough Woods ... ..	487	—	487
(14.) Chopwell Woods ... ..	845	—	845
(15.) Inverliever Estate ... ..	804	200*	1,004
(16.) Hafod Fawr Estate ... ..	157	—	157
(17.) Windsor Woods ... ..	5,850	—	5,850
(18.) Esher Woods ... ..	720	—	720
(19.) Isle of Man Plantations ... ..	792	—	792
(20.) Miscellaneous Woods ... ..	978	—	978
Total ... ..	49,346	16,420	65,766

\* Scrub oak, &c.

Of those forests which are under Mr. Runciman's charge the New Forest, Alice Holt Woods, Woolmer Forest and Bere and Parkhurst Woods were, on 30th September last, under the supervision of the Deputy Surveyor of the New Forest; Dean Forest, Abbot's Wood, High Meadow and Clearwell Woods were under the Deputy Surveyor of Dean Forest; the Tintern and Delamere Woods, Salcey Forest, Hazelborough Woods, and the Inverliever and Hafod Fawr Estates were managed direct from the Office of Woods; while the Chopwell Woods were managed by the Armstrong College, Newcastle-on-Tyne.

Of the woods under Mr. Leveson-Gower's charge, the Windsor Woods are under the supervision of the Deputy Surveyor, the Isle of Man Plantations under the Crown Receiver, and the Esher Woods under Messrs. Clutton.

A short description of each of the above forests is appended. It has not been possible with the time at the disposal of the Forestry Branch to get out details as to accounts, but it is hoped that it may be possible to supply these in some future report.

(1) THE NEW FOREST, *Hants.* Area 23,758 acres.

The Crown lands extend altogether to about 65,000 acres, of which all but 2,000 acres are subject to common rights. Of the 63,000 acres thus subject to common rights, not more than 16,000 acres may be kept inclosed for growth of timber. The amount actually inclosed is now about 12,006 acres; the freehold inclosed woods belonging to the Crown extend to 1,086 acres in addition, and there are uninclosed woods of about 10,666 acres on lands which are subject to common rights. The total area of the Crown woods, inclosed and open, is therefore 23,758 acres.

Naturally over such an extensive area a great variety of conditions obtain, but the outstanding feature is the poverty of the soil. Roughly speaking, the northern portions of the forest are made up of the sands and gravels of the Bagshot and Bracklesham Beds (Upper Eocene), while the southern portion consists of the newer Oligocene clays and sands with Plateau Gravels. It has been estimated that roughly one-half of the area is sandy soil while the other half is of better quality. Locally, within the limits of a single inclosure, the soil varies rapidly from sand or gravel to a heavy clay. In the low-lying, badly-drained places there are considerable areas of peaty soil. The altitude varies from the sea-level on the south coast to about 400 feet in the north. The greater part of the forest, however, lies from 100 to 200 feet above sea-level, and is gently undulating in character. The rainfall is about 30 inches. There are no influences particularly inimical to tree growth.

The area really suited for the growth of oak is not large—the greater part of the forest being better suited to conifers, Scotch and Corsican pine in particular. Larch and Douglas fir also grow well on a limited area.

The ancient name of the forest is stated to be *Ytene*, signifying a furzy waste. There is evidence that it was used as a Royal forest in the days of Canute (A.D. 1017), and it appears that after the Conquest, in 1066, William I. selected this wild tract as a suitable hunting ground within easy reach of Winchester, and proceeded to enforce rigidly the forest laws within its boundaries.

The forest land with which we are now more particularly concerned, was the property of the Crown subject to certain rights of common of pasture, pannage and fuel. No limitations existed as to the number of deer which the Crown might keep in the forest, but, on the other hand, the right to depasture cattle was not exercisable during "the fence month" and "winter heyning," and therefore extended over rather less than one-half the year.

There is evidence that much attention was shown to sylviculture in the New Forest from early times, and there can be little doubt that the fine old open woods which are the chief ornament of the forest owe their origin to cultural measures taken in the Tudor and Stuart periods. The reign of William III., however, forms a convenient starting point for the more recent history of the forest. In the 9th and 10th years of that reign an Act was passed, in consequence of the wastage of timber in the kingdom,

to inclose from the waste land of the forest 1,000 acres forthwith, a further 1,000 acres immediately after the first session of Parliament subsequent to 1699, and thereafter 200 acres yearly for the next 20 years (making in all 6,000 acres), "the whole to remain in severalty in the actual possession of the Crown, for ever freed and discharged from all manner of Right, Title and Pretence whatsoever, and to be made, called and kept a nursery for wood and timber only." Power was also given to the Crown to throw open and inclose fresh areas, so long as the total area under inclosure did not exceed 6,000 acres.

In the year 1700 some 1,032 acres were accordingly inclosed, and for a short time the young plantations were well cared for. No further inclosures were made until 1751, when 300 acres were taken in hand. A further inclosure of 1,000 acres was made about 1768, and these inclosures, with 1,000 acres inclosed in 1776, make a total of about 3,300 acres as against a possible area of about 24,000 acres had the Act been rigidly carried out during the 18th century. Sylviculturally, the plantations of 1776 are of especial interest, since the Scotch pine, which has since proved itself to be thoroughly at home on the sandy soil of the forest, was then introduced.

With the revival of activity in planting for Navy purposes, an Act was passed in 1808 (48 Geo. III., c. 72) confirming existing inclosures to the extent of 2,274 acres, and authorising further inclosures of open forest up to a limit of 6,000 acres to remain inclosed at any one time. Under this Act about 5,557 acres were inclosed and planted up between 1808 and 1817, and about 1,471 acres between 1830 and 1848. The above plantations are described as oak with outside belts of Scotch fir, and some clumps of Scotch fir and larch.

In 1848 much evidence as to damage by deer in the New Forest was brought before the Select Committee of the House of Commons then inquiring into the management of the Crown property. In 1850 a Commission appointed in the previous year to inquire into rights and claims over the New Forest and Waltham Forest, reported that there was no objection to the removal of the deer provided some proper agreement was made for an allotment to the Crown.

The New Forest Act, 1851 (14 & 15 Vict., c. 76) was accordingly passed, and in lieu of the right to keep deer in the forest, the Crown was empowered to inclose 10,000 acres in addition to the 6,000 acres already inclosed, such inclosures to remain in severalty in possession of the Crown freed from all rights of common and other rights. A provision was made for new inclosures whenever old inclosures were thrown open to the commoners' cattle, so that consequently 16,000 acres might be constantly inclosed for growing timber. The planting of other trees than those suited for naval purposes was authorised, while every inclosure to be made henceforth was to be of the extent of 300 acres at least. This Act, moreover, contained provisions for ascertaining the rights of common exercisable over the forest. The right to keep deer was given up accordingly; the deer were so far as possible removed; and a register of the commoners was compiled. Considerable opposition arose, however, when the inclosures were begun.

In 1868 a Select Committee of the House of Lords reported on the operation of the Deer Removal Act. Up to that date 3,090 acres only had been inclosed under the Act, making the total area under inclosure 9,090 acres. It was pointed out that under the Act the Crown would gradually extend its plantations over the forest, and in proportion as the planting was well done, so the pasture would suffer. In consequence the interests of the Crown and the commoners were at variance, and there must be a perpetual struggle of conflicting interests. In the opinion of the Select Committee the effective remedy lay in allotting to the Crown in fee certain portions of the forest. In accordance with this recommendation a Bill to disafforest the New Forest was introduced into Parliament in 1871, but owing to pressure of other business was withdrawn.

Between 1851 and 1877 some 5,000 acres of forest were inclosed. In the latter year the enactment under which the forest is at present administered came into force.

By the New Forest Act of 1877 (40 & 41 Vict. c. cxxi.) the power of the Crown to inclose any lands in the forest for the growth of timber or trees (in pursuance of the Acts of 1698, 1808 and 1851) was limited to such lands as were (in 1877) inclosed, or had formerly been inclosed under those Acts. On the other hand, any part of such lands might be inclosed, planted, laid open, replanted or re-inclosed, provided that not more than 16,000 acres were kept inclosed at any one time, and provided also "that in cutting timber or trees for improving the woods, or for sale, care shall be taken to maintain the picturesque character of the ground, and not wholly to level or clear the woods, but to leave from time to time a sufficient number of the most ornamental trees; and to keep the woods replenished . . . . having regard to the ornamental as well as the profitable use of the ground."

Little was done under this Act until Sir Stafford Howard became Commissioner of Woods. It was recognised then that the New Forest under prevailing conditions was not a favourable field for scientific forestry; but in 1898 the late Mr. H. C. Hill, of the Indian Forest Service, who had already reported on the Forest of Dean and High Meadow Woods, visited and reported on the condition of the forest. As a commencement of operations, Wilverly Plantation of 500 acres was taken in hand: the existing crop of stunted oak, planted in 1809 on poor, gravelly soil, was cleared in patches and replanted with larch and Scotch pines.

Subsequently to the report in 1902 of the Departmental Committee on British Forestry, and the consequent revival of public interest in the subject, there was drawn up a plan of operations, embodying what ought to be done to improve the woods. The main features of this scheme were:—

- (1) To reinclōse the older and decaying oak plantations of William III. and also in rotation the oak woods of 1810-15, and to thin these woods with the object of obtaining natural regeneration.

- (2) To reinclose several of the open oak woods of 1815-45. where oak had failed on the worst land, with the object of replacing the oak with conifers, but allowing the better oak to stand for a longer period.
- (3) Similarly, with portions of the coniferous plantations, to thin heavily the trees of 40 years of age, which sell for poles or pit props, in the expectation that self-sown Scotch pines would fill up the gaps, and that when the plantation had come to maturity it would form a two-storied forest, of which the older trees of 80-100 years could be cut for timber and the younger crop for pitwood, &c.

The inclosures which this policy necessitates have met with very considerable opposition irrespective of the legal rights of the Crown. In actual fact the following work has been accomplished under the scheme:—

Area inclosed, 1,341 acres; area thinned for natural regeneration, about 1,036 acres; area in process of being replanted, about 305 acres.

The system of natural regeneration has not been uniformly successful, and where it has proved in the course of a few years that a full crop would not be obtained, recourse has been had to planting.

The distribution of the inclosed woods as regards age classes is as follows:—

	Acres.
1-20	305
21-40	—
41-60	8,156
61-80	1,736
81-100	575
101-120	1,276
121-140	775
—	—
201-220	270
Total ...	13,093

The Crown possesses the power to make further inclosures to the extent of about 3,993 acres.

One of the most unfortunate aspects of the Act of 1877, which emphasised for the first time the æsthetic value of the forest, is the state into which the woods formed prior to 1700 must degenerate; since inclosure is forbidden it is impossible to protect and regenerate them, and it is certain that ultimately these woods, which form one of the chief beauties of the forest, must disappear. There is no doubt, both from the utilitarian and the æsthetic points of view, that the forest is capable of administration on sounder lines than at present, and that its rational treatment is a duty which the present owes to future generations.

(2) ALICE HOLT WOODS, *Hants.* Area 1,884 acres.

The Alice Holt Woods are situated at the eastern extremity of Hampshire, bordering on the County of Surrey. Except for a narrow strip of private land in the centre, they form a compact block of seven inclosures. The northern part of the area forms a plateau with a maximum elevation above sea-level of about 450 feet. Towards the east, south and west, the land slopes away to an elevation of about 230 feet. The woods are situated on the heavy Gault clay, with here and there deposits of sand and gravel. The greater portion of the soil, however, is clay, with a covering under the existing oak plantations of brambles, bracken and other weeds. The climate is that of the South of England, comparatively mild and damp, with a rainfall of about 26 inches fairly distributed over the year. Spring is the driest season.

Alice Holt Woods are a detached part of the ancient Forest of Woolmer. The woods seem to have been well looked after in the latter part of the 17th century, but, like other Crown woods, suffered a period of neglect in the 18th century. The office of Keeper or Lieutenant of Woolmer Forest had been granted on lease for lives or terms of years, on conditions which, while bringing in little profit to the Crown, had reduced the forest to a bad state. The last lease was for a term which expired in 1811.

Under the authority of an Act passed in the year 1812 (52 Geo. III., c. 72), called an "Act for the better cultivation of Navy timber in the Forest of Alice Holt," the deer were removed and 1,600 acres were inclosed by the Crown out of the waste of the forest which comprised 2,427 acres. This area is held free from common and other rights, and may be used only for the growth of timber. The commoners and others were compensated by the surrender of the Crown rights over the remainder of the uninclosed forest. The 1,600 acres, with existing Crown freeholds to the extent of 296 acres, partly occupied by lodges, &c., made the area of the Crown's estate 1,896 acres. The total area, including farmlands, &c., has since been increased by purchase to 2,126 acres.

Almost the whole of the area now devoted to the growth of timber was planted up with oak between the years 1815 and 1825 on the clearance of a matured standing crop which consisted mostly of oak with some beech and ash, planted probably in the reign of Charles II. Operations for a considerable period after the completion of the new plantations were restricted to thinnings, which were made often and heavy. Between the years 1847 and 1904 material to the value of £70,466 was removed in this way.

In 1881, however, a beginning was made to clear away the poorer parts of this oak crop, and between that date and 1903, when a working plan was compiled by Sir William Schlich, about 50 acres were clear cut and replanted with conifers. In this working plan the existing oak crop was classified as follows:—

1st class (mean height 60 feet and over) ...	315 acres.
2nd class (mean height 40-60 feet and over) ...	1,146 "
3rd class (mean height under 40 feet) ...	331 "



There were also 31 acres of coppice and 61 acres of coniferous plantations.

The instructions for the compilation of the working plan were as follows:—

1. That all places where the oak crop is a failure should gradually be cleared and planted up with trees more suitable to the soil and situation.
2. That the rest of the woods, with the exception of some plantations, perhaps, should be retained as oak woods and treated accordingly.
3. That a plan be drawn up, setting forth the future treatment of all woods, regard being had:—
  - (a) To making the most of the woods financially, without any special desire to obtain immediate, in preference to future, returns:
  - (b) To the probable supply of labour available:
  - (c) To giving the best object lesson in the treatment of woods of this description, from a practical point of view, according to the methods of scientific forestry.

The following proposals for treatment were accordingly made:—

The first-class oak woods to be underplanted with beech (or in the large openings with Douglas fir) at the rate of at least 15 acres annually; the worst of the second and third-class oak to be cut and replanted with conifers at the rate of 15 acres annually for the 20-year period; the coppice to be cut and replaced with conifers; the Lodge inclosure to be treated separately from the remainder of the woods on the selection system.

By 1913, 117 acres of poor oak had been cut and replanted with conifers, chiefly Scotch pine with a small proportion of larch. Corsican pine and Douglas fir have also been used to a smaller extent, while seven 1-acre sample plots of various kinds of coniferous trees have been formed. On the other hand, no underplanting of the first-class oak has been undertaken. The coniferous plantations which have been made in recent years are growing vigorously and are free from disease.

### (3) WOOLMER FOREST, *Hants.* Area, 856 acres.

Woolmer Forest is situated about 6 miles to the S. of Alice Holt Woods. The total area of the forest is 2,070 acres, of which about 856 acres are under timber. The soil over the greater part of the forest is a poor sand with gravel subsoil, often with a pan. In the Linchborough Wood, in the N.E. corner, the soil is better in quality. The land is undulating in character and lies at a mean elevation of about 300 feet.

The origin of the forest is not known. For a long period the office of Lieutenant or Keeper of Woolmer Forest was, as stated above, granted on successive leases under conditions which resulted

in little benefit to the Crown. In 1812, on the expiry of the last of these leases, an Act (52 Geo. III., c. 71) was passed with the object of rendering the forest more productive. The Act recited that there was vested in the Crown the soil of 5,276 acres, exclusive of inclosed lands held in severalty, and that owing to the great and increasing difficulty of procuring a supply of timber from foreign countries and from the estates of private individuals in the United Kingdom it had become necessary to adopt measures for securing a more adequate supply. The Crown was empowered, therefore, to make inclosures for the growth of timber provided that not more than 2,000 acres should be kept inclosed at one time. During the period of inclosure the lands were freed from common or other rights. The keeping of deer or rabbits was prohibited, and the inclosures were not to be used for any other purpose than the growth of timber. Upwards of 1,700 acres were inclosed and planted accordingly.

The forest was disafforested in 1855 by the Act 18 and 19 Vict., c. 46. Under the authority of that Act the boundaries of the forest were ascertained by an Award dated the 7th June, 1856. The area of the forest was found to be 5,242 acres. By an Award dated the 10th July, 1857, there was allotted to the Crown 1,646 acres in compensation for the extinguishment of its forestal rights over the whole forest, in addition to ancient freeholds (174 acres) and then existing inclosures (1,770 acres) made under the Act of 1812, which had been confirmed to the Crown in fee by the disafforesting Act. The residue of the forest was disposed of in part by sale to defray expenses and the remainder was allotted to the commoners and others having interests therein. Of the total area (3,590 acres) which thus became vested in the Crown in fee, about 1,600 acres were exchanged with the War Department for property elsewhere. There have been minor variations of area owing to sales and purchases, and the extent of the Crown property is now about 2,070 acres.

The forest adjoins a great military camp, and the whole of it, except Linchborough Lodge, is leased to the War Department, who have for many years had the use of the forest for military purposes.

The existing crop in the three inclosures consists chiefly of Scotch pine, for the greater part now aged about 80 years. Part (about 250 acres) of the pine crop is younger, having been naturally regenerated after fires occurring in the years 1864 and 1882. There is also a small area of oak; but except for some 20 acres growing in Linchborough Wood it is very poor in character. The Scotch pine varies a good deal; in Forked Pond inclosure it is very good and well grown, but in the bottoms where the drainage is bad it is often poor. Fire presents the chief danger to forest growth. In 1912 considerable damage was done to 175 acres, and the area will probably have to be cut over.

Under the terms of the lease to the War Office a rifle range has been constructed in Brimstone inclosure; and since more than half of that inclosure and practically the whole of Forked Pond inclosure lie within the danger zone, the opportunities for carrying on forestal operations are very limited.

(4) BERE WOODS, *Hants.* Area 1,413 acres.

Bere Woods are situated in the S.E. of Hampshire, about 10 miles from Portsmouth. The total area is about 1,460 acres, of which 1,413 acres are under timber. The woods lie in three detached blocks, a considerable distance apart from each other, and not near any other Crown property. The land is gently undulating, and ranges from 150 to 300 feet above sea-level. The soil varies from a stiff clay to a loam, with occasional patches of sand and gravel. Of the three blocks the West Walk, containing about 917 acres, is mostly good soil, the East or Creech Walk (458 acres) is poorer, while Queen's Inclosure (85 acres) is good.

These woods are part of the ancient Royal Forest of Bere. Commissioners appointed to inquire into the state and condition of the Woods, Forests, &c. of the Crown reported in 1792 that the extent of the King's purlieus (that is of the areas in which the Crown was entitled both to the soil and to the timber growing thereon) was about 929 acres, of which only about 131 acres were inclosed, the remainder being open to the forest, which was subject to commonable rights. They stated that the forest was then in a very neglected state, and the produce, small as it was, had arisen principally from a stock of timber nursed up and protected during the 17th century.

In consequence of the recommendations of those Commissioners the forest was, after some delay, disafforested and inclosed under the authority of the Act 50 Geo. III., c. ccxviii (1810), which recited that the uninclosed waste lands subject to commonable rights extended to about 8,000 acres, and the demesne lands, the property of the Crown, to about 929 acres and also that "the Waste Lands of the said Forest were heretofore of great Value and Utility from the Timber and Underwood thereon, which of late Years have been very much injured, and in many Parts totally destroyed, and the Soil thereof in its present uncultivated State, is but of small Value, either to His Majesty or to the other Persons interested therein, but from its Contiguity to His Majesty's Dock Yard of Portsmouth, if the said Forest were disafforested and the Open Commonable Lands within the same were divided, allotted, and inclosed and if the present Demesnes of the Crown and the Allotment to the Crown, as hereinafter mentioned, were set apart for the Growth and Preservation of Wood and Timber, the same would be of great Benefit and Advantage to His Majesty and to the Publick in general, as well as to the several Persons having Property and Rights in the said Forest." By the same Act it was declared that the demesne lands of the Crown and the allotments directed to be made to the Crown in consideration of the extinguishment of its forestal rights over the remainder of the forest should be vested in and remain the absolute property of His Majesty freed from all commonable and other rights, and should be kept "as Nurseries for Wood and Timber only, and for no other Use, Intent, or Purpose, whatsoever."

Before 1823, 1,250 acres were planted up, chiefly with oak, the remainder being under old timber; this was subsequently

removed by degrees, and only a few specimens now remain. A good deal of expense was incurred in trenching land and raising a crop of potatoes previous to planting.

In 1826 the Queen's Inclosure was bought by the Crown, apparently with timber on it.

The young plantations were subsequently thinned in accordance with the practice of the time and yielded high returns. From 1850 to 1880 the nett return from the forest was £33,044, or £1,100 per annum and 15s. 4d. per acre. This probably included, however, sales of some timber planted before the disafforestation of the forest.

A beginning was made 40 years ago in Creech Walk to clear away the least successful of the oak plantations, and to replant the ground with conifers. Since that time about 130 acres have been cut over and replanted with common and Japanese larch, and Scotch and Corsican pine. These coniferous plantations are all growing well.

These woods contain some of the finest oak which has resulted from the Crown plantations of the early 19th century, and it is intended to allow a portion of it to grow to large dimensions. For this reason some 50 acres have been underplanted, since the year 1902, with silver fir, beech and chestnut.

(5) PARKHURST WOODS, *Isle-of-Wight*. Area 1,056 acres.

The total area of the Crown property is about 1,393 acres, including 80 acres granted in 1772 on a long term for Poor Law purposes, and about 152 acres allocated for military purposes by the Disafforestation Act referred to below. The latter now forms the site of barracks and a prison. A further area of about 105 acres has been leased for the purposes of the prison, leaving an area now under forestal management of about 1,056 acres. The Crown property lies in a single block between the town of Newport and the Solent at an elevation above the sea of from 50 to 275 feet. The ground is undulating and the soil for the most part a stiff retentive clay. The woods are exposed to the south-west gales off the Channel, which have a stunting effect on tree growth.

The forest was formerly held by the Governors of the Isle-of-Wight in virtue of their office. Under the authority of the Act 52 Geo. III., c. clxxi (1812), the forest was disafforested and all commonable rights extinguished, compensation being given by allotments to the commoners and others having interests therein. The Act recited that the total area of the forest was 2,500 acres, all of which was subject to commonable rights, except an area of 415 acres formerly inclosed and belonging to the Crown; that the forest was formerly of great value, but of late years had been very much injured and in most places totally destroyed; and that from the great and increasing difficulty of procuring a supply of timber from foreign countries and the estates of private individuals in the United Kingdom for the use of the Navy, it had become necessary to adopt measures for insuring a more adequate supply thereof, for which the proximity of Parkhurst to the Dockyard at Portsmouth would be advantageous owing to

facility of carriage. The bulk of the allotments to the Crown under this Act, exclusive of the lands appropriated for military and other public purposes, was directed to be set apart as "nurseries for timber and wood," and the grant of any interest therein or the use thereof for other purposes was strictly prohibited. It was provided that no rabbits should be kept on any of the allotments directed to be made by virtue of the Act.

About 278 acres of allotted land adjoining were subsequently acquired by the Crown by purchase in 1813 and added to the estate.

By 1823 about 900 acres had been planted, chiefly with oak, and with a few larch and Scotch pine as nurses. The greater part of the crop is now oak, but there is some fair Scotch and maritime pine. The oak is on the whole very poor, and all, except about 200 acres, may be described as a failure.

It soon became apparent that a great deal of the existing oak crop would not grow into timber fit for naval purposes, and unsuccessful experiments were made in planting other trees. An effort to replace parts of the oak with Scotch pine was made about 1885, but met with little success, and the work was abandoned. Again, about 1895 cutting and replanting was attempted, and since that date 71 acres have been replanted with Scotch pine and larch. These plantations show more promise, but the cost of replacing failures is heavy.

(6) DEAN FOREST, *Gloucestershire*. Area, 15,184 acres.

The total area of the Crown lands in Dean Forest is about 18,700 acres, of which, however, only about 1,058 acres are the absolute property of the Crown free from commonable rights. The forest lies in the angle of the Rivers Wye and Severn, and occupies three main valleys running north and south, rising from 200 to 900 feet above sea-level. The Coal Measures occupy the greater part of the area, but some 1,500 acres are Old Red Sandstone. The soil on the Carboniferous Series is a loam chiefly suitable for oak. There are considerable areas, however, of stiff white clay only suitable for spruce or poplar. The soil overlying the Old Red Sandstone is excellently suited for timber production. The rainfall is about 33 inches. Frost and, in minor degree, wind cause a certain amount of damage.

Under the Statutes 20 Car. II., c. 3 (1668), and 48 Geo. III., c. 72 (1808), the Crown may inclose commonable waste of the Forest of Dean for the purpose of the growth of timber, provided that the total area inclosed shall not at any time exceed 11,000 acres. Such areas are, while inclosed, freed from common rights. When the trees are grown beyond damage, inclosures may be thrown open to the commoners' cattle, and an equivalent area inclosed elsewhere.

The modern history of planting in Dean Forest may be considered to begin in 1668 with the Statute above referred to, by which effect was given to an arrangement with the commoners to enable the Crown to inclose against their cattle up to 11,000 acres for the purpose of timber growing. The Act recited that the wood and timber of the Crown which of late years had been very great in quantity and value within the Forest of Dean

had become totally destroyed excepting what was standing within the Wardenship of the Lea Bayly, so that some course was necessary to be speedily taken to restore and preserve the growth of timber for the supply of His Majesty's Royal Navy. The full area authorised by the Act was soon afterwards inclosed. In 1675 the forest was divided into six walks or districts; for each walk a keeper was appointed, and six lodges were built.

From a return made in 1691, it appears that though local opposition to the inclosure had been shown by the destruction of fences of the Lea Bayly, in other places the plantations were "generally very well grown with oak and beech of 50, 40 and 30 years' growth and under, many thousands of them being 40 feet and upwards without a bough to hurt them."

The Surveyor-General reported in 1705 that he had carefully surveyed the woods and found them very full of young trees, two-third parts whereof were beech which overtopped the oaks and would prevent them ever growing up to be ship timber. Apparently the fences of the inclosures had by that time been allowed to lapse, because the Surveyor-General referred to the 11,000 acres as having been "formerly" inclosed. He recommended that the woods should be divided into 16 parts of about 700 acres each, one to be cut each year and inclosed, leaving standards of oak or beech, and he estimated that each cutting would yield £3,500 and room would be given for the standards "to grow and come to perfection." This suggestion was approved, but does not appear to have been acted on, because in 1736 the local officer in charge reported to the Treasury that the forest had been entirely neglected during the preceding 30 years, and that only a few of the 11,000 acres remained inclosed.

In each of the years 1758 and 1771 inclosures of 2,000 acres were sanctioned, though they do not appear to have been made until a good many years afterwards.

In 1788 the Commissioners appointed to inquire into the state and condition of the Woods, Forests, &c. of the Crown reported on Dean Forest. In their opinion the forest was probably in its best state at the beginning of the 18th century, but the Commissioners stated that then all care appeared to have ceased; nevertheless, it was from the plantations of Charles II. that the Navy timber since supplied from the forest had been obtained, and in these plantations only that any considerable quantity of useful timber was then to be found. The actual area remaining inclosed in 1788 was only 675 acres.

It was not, however, until 1808 that active steps were taken to remedy this state of things. In that year the Act 48 Geo. III., c. 72, was passed, substantially re-enacting the Act of Charles II. as to inclosures. The Act recited that the Act of 1668 had "not been duly put in Execution," and that "from the great and increasing Difficulty of procuring a Supply of Timber from Foreign Countries, and from the Estates of private Individuals in the United Kingdom, for the Use of the Navy it has become necessary to adopt Measures for insuring a more adequate Supply of Timber in this Kingdom." The Act proceeds to declare that the 675 acres above referred to should be deemed

to have been legally inclosed, and to direct that the balance necessary to make up the full 11,000 acres should be inclosed.

The rest of the forest was then very sparsely covered, but a good number of old oaks existed, estimated at 24,000, and large quantities were felled for Navy timber until 1863, when the supply to the Navy finally ceased. Very few of these old trees now remain standing.

In 1810 the Commissioners began to reinclose, and started with Barn Hill, Serridge, Beechenhurst and Holly Hill, in all, 1,499 acres. These areas were planted by contract. The agreement was "to dig holes 15 inches square and 9 inches deep to be planted with sound, healthy acorns at 4 feet apart each way and every tenth hole 18 inches square and 12 inches deep to be planted with sound healthy plants of oak, Spanish chestnut, larch, fir, sycamore or beech of five years old, three years transplanted, as the various qualities of the land or other circumstances may require, and, in general, throughout the whole with a Spanish chestnut in each hundredth hole." Probably from neglect in keeping the young oaks clear of the rank undergrowth, and also from the ravages of birds and mice, the young oak seedlings were nearly all killed, and the plantations were filled up by putting one four-year old oak between every tenth tree, *i.e.*, there were actually left to grow about 600 trees per acre.

In 1811, Crabtree Hill, 373 acres, was planted, and received a similar treatment. From 1812 to 1816 the remaining ground, to complete the 11,000 acres authorised, was planted in the same way, except that 1-year seedling oaks were substituted for acorns. There were many failures of plants owing to a plague of mice and to drought and exposure, and the woods were not considered complete till 1832.

From 1828 to 1853 no less than £134,244 was received for thinning, with the result that the woods, which to begin with had not been properly planted, were completely overthinned, and to this day have never recovered. No underplanting of beech was tried, and the soil of course has deteriorated. It is necessary to bear in mind in this connection that the production of trees with "knees" and large, spreading crowns was specially desired for Navy purposes.

From 1842 to 1847 about 2,039 acres were inclosed and planted to take the place of inclosures thrown open. From 1857 to 1862 about 576 acres were similarly dealt with, but the oak trees were four years old and were given nurses of Scotch pine, larch or spruce, larch being used for preference.

In 1872 about 295 acres were reinclosed and planted with oak and larch nurses. From that date to 1896 no more land was inclosed, and very little planting done, and the total area of inclosed woods was then only 4,665 acres out of a statutory area of 11,000 acres. In 1896 it was decided to start reinclosing, and from that date to 1914 the area of inclosures has been raised to 9,252 acres, and will shortly be increased to the statutory 11,000 acres.

In 1896 a report on the forest was made by the late Mr. Hill, and a start was made to regenerate the poorer woods, then aged

80-90 years. For reasons of policy and sentiment, it was judged wise to cut out comparatively small groups of trees and to replace them chiefly with conifers; but experience taught some years later that the new groups became suppressed by the development of the lateral branches of the surrounding oaks, and since 1908 the practice has been to remove the rest of the oaks in the inclosures gone over, and fill up the blanks with conifers; the areas to be dealt with, amounting to some 1,969 acres, are now nearing completion. This method was not, however, adopted in Blakeney Hill North (499 acres), where a clear felling was made, with the result that a wonderfully fine regeneration of oak was obtained over about 370 acres. This inclosure has been filled up with oak and beech plants where any vacancies in the natural crop occurred.

A new working plan is now required for the forest, and data for this are being gradually collected. The inclosures have been divided into measured compartments, the age classes taken out, and a schedule of cubic contents compiled. It is proposed that soil suitable for the purpose shall be devoted to oak and the remainder to conifers. The estimates show that of the 11,000 acres to be inclosed roughly 4,000 acres are oak soil.

The present position with regard to the forest is, therefore, as follows:—

The total area of the woods is now about 15,184 acres, comprising some 9,252 acres inclosed under the statutory powers above referred to, 378 acres freehold of the Crown, and 5,554 acres of uninclosed woods over which commonable rights are exercisable.

Of the lands not under timber 680 acres are Crown freehold; the remainder consists of about 765 acres of the wastes, let, free from commonable rights, under special statutory powers, for mining or railway purposes, and about 2,071 acres of uninclosed waste not appropriated for any special purpose.

The actual area (including uninclosed woods) over which commonable rights are for the time being exercisable is about 7,625 acres.

The bulk of the inclosures are practically pure oak, but there are now mixtures, principally of conifers, comprising, roughly, some 1,500 acres. The main crop of oak, now 90-100 years old, is thin, having about 65 stems to the acre, and of inferior quality. The 60-70-year old oak is not as thriving as it should be, but the younger oak, 40 years old, is growing well. The reasons for the older oak being poor are bad planting, over-thinning, the absence of beech under-planting, and damage done by throwing open the woods to grazing by sheep.

Evelyn, in his "Sylva" (1664), advocated the propagation in the Royal Forests of "large spreading oaks" standing so wide apart as to admit of the grazing of the cattle beneath them; and the system of heavy thinning which this necessitated persisted well into the second half of the 19th century. Possibly the fine timber obtained from the plantations of Charles II. may have been the result in some measure of a happy neglect of this treatment.



(7) THE HIGH MEADOW WOODS, *Gloucestershire, Herefordshire and Monmouthshire.* Area 3,349 acres.

The High Meadow Estate and Great Doward Woods extend to about 3,580 acres, of which 3,349 acres are under timber. The woods lie in a compact block to the east of the Forest of Dean, and are intersected by the River Wye. The elevation of the ground varies from 70 to 890 feet above sea-level. The upper slopes are gentle, but become steeper and even precipitous near the river. The western quarter of the woods lies on a deep sandy loam derived from the Old Red Sandstone. The members of the Carboniferous Series occupy the remainder of the ground, giving rise to soils of varying types. The Mountain Limestone, with a stiff but sometimes shallow soil, forms the greater part of this section. The rainfall is about 35 inches, and except for a little damage from frosts in the hollows, and wind on the tops, the climate is very favourable for tree growth.

The High Meadow Estate was purchased by the Crown in 1817 under authority of the Act 57 Geo. III., c. 97, which recited that "from the Quantity of thriving Oak Timber now growing on the said Estates . . . and the Facility of conveying the Timber growing thereon when cut to the Government Dock Yards by Water Carriage and from the Contiguity of the said Estates . . . to the Royal Forest of Dean whereby the same might be managed as the Crown Lands by the Officers of the said Forest at a small expence, the same appeared to be a desirable Purchase." The estate then comprised 2,229 acres of wood and 696 acres of other lands which were afterwards planted up. The Great Doward Estate (282 acres) was purchased in 1824, and the Hadnock Estate (110 acres) in 1828. There are no rights of common over the woods.

The timber in the High Meadow Estate at the time of purchase was between 50 and 60 years old, and about 1,000 acres were planted with oak between the years 1825 and 1850. The woods never yielded much timber for the Navy. They were first drawn upon for that purpose in 1851, but the supply was discontinued in 1864.

The woods formed between 1825 and 1850 were apparently planted with oak and with larch and Scotch pine nurses, and for a while grew vigorously. Subsequent mismanagement, however, produced a crop of unthrifty oak. The treatment of the older woods was probably confined to gradual thinning-out of the oak with coppicing of the underwood. No very definite object of management was kept in view, and the treatment was consequently irregular in character.

In 1897 a working plan was compiled by the late Mr. Hill. At the time practically the whole was coppice with standards, two-thirds of the woods consisting of old, fairly well-stocked woods, and the remainder of incomplete oak plantations 47 to 72 years old, with an underwood of hazel. It was proposed, accordingly, to undertake the conversion of the former into high forest, and to treat the latter on a regular system as coppice with standards, with a rotation of 25 years for the underwood. Of the area to be converted to high forest 678 acres were to remain untouched,

except for cleanings and thinnings, during the 35 years period of the working plan, and the remaining 1,560 acres were to be treated as coppice with standards on a 35-year rotation. At the end of the period a further area was to be converted to high forest, the idea being to regenerate one-quarter to one-fifth of the area to high forest during each 30-35 years period with a view to an ultimate rotation of 140-150 years.

This plan, with some minor alterations, was adhered to until 1911. Larch had been freely introduced in groups among the oak to replace the mature standards cut out, but in most cases the groups were too small, and the surrounding oaks were tending to close in over the larch.

In 1911 the above plan was abandoned and a system of clear cutting and replanting at the rate of approximately 100 acres per annum was begun. In replanting, oak, larch and some Douglas fir have been used. The latter trees grow very well, and it should be possible to work on a lower and more profitable rotation than that contemplated in the above working plan. At the same time it is clear that cutting has been proceeding too fast, and a new working plan is urgently required.

(8) ABBOT'S WOOD, *Gloucestershire*. Area 618 acres.

This Estate is part of an area of 872 acres in the Forest of Dean originally granted in 1258 by Henry II. (with a reservation to the Crown of the herbage, the right of hunting and the minerals) to the Abbot and Monks of Flaxley, in lieu of the right of cutting two oaks weekly for the supply of the Monks' Forge in the Forest. The reserved rights (excepting minerals) were sold by the Crown in 1869 for £12,162 to the then owner of the soil, Mr. Henry Crawshay, and under the authority of the Abbot's Wood (Dean Forest) Act, 1870 (33 & 34 Vict., c. viii) the commonable rights after being ascertained by arbitration were bought up by Mr. Crawshay and the Abbot's Wood disafforested. In 1899 the Crown purchased for £8,800 the greater part of the Estate together with a Mansion which Mr. Crawshay had erected thereon and a small detached property at Parkend. The Mansion and about 28 acres were sold by the Crown in 1907 for £2,330. The total area now belonging to the Crown is 646 acres, of which about 618 acres are under timber.

The land lies on both sides of a valley running north and south and varies from 300 to 700 feet in elevation above sea level. The geological formation is chiefly Old Red Sandstone, and the soil is a red loam of good depth. Frosts in the valley are troublesome, and strong winds, against which shelter belts are now planted, blow up and down the valley.

At the time of the purchase by the Crown some 450 acres were covered with a scanty crop of beech and oak with some spruce and larch, the whole of the timber being valued at £3,000. During the last 13 years, 78 acres have been cut and replanted while 168 acres of bare ground have been afforested. Of the latter area about 20 acres are utilised for experimental plots of various species, while the remainder has been planted with

Douglas fir, Corsican pine, larch, and spruce, with Scotch pine belts. There is also some young oak and some sweet chestnut. The young plantations look well, are fairly immune from disease and seem to be thriving.

(9) CLEARWELL WOODS, *Gloucestershire*. Area 298 acres.

The woods extend to about 298 acres. They form part of the Clearwell Estate, on the western boundary of Dean Forest, and were purchased, along with the estate, by the Crown in 1907 and 1912. The soil is chiefly loamy clay resting on the Carboniferous limestone. The land is undulating in character and lies from 500 to 600 feet above sea-level, and is much exposed to winds. There are no common rights.

With the exception of about 15 acres of good young ash the crop is very poor, consisting of inferior coppice with standards (stored 7 or 8 years ago and probably about 50-60 years old), some diseased larch and a few spruce.

Thus far nothing has been done in the woods, which are now being fenced preparatory to treatment under a working plan.

(10) TINTERN WOODS, *Monmouthshire*. Area 3,154 acres.

The Tintern Estate, including the woods and the abbey, was purchased by the Crown in 1901. The woods at that time comprised about 2,863 acres, of which 147 acres were bare or covered with worthless scrub, 231 acres were almost pure larch, and 2,485 acres were coppice with standards.

The woods are split up into many blocks and extend for about 9 miles along the right bank of the River Wye, between Chepstow and Monmouth. The height above sea-level varies between 30 and 1,000 feet. The underlying rock belongs for the greater part to the Old Red Sandstone, but Carboniferous limestone and shales occur in the southern sections. The soil varies from a sandy loam on the coarser sandstone and conglomerates to a rich red loam on the lower slopes and bottoms of the valleys. The rainfall is about 37 inches, and the climate generally is excellently adapted to the growth of timber.

Prior to their purchase by the Crown, the woods had been managed chiefly as coppice with standards, into the poorer parts of which larch had been introduced from time to time. The low prices obtainable for coppice material rendered necessary a change in the system of management, and the following method has been practised and promises, with certain modifications, to yield excellent results:—

The better portions of the coppice, consisting chiefly of oak, beech and ash, are being converted to high forest by gradually reducing the number of shoots on the stools, the object being to produce material of pitwood or perhaps timber dimensions. At the same time the worst of the old standards are being removed in the areas under conversion. Until recently the spaces thus made were filled up with rapidly growing conifers, but it has been found by experience that the young groups are quickly overgrown by the surrounding coppice, and it is proposed in future

to remove only those standards which have an undergrowth of beech.

The inferior coppice, consisting chiefly of hazel, is being cut over, and either replanted with conifers or with valuable hardwood, or allowed to run on for a further coppice rotation. The more mature larch is being gradually cut and replanted, while the remaining larch is to be thinned regularly.

From the time of purchase in 1901 to October, 1913, a further area of 163 acres of wood were purchased and added to the area, and 128 acres of rough land taken in from the farms for planting, the total area of the woods being, therefore, at the end of that period, 3,154 acres.

Since the Crown acquired possession of the woods there have been converted to high forest approximately 750 acres of coppice with standards, while roughly 540 acres have been planted with conifers.

These woods should in course of time produce a very high nett revenue. The growth of conifers is especially good, and there is a ready market for small thinnings in the South Wales coalfields. A pleasing feature in the management of the woods is the subsidiary industries which have grown up in the neighbourhood. The coppice material now finds a use in the manufacture of turnery work, hoops and various kinds of cleft work. Employment is thereby given to a considerable number of men, and there is practically no waste of wood, with the exception of small twigs.

(11) DELAMERE FOREST, *Cheshire*. Area 2,105 acres.

The area of woodland is about 2,105 acres. The forest is situated between Northwich and Chester—roughly speaking some 8 miles from the former and 10 miles from the latter. The woods are in a fairly compact block, with two narrow prolongations towards the south, and one larger, and a few small detached portions. The soil, which is formed from Triassic sandstone, is a sand or sandy loam over the greater part of the area. Locally, however, and notably in the north-east corner of the forest, it is a loam. Here and there pockets of marl and gravel are found. Considerable areas, particularly in the centre of the woods, are occupied by peat mosses of considerable depth. The greater portion of the forest lies between the 200 feet and 300 feet contour lines, but in the south-east the altitude rises to nearly 500 feet. The ground for the most part is undulating to flat. Owing to the light character of the soil and the low rainfall the forest is better suited for the growth of pines than other trees.

The estate of Delamere was formed out of the ancient forest of Mara and Mondren, and was originally the property of the Earls of Chester, thus becoming merged in the Crown possessions. In June, 1812, an Act was passed for the inclosure of the forest, which at this time consisted of some 8,000 acres of sandy waste, destitute of timber, boggy in places, and elsewhere covered with gorse and bracken. (In subsequent draining operations, however, oaks of considerable size were found buried, indicating the existence of a previous crop of timber.)

The arrangements for allotment under the Act of Inclosure were: (1) that one-half of the total area should go to the Crown free of all rights, and should be used solely for growth of timber, and (2) that the other half should be divided between the Crown (in respect of the ownership of the Old and New Pale Farms situate in the forest) and the other holders of rights. It was provided also that after allotment no rabbits were to be kept on any part of the forest so allotted, under any pretext whatever. Under the first award, in 1815, about 3,846 acres were allotted to the Crown. By the third award and some exchanges 150 acres were added in 1819, bringing the total up to 3,996 acres.

Planting in the Crown allotments began in 1815 and was finished in 1823. It is stated that returns from the woods were beginning in 1831, and that for some years prior to 1848 the returns not only defrayed the cost of management but yielded a nett income of £1,373. Presumably, therefore, the thinnings were very heavy and the sales of small poles lucrative. Nevertheless Mr. James Brown, of Arniston, the Scotch forester, who had also reported on other Crown forests, in reporting on these woods in 1852, condemned the closeness of the trees, and recommended that extensive thinnings should be undertaken.

In 1849 Mr. J. Clutton reported that 4,022 acres were under timber.

In 1854, on the instructions of the Treasury, three surveyors, Messrs. Mathews, Moreton and Menzies, drew up a report on Delamere. The planting of oak in the past and the management were condemned, together with some of Brown's recommendations.

The obligation to grow timber was repealed in 1856; and between 1859 and 1867 a large part of the forest was cleared and the ground prepared for farms. The actual cost of this operation was £47,000, though a large sum must have been received from the sale of timber.

In 1893 it was decided to replant the area of about 2,100 acres still under timber. During the next 15 years some 540 acres were cleared and replanted, chiefly with pines.

In 1908 Mr. Popert, Consulting Forester to the Office of Woods, drew up a working scheme for the treatment of 1,900 acres of woodland, whereby the whole area—apart from the plantations formed since 1893—will be replaced by 1930. This scheme is at present in progress and provides for the planting of 284 acres of the best soil of the forest with oak and other broad-leaved species, while the rest of the area will carry a coniferous crop. The yearly plantings should amount to about 40 acres of conifers, and 20 acres of broad-leaved trees.

Hitherto the conifer area has been dealt with annually, but it has not been found possible, owing to scarcity of mast and to other causes, to plant more than some half a dozen acres all told with oak.

The present crop is, therefore, of two kinds:—

- (1) Coniferous plantations (and a few acres of young oak) formed since 1893; and
- (2) The remains of the old crop of oak and Scotch pine planted between 1815 and 1823.

The young plantations now extend to an area of about 770 acres—more than one-third of the total forest—and vary in age from 1 to 19 years. The growing stock is mostly Scotch pine, with a considerable admixture of Corsican and some Weymouth pines. Some common and Sitka spruce have been also planted in the damp spots. Beech is now being introduced to serve as fire breaks, and is mixed with the conifers in the new plantings.

These plantations have suffered from frost, fire, rabbits, insects and fungi. Fire is the chief enemy. The woods become very inflammable at certain seasons of the year, and sparks from railway locomotives, and the carelessness of visitors who resort to the forest in considerable numbers, are constant sources of danger. Forest weeds, such as birch, have also done harm. For the most part, however, satisfactory final crops are likely to result.

Very little of the soil in the forest is suitable for oak, and the drastic thinnings (if this term can be applied to the treatment of the Delamere Woods from 1860 onwards) have left on the ground a scattered crop of stunted oak, chestnut, birch and Scotch pine. Under these circumstances small returns only can be expected for a number of years.

(12) SALCEY FOREST, *Northamptonshire*. Area, 1,258 acres.

Salcey Forest was disafforested in 1826 under the Act 6 Geo. IV., c. 132. Of the allotments made to the Crown, 1,258 acres were well drained and planted up with oak (probably with Scotch pine nurses) during the period 1832-1846. The cost of these operations is not known.

The forest is situated about 8 miles south of Northampton, and lies in a fairly compact block. The land is almost flat, and lies at an elevation of about 400 feet above sea-level. The rainfall is about 25 inches per annum. The soil is very heavy Lias clay, which is cold and subject to late spring frosts. The existing old crop is almost pure oak.

In accordance with the system of treatment in vogue at the time, the woods were thinned every five years from about the year 1850 onwards. Owing to the high price of tan bark and the ready sale of small wood, large returns were obtained from this source. The nett returns per acre per annum for each of the 10-year periods from 1853 to 1903 were as follows: 1853-63, 5s.; 1863-73, 7s.; 1873-83, 5s.; 1883-93, 17s.; 1893-1903, 19s.

Thinnings were continued regularly up to the year 1903, when clear felling and replanting was begun. The crop on the ground had been reduced by this time to some 40-50 broad-crowned oaks. Here and there a little coppice and thorns were present as under-wood, but for the most part this had been destroyed by rabbits, which were very numerous in the woods at one time. The growth of thorns was encouraged by the fact that they were not cut with the coppice. The greater part of the soil, however, was covered by a tangle of brambles and coarse grasses.

From 1903 to 1912, at which date the management of the woods was taken in hand direct from the Office of Woods, 178 acres have been cut over and about 165 acres replanted. For the most part the cuttings were made in comparatively large areas of

15-20 acres, and the replanting was done with large transplants of oak and ash spaced 5 feet apart. Owing to the excessive weed growth and the damage from frost and wind, it is problematical whether the greater part of this replanting will ever produce a proper crop of timber. It is proposed in future to regenerate the old crop by strips and in groups in order to reduce the effects of frost, wind and weed-growth to a minimum. Nevertheless, it appears probable that the excessive weed-growth will render regeneration a difficult and costly matter.

(13) HAZELBOROUGH WOODS, *Northamptonshire*. Area 487 acres.

This wood is part of an allotment made to the Crown on the disafforestation of Hazelborough Walk in Whittlewood Forest under the Act 5 Geo. IV., c. 99 (1824). The existing wood was drained, inclosed and planted up with oak between the years 1830 and 1845 at an estimated cost of £7 15s. 0d. per acre.

The wood is situated in a compact block about 4 miles from Towcester. The ground is slightly undulating and lies about 450 feet above sea-level. The rainfall is about 25 inches. The soil varies considerably from place to place. As a rule heavy Lias clay forms the subsoil, but it is overlain in many parts with a fertile sandy loam of considerable depth, which is admirably suited for the growth of timber.

The young oak woods were treated similarly to those at Salcey and even larger returns obtained from the thinnings. The nett returns per acre per annum were as follows: 1853-63, 3s. 6d.; 1863-73, 9s. 6d.; 1873-83, 9s. 6d.; 1883-93, 22s.; 1893-1903, 25s. Generally speaking, however, the present conditions are better than at Salcey. There is more coppice and the coarse grasses are replaced by bracken.

Cutting and replanting was begun in 1902, and from that time to 1912, when the woods were taken in hand direct from the Office of Woods, 101 acres (or nearly a quarter of the whole) were cut over and replanted, partly with oak and ash, but also with larch. On the whole, these plantations promise to be successful owing to the excellent soil conditions and to the fact that the openings are smaller than at Salcey: but parts of the oak and ash regenerations are doubtful. It is obvious also, that cutting has proceeded too fast, and it will be necessary to reduce the rate considerably.

(14) CHOPWELL WOODS, *Durham*. Area, 845 acres.

The area at present under a working scheme is 845 acres. The woods lie about ten miles from Newcastle-on-Tyne, at an elevation varying between 200 and 650 feet above sea-level. They form one compact block on the left bank of the River Derwent. The slopes near the river are rather steep, but otherwise the topography presents no special features. The rock formation consists chiefly of the sandstones and shales of the Coal Measures, but only in a few spots do the underlying rocks exert any direct influence on the surface soils. The soils for the most part overlie glacial deposits, and are extremely

variable. Deep sands and pebbly gravels are intermingled with stiff clay, clay loams and sandy loams. Peat occurs in one or two small patches in the woods.

Chopwell Woods became vested in the Crown in the reign of Queen Elizabeth by the forfeiture of one John Swinborne for high treason. About the year 1635 Chopwell provided the greater part of the oak timber required for the building of the famous battleship "The Sovereign of the Seas," afterwards "The Royal Sovereign." During the 16th and 17th centuries the woods provided the tanners in Newcastle with large quantities of bark for use in their business. Oak and ash timber were also obtained from Chopwell for various purposes connected with work under control of the Crown. Oak timber, *e.g.*, for repairing the "longe" bridge at Berwick was procured from Chopwell.

From the time of the forfeiture to the Crown down to 1812 the property was regularly leased, with a reservation to the Crown of the timber. On the expiry of the last lease in 1812 the estate, which was then chiefly farm land with a few belts of timber, was taken in hand and planted within the next few years with oak. Owing primarily to the unsuitable nature of the soil, but also to unskillful management, the crop did not thrive. In 1851 Mr. James Brown advised that 779 acres of this crop should be cut forthwith, and the land drained and planted with larch in the space of three years, but that 100 acres of the better oak be retained. This work was completed in 1858-9, the proceeds from the crop being £14,470 and the cost of clearing and replanting £4,768. Of the larch planted, 50 per cent. appears to have failed entirely, and the remainder has not thriven particularly well. There are, in fact, few sites in any part of the wood which are suited for the growth of larch.

In 1908 the management of these woods, which had previously been in the hands of Crown Agents, was handed over to the Armstrong College. Under this arrangement a house was built for the College Lecturer on Forestry, who resides in the woods, and is responsible for the local management. A house was also erected for the accommodation of woodmen-students from the College, and it is now found possible to conduct nearly the whole of the silvicultural operations by means of the students. The arrangement has worked well from the point of view both of the Office of Woods and of the College.

During the year a building for a museum and lecture room has been put up by means of a grant of £285 from the Development Fund, and the facilities for instruction in forestry will be increased considerably thereby.

In 1908 a working scheme for the woods was prepared, and is now being acted upon. This scheme provides for the clearing and replanting during the next twenty years of all portions where the crops are most defective, where the increment is smallest, and where there is no likelihood of any improvement.

During the period under review and for the past three years the average annual expenditure, excluding rates and taxes, has amounted to £366, and the average annual income to £368.



During the same period 94 acres have been cut over, cleared for planting, and restocked.

The chief species of tree, therefore, at present over the greater part of the area is larch; but intermixed over the whole area are also to be found all the common hardwoods, which are the growth from the stumps of the former hardwood crop cut over about 60 years ago.

The working of the coal mines interferes to some extent with the growth of the timber, chiefly by a lowering of the water-level and by interference with the natural drainage. This has had a decidedly injurious effect on the growth of the timber. Public paths running through the woods are also a source of danger, inasmuch as many fires have had their origin at these paths. Formerly the woods were heavily grazed and this also had an injurious effect, particularly on the heavy clay soils. Until about 10 years ago the woods were also over-run with rabbits, and an immense amount of damage was done by them to the hardwoods, especially the ash, large numbers of which were killed off. All these conditions combined have had the effect largely of reducing the volume of timber to its present low dimensions, although it is difficult to apportion the bad effects between these and a wrong selection of species and excessive thinning in early stages.

The cleared areas in most cases have been little better than scrub. The timber consisted chiefly of small hardwoods of poor quality, and small larches of fair quality. The proportion of larch, however, has been very small. The volume of timber even in the best of the areas being cleared is equal to not more than one-tenth to one-sixth of what could be grown on the ground. This is due, of course, mainly to the failure of the larch and to excessive thinnings.

The chief difficulty in connection with the clearing and preparation of the ground for replanting is the disposal of branch-wood and timber too small and crooked to be marketed. Cord-wood and billet-wood have no value whatever in the district, as coal is very easily obtainable for fuel. The clearing and disposing of this unsaleable material in some years has cost over £4 an acre—a sum almost equal to the whole of the other expenditure connected with the restocking of the ground with suitable species. The only method which can at present be suggested for disposing of this waste timber material is that of using it for the production of wood tar, acetate of lime, and other products of wood distillation. This could probably be best effected by means of a portable distillation plant, which could be moved from site to site in the wood as required. The cost of clearing the inferior timber off the ground and the cartage of it to a central distillation plant, *e.g.*, at Newcastle, would appear to amount to about as much as could be obtained for it. The only practicable method of dealing with it appears to be, therefore, to set up a small plant on the spot as suggested. Designs for such a plant have been proposed, and the question of providing a grant for its erection was before the Development Commissioners at the end of the year.

(15) INVERLIEVER ESTATE, *Argyllshire*. Area 1,004 acres.

The estate was purchased by the Crown in 1907 for the purpose of conducting an afforestation scheme on a large scale. The estate is situated at the west end of Loch Awe on which it has a frontage of about  $8\frac{1}{2}$  miles. The loch lies at an elevation of about 120 feet above sea level while the highest point on the estate is about 1,450 feet. The rock varies from a coarse grit to a fine-grained shale. The soil changes rapidly from place to place; on the steeper slopes it is generally a yellowish loam of good depth, on the gentle slopes there is everywhere a tendency for peat to form, and on badly drained sites this formation goes on to a depth of several feet. The whole area has been heavily glaciated, generally in a direction parallel with the loch, with the result that the ground on the upper slopes is very broken. What were formerly numerous small glacial lakes are now the sites of peat bogs. The sea is distant only 4 miles from the western boundary of the estate, but a certain amount of shelter is derived from the intervening high land. The rainfall varies from 70 to 90 inches but the climate generally is mild and suitable for the growth of trees where sufficient shelter can be obtained from the strong westerly winds. Along the loch side and in favoured places the growth of timber is very rapid, but the large areas of peaty soils in exposed positions present difficulties to successful afforestation, and experiment alone will show what use can be made of them. On the whole this area is not unrepresentative of the very large areas of rough grazing land which exist along the west coast of Scotland.

One of the difficulties in the way of economical management is the absence of good roads through the estate, while the topography renders the improvement of existing, or the construction of new, roads very costly.

At the time of purchase the estate was divided into four farms carrying the stock indicated below:—

Name of farm.	Approximate area.	Sheep.	Rental per annum.
	Acres.		£
Salachry ... ..	635	300	66
Torran ... ..	2,800	1,900	190
Arichamish ... ..	4,900	2,700	150
Barmaddy and Cruachan ... ..	4,000	1,750	190
Totals ... ..	12,335	6,650	596

Torran Farm carried in addition some 20 to 30 cattle.

There were also some 200 acres of scrub, consisting of oak, ash and birch, of little value, and about 80 acres of plantations.

A nursery of  $8\frac{3}{4}$  acres was established at Ford and planting was begun on Arichamish farm in 1909, the planting being continued

in a westerly direction along the slopes facing the loch. The area actually planted from year to year was as follows:—

Year.	Area Planted.	Total Number of Plants used.
1909-10 ... ..	190	674,000
1910-11 ... ..	169	664,100
1911-12 ... ..	187	509,600
1912-13 ... ..	178	445,900
<b>Totals ... ..</b>	<b>724</b>	<b>2,293,600</b>

Of the total number of trees planted out, 1,181,500 were lifted from the nursery at Ford while the remaining 1,112,100 were purchased from nurserymen in this country. Of the plants raised in the nursery, a small proportion only have been purchased from nurserymen abroad, the remainder being obtained from seed or from British nurserymen. It is hoped that now the nursery is in full working order practically all the plants required will be raised direct from seed.

In the initial stages a good deal of Scotch pine was planted on the upper slopes but subsequently the use of this tree was abandoned, both on account of its unsuitability for the conditions and because of the damage done to it by black game. In general the better soils have been planted with larch and Douglas fir according to exposure, with a limited quantity of silver fir and beech, and these plantations are showing excellent development. The bulk of the ground, however, is suited only to spruce, and both the Sitka and common spruces have been largely employed. The common spruce is of course very slow in establishing itself, and it is difficult to say at this stage how it will grow on the upper slopes. Much of the early planting was experimental in nature, particularly that relating to planting of peat on upturned turves.

It is proposed in future to leave unplanted all ground of a doubtful nature, and for this purpose a detailed mapping of the soil is being carried on as opportunity permits. About 1,200 acres of plantable land have been mapped out on Barmaddy and Cruachan Farms in this way, and it is hoped that by the time planting of that area has been completed, sufficient data will be available to decide on the value of the large areas which in the state of existing knowledge are of doubtful value.

The area of land on the estate which is adapted for the use of small holdings is strictly limited, but it is being scheduled for that purpose as planting proceeds. The policy which the Crown is following in this respect is to equip small holdings as they are wanted, and as they can be placed to the advantage of the small holder himself. The rapid multiplication of small holders is prevented, first by the fact that considerable capital was sunk in both accommodation in the first instance in order to push on with planting operations, and secondly by the fact that there was little ground in the immediate neighbourhood of planting operations suitable for the purpose. The absence of a school at a convenient point is also a serious drawback.

The following buildings have been erected and were occupied at the end of 1912-1913:—

Bothy at Cruachan; two cottages at Ford (occupied by nurseryman and handyman; conversion of cottage at Ford into nursery bothy; cottage at Kilmaha (occupied by trapper); shepherd's cottage at Arinectan.

The question of the amount of labour absorbed by afforestation operations on an estate of this kind is of particular interest at the present time. An attempt is made below to compare the position in this respect in 1908, when the estate was used purely for grazing purposes, with the position in 1912-1913 when afforestation operations were in full swing.

The tables below indicate the numbers actually resident on the estate at the two dates.

*Resident Population in 1908.*

Source of employment.	Males.	Females.		Children under 16 years of age.	Total.
		Earning wages.	Dependents.		
Farming pursuits generally.	18	5	10	10	43
Game .. .. .	3	1	3	1	8
Post Office ... ..	1	2	1	—	4
Resident only ... ..	—	—	—	—	—
<b>Totals</b> ... .. .	<b>22</b>	<b>8</b>	<b>14</b>	<b>11</b>	<b>55</b>

*Resident Population in 1912-1913.*

Source of employment.	Males.	Females.		Children under 16 years of age.	Total.
		Earning wages.	Dependents.		
Farming pursuits generally.	13	3	7	15	38
Game ... .. .	3	1	3	—	7
Post Office ... ..	1	2	—	—	3
Afforestation ... ..	17	3	5	8	33
Resident only ... ..	1	—	1	4	6
<b>Totals</b> ... .. .	<b>35</b>	<b>9</b>	<b>16</b>	<b>27</b>	<b>87</b>

On comparing the above tables, it will be noted that there is an apparent reduction under the head "farming" of 15 persons. This is due in part to the fact that the tenant at Arichamish Farm is no longer resident, and his family and dependents to the number of seven have been replaced by a shepherd and his sister. In addition to the 17 resident males employed in forestry work in 1913, there were also two non-resident.

In view of accidental variations of this kind a better view is obtained of the relative state of affairs from the total number of

days of male labour put into the estate in 1908 and in 1913. It is estimated that in the former year a total of 6,800 days of labour was expended, against 11,000 in 1913, representing an increase of 62 per cent.

It may be assumed that the amount of employment will increase slowly until the time for thinning the young plantations arrives, when a considerable increase should take place.

(16) HAFOD FAWR ESTATE, Merionethshire. *Area 157 acres.*

This estate was purchased between the years 1899 and 1905 for afforestation purposes at a total cost of £5,900. It is situated about 3 miles to the S.E. of Festiniog. The total area is 1,202 acres, of which only a few acres are under cultivation, the remainder being permanent pasture and rough grazing land. The land occupies for the most part moderate to steep slopes between the elevations of 600 and 1,853 feet. The prevailing aspect is north. The rock consists of Cambrian shales and coarse grits. The soil in the lower parts is a loam of moderate depth: in the upper parts it is shallow, generally with a thin layer of peat. The rainfall is very high, being 70-80 inches per annum, and considerable quantities of snow fall in some years. On the whole the climate is mild and very suitable for the growth of coniferous timber. Wind is the chief difficulty in afforesting the upper slopes.

At the time of purchase the estate was divided into farms as follows:—

Name of Farm.	Freehold.	Sheepwalk.	Total.
	Acres.	Acres.	Acres.
Hafod-fawr-uchaf ... ..	106	58	164
Bron-y-foel and Tyddyn-bâch ...	246	328	574
Hafod-fawr-isaf and Tyn-y-coed ...	82	63	145
Côch Gwan ... ..	48	25	73
Bryn-saeth and Tyn-y-fedwen ...	138	90	228
	620	564	1,184

There were also 13 acres of wood, of which 9 acres were scrub and the remainder larch and oak.

From the time of purchase to the end of 1912-1913, 153 acres were fenced and planted with conifers. The plantations on the lower slopes, which consist chiefly of Scotch, Austrian and Corsican pines and larch with some spruce, have grown very well and will soon need some thinning. The trees on the upper slopes have not done well, owing to the poverty of the soil, exposure and the choice of species. Scotch pine, which has been used chiefly, does not thrive under these conditions, and will be replaced in future by common and Sitka spruce.

During the year a detailed survey was made of the estate, with the object of classifying the soil available for planting according

to its suitability for timber production. The results were as follows:—

	Acres.
1st class ...	53
2nd class ...	194
3rd class ...	365
	<hr/>
	612
Not afforestable and doubtful ...	590
	<hr/>
	1,202

Thus rather more than one-half of the area appears to be afforestable.

It is proposed for the present to plant up the soils which are suitable for timber-growing at the rate of 10-15 acres annually, and to make some experimental plantations with the object of testing the value of the doubtful ground.

(17) WINDSOR WOODS, *Berkshire and Surrey.* Area 5,850 acres.

The Windsor Woods as now existing are under the immediate charge of the Deputy Surveyor of the Windsor Parks and Woods, acting under the direction of the Commissioner of Woods, at present Mr. Leveson-Gower. The woods form a series of blocks extending almost from Windsor in the north to Camberley in the south. The ground is flat or undulating, and lies at a mean elevation of about 300 feet. The Bagshot beds extend over almost the whole of the area. As a general rule the soil is sandy, with beds of gravel in the south, but it becomes progressively heavier on proceeding northwards, when the London clay is finally encountered. The rainfall is about 28 inches. Generally speaking the sandy soils are suitable only for the growth of pines, while the heavier soils in the north are suitable also for oak.

Prior to the passing of the Windsor Forest Disafforesting Act, 53 Geo. III. c. 158 (1813), the Crown was entitled to forestal rights over a very extensive area surrounding Windsor, in which there were open woods or waste lands containing about 24,000 acres, and, as the lord of manors, was also entitled to a considerable extent of waste land within the forest subject to rights of common, and also, as owner of freehold lands, to rights of common over the same or other waste lands. The Act provided for disafforestation of the areas subject to forestal rights, and for allotment of the waste lands, and under the Award of 1817 made under the Act allotments of considerable extent were made to the Crown in satisfaction of its forestal rights. Further areas were obtained under later inclosure awards dealing with the wastes of various manors in the forestal area, while extensive areas were also acquired by purchase or exchange. Most of the timber that existed on the lands dealt with by the various awards appears to have been cleared soon after the passing of the Act of 1813, and most of the lands awarded to the Crown must have been planted soon after they were so acquired. Some of the lands obtained by purchase or exchange were planted when so acquired,

The woods are at present managed in two separate sections.

The northern section immediately adjoins the Windsor Great Park, and consists of the area commonly known as the Oak Forest, containing approximately 1,575 acres, and of two detached areas known as the Belvedere and the Clockcase Plantations, containing about 200 acres and 127 acres respectively.

The southern section extends over an area of about 6,475 acres, but the area includes about 2,468 acres that are not, for various reasons, at present available for growing timber under a scheme of forestry. Part of it is used by the War Department for instructional and military purposes, while other parts comprise Bagshot Park and an adjacent farm, and lands let for golf links, brick works, &c. There are thus left about 4,000 acres at present available for growing timber.

*The Northern Section.*—According to the Report for 1819 of the Commissioners of Woods, it was proposed to devote the greater part of the Oak Forest to the growth of Navy timber, for which it was described as well suited, preserving such of the old trees as should be deemed ornamental, and maintaining convenient rides or drives through the plantations. Planting was probably begun soon afterwards, though in 1823 only about 300 acres had been planted and it was stated that the planting was to be done “in proportion as the young trees raised in our nurseries are fit to be put out.” Probably the planting proceeded more rapidly after this, though it does not appear to be specially referred to in subsequent reports.

This area is bounded on the west by residences and on the east by Windsor Great Park, of which it is in reality an extension. It is much frequented by the public as a pleasure resort, and is intersected with main thoroughfares to Windsor, &c.

The woods consist principally of healthy oak, aged about 80 years or more. Parts contain oak mixed with chestnut, or clumps of over-mature beech, and there are some areas, varying in extent, of pure chestnut, Scotch pine, ash and larch. The oak trees are, as a rule, short in the bole and heavily branched, due to wide planting originally, and, later, to early and excessive thinnings.

Belvedere Plantation (200 acres) contains the old Belvedere Fort and well-known Cedar Drive. The area available for forestry purposes is consequently reduced to 150 acres. North and west of the Cedar Drive consists of either bare land formerly cultivated, or of naturally grown birch. The southern part, which was planted about 1820, is principally Scotch pine with some Weymouth pine, spruce and chestnut. The growth is very good, and the wood contains some very fine trees, which are quite mature. The soil is generally a sandy loam.

The Clockcase Plantation (127 acres) was planted about 1820, and was originally a mixture of Scotch pine and chestnut. The chestnut has almost disappeared, except as underwood, having been removed, doubtless, in periodical thinnings. The standing crop is well grown, is mature, and ripe for felling. The soil is mostly suitable for the growth of Scotch and Corsican pines, and the plantations will probably be restocked with these and a small proportion of chestnut in suitable localities.

Both the above plantations are inclosed and free from all rights and easements.

*Southern Section.*—As already mentioned, the area in this section now available for forestal treatment is about 4,000 acres. The elevation of the whole of the woodland is between 200 and 430 feet above sea-level, and consists of gently undulating and level ground; there are no steep precipitous hills. The soil, with the exception of that about Swinley Park, is sand or gravel; in a few places there is a pan varying in thickness from 4 to 8 inches. In Swinley Park the soil varies from a sandy loam to a loamy clay. Approximately three-quarters of the area is occupied by Scotch pine, one-tenth by mixed woods of oak and chestnut, and the remainder is scrub or blank.

The crop may be classified as follows:—

Scotch Pine about 80 years or over.	Scotch Pine about 40 years.	Scotch Pine under 30 years.	Mixed Woods (all old).	Scrub and Blank.	Total.
1,876 acres	313 acres	667 acres	404 acres	753 acres	4,013 acres

The old Scotch pine are generally of very fair and regular growth. The density varies in different parts of the woods, as does also the height; but it may be taken that, on an average, the cubic contents per acre is about 2,000 feet.

The Scotch pine, aged about 40 years, are very irregular in growth, and, as a rule poorly stocked. They have the appearance of having sprung up naturally, probably after fire. There are, however, here and there, groups which are closely grown and of good quality.

The young plantations formed within the last 30 years are, for the most part, thriving. Some of them, especially those under 10 years old, have been largely stocked by natural seedlings.

Most of the 15- to 30-year old woods are in need of cleaning, and this operation is being carried out gradually.

The mixed woods consist, for the most part, of broad-leaved species, chiefly oak, with some chestnut, beech, and birch. There is in some places an admixture of Scotch pine—both singly and in groups. These mixed woods (which are situated in the Swinley district) are all mature. They are open, uneven, and patchy, and of inferior quality from the point of view of timber, the trees being short-boled, branchy, and ragged.

The unproductive area in the southern section of the Windsor Woods amounts approximately to 753 acres, or nearly 19 per cent. of the total forest. This waste ground is covered partly by scrub (birch, pine, sallow, &c.) and partly by heather and bracken. A large proportion (some 220 acres) occupies part of the best soil in the forest. Nearly the whole of the scrub and blank area is suitable for the growth of trees, and will be dealt with as opportunity arises.

By far the most serious danger to which the forest is liable is fire. The public resort to and traverse nearly all parts of the woods, while, in addition, a portion of them is used by troops for



military exercises. Owing to the inflammable nature of the growing stock and soil-covering fires are frequent and cause grave damage and loss. The risk of fire is particularly serious in young plantations prior to the first thinning. In dry weather, when there is a danger of fires, a system of fire patrol—necessitating the employment of about ten men—is organised.

As regards insect pests, considerable damage has been done to newly-planted trees by the pine weevil (*Hylobius abietis*). To combat this insect, newly-felled areas are now allowed to remain unplanted for four years in order that the stumps, in which (when fresh) the beetles breed, may lose their attractiveness. The pine beetle (*Myelophilus piniperda*) is also a source of damage.

At the present time working plans for both the Northern and Southern Sections are under consideration.

(18) *ESHER WOODS, Surrey. Area 720 acres.*

The woods are situated near Leatherhead and lie in one compact area. The soil consists of heavy London Clay, with about 70 acres of loam where the Bagshot sands have been washed over the underlying clay. The land is undulating, and varies in altitude from 100 to 200 feet above sea-level. The rainfall is about 23 inches.

The woods originally consisted of old plantations intermixed with waste land and two farms. The whole was inclosed in 1842 by the King of the Belgians. The waste was at that time more or less covered with oak, birch and thorns. On the farm land acorns were sown, and the resulting oaks now form the standards in the present crop. Ash, hazel and subsequently sweet chestnut were planted among the oak to serve as underwood.

The estate was purchased by the Crown in 1867, and most of the old oaks on the waste and in the plantations were then felled and sold to cover part of the purchase money. Since the time of purchase the woods have been managed by Messrs. Clutton, as agents for the Crown. The system followed throughout has been coppice with standards. No definite rotation was adhered to for the coppice, but the area cut annually varied from 65 to 75 acres up to 1876, 55 to 65 acres up to 1896, and from 1897 to 1907 about 52 acres, including about 5 acres of thorns. This treatment had in practice led to the cutting of the best underwood every ten years.

A working plan for the woods was made in 1907 by the late Mr. W. R. Fisher. Describing the condition of the crop at that time, he stated that the soil of 126 acres was too stiff for oak, while the rest of the area, 594 acres, was very suitable. The underwood was in fair condition, except that in an area of 123 acres thorns had developed to a very great extent. The standards were not sufficiently distributed as regards age classes, there being a deficiency of poles and saplings. Mr. Fisher proposed to divide the woods into three sections, two of which, aggregating 500 acres, were to be retained as coppice with standards and worked on a 14-year coppice rotation. The third section of 220 acres was to be clear cut and regenerated with oak at the rate of two acres yearly. The coppice on the portions

of this section which were awaiting their turn for clear felling were to be cut over, meanwhile, on a 15-year rotation.

This plan was carried out for the 5-year period ending in 1912, but it was found that coppice grown on a 14-year rotation did not suit the local markets, and sold for no greater price per acre than that produced in 10 years. During the last two years the longer rotation has consequently been abandoned. It is necessary, therefore, that the working plan should be revised in the light of experience gained in the interval.

(19) ISLE OF MAN PLANTATIONS. *Area 792 acres.*

These plantations were begun in 1883 on mountain land purchased from the Disafforesting Commissioners in 1863-1864. The woods are comprised in three blocks, known as Greeba, Barroole and Archallaghan Plantations. The elevation varies between 200 and 1,200 feet, but by far the greater part is under the 1,000 feet contour. The rock is a clay slate, while the soil varies from place to place: in the lower portions of Greeba and Barroole Plantations it is generally a loam of fair depth, but on the middle and upper slopes and in Archallaghan Plantation the soil is of extreme poverty, shallow and accompanied by peat and a pan.

The greatest climatic difficulty in the way of afforesting mountain slopes in the Isle of Man is the severity of the prevailing westerly winds, which render the establishment of crops almost impossible in exposed places; where, however, soil and shelter are good the climate is admirably suited to tree growth. In view, therefore, of both soil and situation an almost hopeless task was undertaken in attempting to grow timber on the upper slopes. In addition also, the method of planting which has come to be known as the "copy-book" plan was largely adopted. That is to say, a large number of species—hardwoods and conifers—were planted on a set plan regardless of soil and other conditions. In one section as many as 25 kinds of trees were used. The result is that those trees, such as Corsican pine, which could grow under the adverse conditions, now stand too far apart to form a forest crop, while the intermediate hardwoods and less resistant conifers have died off. These plantations were experimental in character, but sufficient consideration does not appear to have been given to the factors which affect tree growth.

It is proposed in the future to pay attention chiefly to the treatment of the better portions of these plantations and to experiment on a small scale in the parts where there is a partial crop with trees such as the Sitka, white and common spruces, which may prove to be more suitable than the species already planted.

The following brief account of the individual plantations may be of interest:—

*Greeba Plantation (155 acres).*—This area was planted during the years 1889-1891. Owing to damage by rabbits 8,000 trees per acre were, on the average, used in planting and beating up. The total expenditure on the area to 31st March, 1891, amounted to £7

per acre. The trees planted consisted of sycamore, Norway maple, alder, birch, beech, ash and oak, and larch, Scotch, Austrian and Corsican and mountain pines, silver and Douglas firs.

The ground forms a steep slope with eastern aspect, and between the elevations of 200 and 800 feet the soil is good and the plantation shows excellent growth, Douglas fir, larch and Corsican pine being from 30 to 40 feet high. Above about 800 feet the soil is poor and exposed, and the crop has done badly.

*Archallaghan Plantation (372 acres).*—The whole area was drained and planted in the spring of 1883 with 4,840 trees per acre. The trees used were chiefly larch, Scotch, Corsican and Austrian pines, spruce and silver fir. There were planted also a number of beech, birch, oak, ash, &c. Beating up was continued during the years 1884-1886, over 2½ million trees in all being used before the plantation was considered complete. The total expenditure on all heads amounted up to 31st March, 1886, to £12 14s. 0d. per acre.

The land is flat on the top and slopes gently in all directions. It is between 430 and 650 feet in elevation, and is exposed to wind from almost all directions. The soil is extremely poor, and in spite of extensive draining is still very wet in places.

Under such circumstances it can cause little surprise that the plantation shows little promise of developing into a profitable wood.

*Barroole Plantations (265 acres).*—This area was planted in the years 1884-1889 with 4,840 trees per acre. The trees used were chiefly conifers, as in the Archallaghan Plantation, but a few broadleaved species were also planted. In all about 1½ million trees were used in planting and beating up, the total cost to the end of 1889 being £7 11s. 0d. per acre.

The aspect is east, and the elevation 680-1,110 feet. The soil in the lower half is of moderate depth, and the larch and Corsican pine are from 20 to 24 feet high, with complete canopy. In the upper half the soil is very shallow and poor, and with increasing exposure the trees show no signs of forming a crop.

#### (20) MISCELLANEOUS WOODS.

In addition to the above there are a number of scattered woods on various Crown estates. These are for the most part managed as coppice with standards, and call for no particular comment in this report.

Among these woods are included:—

	Acres.
Eltham Woods (Kent) ...	232
Osborne Woods (Hants.) ...	346
Stagsden Woods (Bedford) ...	140
Aldingham Woods (Lancs.) ...	61
Poynings Woods (Sussex) ...	149
Woodhouse Grange (Yorks.) ...	50
Total	978

## CHAPTER V.

## SCHOOL FOR WORKING FORESTERS, FOREST OF DEAN.

*Situation and Buildings.*—In August, 1903, the Treasury sanctioned the formation of a school for working foresters at an annual cost not exceeding £400, and the school was opened on the 1st January, 1904, in a room at the Crown Offices at Coleford. In 1905 the school was moved to a wooden building at Parkend, and remained there till July, 1909, when the present permanent stone building was provided. This consists of a large, well-built four-storied house, which hitherto has proved sufficient for the needs of the school. At first two stories only were occupied, but from time to time additional room was required, until now the whole building is used. The school at present consists of class-room, museum, dormitory for eight men, kitchen and dining-room, recreation-room, and caretaker's quarters. Board and lodging is provided for eight men, the rest living in private lodgings. Lodgings are difficult to obtain, and a proposal is now under consideration to enlarge the school by means of a grant from the Development Fund in order to take in an increased number of students.

*Admission of Students.*—The school is for working men only. The age of admission was at first from 16 to 20, but the men were found to be too young to obtain foresters' posts on leaving, and in 1908 the age limit was raised to 20-25 years, with very satisfactory results. The maximum number of men admitted in any one year is 12, and as the course extends over two years there may be 24 men at the school at any one time. It is now proposed to increase this number to 30. Vacancies in the school are first given to men already employed in the various Crown Woods, and the rest are filled from outside applicants, preference being given to those who have worked in private woods for some years. There is no entrance examination, and the men are chosen on their merits as disclosed by testimonials from previous employers. This system has worked satisfactorily, and very few unsuitable men have been admitted. Any man who shows unsatisfactory progress is liable to dismissal. Students were formerly paid a wage of 10s. per week for work done in the forest, but in 1908, when the age of entrance was altered, the pay was raised to 15s. Board and lodging costs 11s. per week, so that a careful man can keep himself on his pay. A few students receive a small allowance from home in addition. The education is entirely free and stationery is supplied, but axes, spades and other necessary implements are provided by the students. Each student is also required to have a bicycle to facilitate getting about the forest.

*Education.*—The course extends over two years, beginning in October. There are no regular terms, the work continuing throughout the year except during August, when the instructor is away on his holidays. If students wish to do so they are also allowed to take a short holiday at Christmas.

Each class attends at the school for one and a half days per week, lectures being given on two afternoons, and one morning

being devoted to private study. Saturday afternoon is a half-holiday. The remaining four days the men work in the woods under a foreman, and perform the ordinary work in the forest, including nursery work, planting, weeding, pruning, stripping bark, hedging, fencing, draining and timber-felling. In the school-room, forestry in all its branches is taught, silviculture, protection, and forest mensuration in some detail, and utilisation, working plans and forest management in a more elementary way. Botany and forestry accounts are also taught by the instructor, surveying by the Dean Forest survey clerk, and a special winter-evening class in arithmetic is conducted by an instructor from the Lydney Secondary Schools. Each student also works for two months in the Crown carpenter's shop. A fairly extensive museum is attached to the school, and a small library of forestry and botanical books is available. The instructor often takes the students out into the woods to study silviculture and to measure felled and standing timber; excursions are also made to neighbouring Crown woods (Tintern) and to interesting private estates at some distance. Examinations are held periodically, and those passing the final tests are awarded certificates.

That the type of instruction which is given is appreciated is shown by the fact that in almost every case employers of former students have been entirely satisfied with their work, and have selected them for promotion. Employment is found for some of the students in the Colonies: the Government of British East Africa now employs four old students, while Uganda has one. Two bronze medals of the Royal English Arboricultural Society and one silver medal of the Highland Agricultural Society have been obtained by past students, and two obtained scholarships for the recent tour in Germany given by the Royal English Arboricultural Society. At the Royal Show at Bristol, 1913, the school obtained "Highly Commended" for their exhibit.

*Certificates.*—The following statement shows the number of students admitted each year, the number who failed, were dismissed or left before completing the course, and the number of certificates granted:—

Year of Admission.	Number Admitted.	Number who failed, left or were dismissed before completing course.	Number who obtained Partial Certificates.	Number who obtained Full Certificates.
1903-04 ... ..	9	2	1	6
1904-05 ... ..	7	1	—	6
1905-06 ... ..	7	1	—	6
1906-07 ... ..	8	—	—	8
1907-08 ... ..	8	1	1	6
1908-09 ... ..	8	—	—	8
1909-10 ... ..	10	1	—	9
1910-11 ... ..	8	1	—	7
1911-12 ... ..	11	2	1	8
1912-13 ... ..	12	2	Still at the School (10)	
1913-14 ... ..	13	—	Still at the School (13)	
Total ... ..	101	11	3	64
			Still at the School (23)	

*Appointments.*—The following shows, as far as is known, how the 67 men who obtained certificates are now employed:—

British East Africa and Uganda, in Government appointments, present pay between £120 and £230 ... ..	5
Burma, Belgian Congo, Canada, under private companies connected with forestry, pay between £150 and £260 ... ..	4
Pole Inspector, Postal Department, present pay £130 ...	1
Head Foresters on private estates in the United Kingdom, present pay between £75 and £120 ... ..	8
Assistant Foresters, Foremen, or Head Woodmen on private estates, present pay between 20s. to 30s. per week ... ..	23
Woodmen in Crown Woods and Forests ...	7
Foreman, School of Forestry	1
Workmen in Dean Forest ... ..	8
In trades unconnected with forestry	9
Out of a situation at present	1
	—
	67
	—

*Expenditure.*—The nett annual expenditure under School of Forestry Account has been as follows:—

<i>Financial Year.</i>	£	s.	d.
1903-04 (last quarter) ...	66	3	6
1904-05	219	19	7
1905-06	257	11	5
1906-07	257	7	8
1907-08	266	5	4
1908-09	251	3	4
1909-10	323	4	9
1910-11	304	13	3
1911-12	323	16	7
1912-13	311	13	3

This does not include the pay of the students, which has always been included in the Dean Forest Account against work done. Students are also paid for time actually spent in the school, and this item, which has been separately noted since April, 1911, amounts to the following sums:—1911-12, £171 2s. 9d.; 1912-13, £179 15s. 0d. The expenditure on this head before 1908 was very much less than this, as the students then received 10s. per week instead of 15s., they had less school time and there were fewer students.

## WOOD DISTILLATION WORKS, FOREST OF DEAN.

These works have been erected with the object of utilising the considerable quantities of almost unmarketable cord-wood and small branch-wood which are left over when the broadleaved areas in Dean Forest and the adjoining woodlands are felled. The works were opened in October, 1913.

The total capital cost has not yet been adjusted, but was approximately as follows:—

Buildings	£8,000
Machinery	6,500
Fittings, architect's commission, fencing, &c.	1,000
	<hr/>
Total	£15,500
	<hr/>

The patent process of Herr F. H. Meyer, of Hannover-Hainholz, was adopted, after enquiry, as the most suitable, and the machinery was designed and supplied by his firm, the engine, boiler and principal non-patented apparatus being of English manufacture. The buildings were erected from Herr Meyer's plans by Mr. E. Maples Linton, Architect, of Newport, Mon.

The works are designed to produce charcoal, wood tar, wood alcohol and grey acetate of lime, which is used in the manufacture of acetone. It is not intended at present to manufacture acetone, but the works have been designed for installing the additional machinery necessary for that purpose, if required.

The contractor estimated that the following products would be obtained from the plant by carbonising 420,000 cubic feet of wood per annum:—

Grey acetate of lime	384 tons.
Tar	270 tons.
Charcoal	1,380 tons.
Wood Spirit	90 tons,

(equal to 23,400 gallons of 8·61 lbs. each).

As production commenced only a few months ago, sufficient time has not yet elapsed for the purpose of enabling the results and estimates to be fully compared, but the experience already gained leads to the conclusion that the above output will scarcely be obtained.

Most of the wood used is oak, which is brought in by hauliers from the Crown forests, in the centre of which the works are situated, and is stored in large stacks, a stock of 1,500 to 2,000 cords being kept at the works.

*The Process.*—The retort for the carbonisation of the wood is built of iron plate and is about 56 feet in length and 7½ feet in

diameter. It is fired from a furnace on the left side, and is set in flues which enable the wood to be carbonised effectually. The wood is packed into cylindrical-shaped trucks, each holding about two cords, or 256 cubic feet, stacked, and five trucks form one charge for the retort. When ready the iron door of the retort is lifted and the trucks of wood are drawn in by an electric motor. The door is then securely closed and the temperature raised to between 330° and 350° C. Distillation usually commences in about two hours and continues for twenty to twenty-two hours.

After the process is completed the door at the other end of the retort is raised, and the trucks, which now contain charcoal, are quickly drawn by motor into an iron cooling-chamber similar in form to the retort. The doors at each end of the cooling-chamber are made secure and the exterior is irrigated with water to expedite cooling. From the cooler the trucks of charcoal are removed, on the following day, to the charcoal shed, where they are emptied and the charcoal filled into bags ready for despatch.

During the process of distillation about 70 per cent. of the weight of the wood is given off in the form of gases, which pass out of the top of the retort through two copper pipes into a tar separator, where the tar is condensed and flows into a tank. The tar is then run into a *montejus* and lifted by a compressor into the tar still, where it is freed from the acid, oils and water remaining in it. It is run direct from the still into casks, and is then ready for marketing.

The gases and vapours, freed from tar, pass out at the top of the separator, and on into a tubular condenser, where the naphtha and acid vapours are condensed and run into large storage vats. This pyroligneous liquor, as it is called, is left in the vat three or four days to free it from any tar in suspension, and is then ready for further treatment.

The incondensable gases pass from the tubular condenser into a gas washer, where any residual naphtha or acid is removed by water, and are then conveyed by a pipe to the furnace, where they are utilised in the process of carbonisation.

The pyroligneous liquor, freed from tar, is pumped from the storage tanks across the yard to a vat in the acid room and neutralised with lime, which has been prepared in a lime-mixing tank outside. The liquor is stirred continuously by a mechanical stirrer until the mixing and neutralisation are complete. Thence it is pumped into settling tanks at the top of the building, then into sludge tanks on the first floor, where further impurities are removed, and thence into a storage tank in the acid room.

It is now pumped into a small "clear liquor" tank on the top floor, and runs thence into the iron column of the continuous apparatus, where the neutralised acid liquor is completely separated from the naphtha. This apparatus consists of a wrought-iron base or still, containing a copper coil, surmounted by a series of cast-iron plates. The neutralised liquor is run off continuously from the still into a tank below, and while still hot



is pumped into an evaporating pan. It is there boiled down to a strength of about 10 degrees Baumé, and when this point is reached, is run into the pan of a rotary dryer. This is a large wrought-iron drum, heated internally with live steam. The drum revolves slowly in a shallow tank and picks up a coating of the neutralised liquor. The liquor is dried, as the drum revolves, to a content of about 70 per cent. of grey acetate of lime, and then removed by a series of scrapers on the other side. The acetate, which is now in a pasty condition, is spread upon a concrete drying floor, under which pass the gases from the retort to the chimney stack, and, after being dried for several hours, is filled into sacks. The acetate now contains from 84 to 85 per cent. of true acetate of lime.

The naphtha which runs from the top of the iron still and column, after being freed from the acetate of lime liquor as previously described and also from some of the heavy oils, is passed through a copper wash-column, into which a weak solution of sulphuric acid trickles, and is here further purified. Thence it goes into a second column, where it is treated with a weak solution of caustic soda, and more oils are separated out. After passing through a small condenser the purified methyl alcohol is run into a storage tank below, and is ready for filling into drums for despatch.

Power is provided by a 27 ft.-by-7 ft. 6 ins. boiler, made by Messrs. E. Danks & Co., Ltd., of Oldbury, which supplies steam to the following machines:—a 35 H.P. single-cylinder, non-condensing engine, made by Messrs. Marshall, Sons and Co., Ltd., of Gainsborough; a Worthington steam pump for the cooling water; the fan engine; the condenser engine; the evaporating pan; the rotary dryer; the continuous apparatus; the tar still; the tar condenser; and the boiler-feed pump.

The main engine drives by shafting a dynamo, which, in addition to lighting the works, provides power for the motors used in charging and discharging the retort and cooler, and for the acid pump, the neutralised liquor pump, the clear liquor pump, the evaporator pump, the lime stirrer and the rotary dryer.

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## CHAPTER VI.

### THE TIMBER TRADE OF THE UNITED KINGDOM.

#### *Introduction.*

Until the second half of the 19th century the available statistical information relating to the imports and exports of timber is fragmentary: with the publication of the Statistical Abstract

and the Annual Statement of Trade it is possible to obtain fairly full information, but unfortunately, as will appear from the following pages, the basis upon which figures have been collected has varied considerably from time to time. The information contained in this chapter has been mainly obtained from the sources named: where other sources have been used an indication is given in a footnote.

*Imports—Unmanufactured Timber.*

Little information is available for the 18th century. The following figures\* relating to certain species of timber indicate, however, that in the last decades of that century timber imports were increasing rapidly:—

—	Year.	Deals, Pine Timber, Pine Boards and Planks (by tale).	Pine Timber, Pine Boards and Planks (by measure).	Oak.	
				Plank.	Timber.
		No. of Pieces.	Loads.	Loads.	
England only...	1721	3,972,618	23,085	—	—
Great Britain...	1771	3,912,413	104,010	—	—
Great Britain...	1790	5,776,478	214,881	6,606	3,394

The progress of timber imports into the United Kingdom in the first four decades of the 19th century is exhibited by the following table† giving the quantity of “timber eight inches square and upwards” imported for home consumption in the years stated:—

Year.	1801.	1811.	1821.	1831.	1841.
Quantity in thousands of Loads	162	279	417	546	745

These figures are exclusive of timber re-exported. The average annual imports of such timber (inclusive of re-exports) during the decade 1821-30 was 557,000 loads, and during the following decade 651,000 loads. Since the figures for battens, deals and staves are, until 1843, given not in loads but by the piece it is difficult to give any satisfactory statement showing the progress of the imports of those articles. It may be remarked, however, that during the period 1820 to 1840 (assuming that the average piece is practically the same in each year) the quantities of battens and deals rise and fall with the quantities of hewn timber: the imports of staves, while fluctuating greatly, appear to have

\* Abstracted from 11th Report of Commissioners appointed to enquire into the State and Condition of the Woods, Forests and Land Revenues of the Crown (1792): App. No. 15.

† Abstracted from Porter's Progress of the Nation (1912), p. 425.

shown no upward tendency. These facts are illustrated by the table below:—

Imports (including re-exports) of the principal kinds of Unmanufactured Timber 1820-40 (all quantities are in thousands):—

Year	1820.	1825.	1830.	1835.	1840.
Timber 8" square (loads) ...	384	769	502	694	817
Battens and Batten Ends (Great Hundreds)* ...	5	20	11	13	19
Deals and Deal Ends (Great Hundreds)* ...	36	77	50	62	74
Staves (Great Hundreds)* ...	100	103	73	109	97

It will be noticed that in the abnormal year 1825 each kind of timber shows a similar movement with a similar fall and recovery in subsequent years.

From the year 1843 onwards we have more satisfactory figures for imported timber: it is, however, practically impossible exactly to correlate them with the figures for the preceding period. It may be remarked, however, that the upward tendency during the first four decades of the nineteenth century exhibited in the figures for timber imports already given is, as will be shown subsequently, as strongly marked during the remainder of the century. We may, therefore, safely conclude that the movement was continuous and that were an unbroken series of figures available for the century they would show a steady increase in the volume of timber imported. The only figures consistently obtained throughout the period 1843-1912 have been those for hewn timber, sawn timber and staves; but since these kinds represent the vast bulk of the imports of unmanufactured timber they may be taken as representative of the whole. Values are not given in the official returns until the year 1854; and in the following table the value for the year 1853 has been calculated upon the basis of the values in the nine subsequent years:—

TABLE showing the average annual imports of the principal kinds of Unmanufactured Timber during each decade from 1843-1912.

—	1843-1852.		1853-1862.		1863-1872.		1873-1882.	
	Quantity Thou- sands of loads.	Value Thou- sands of £.	Quantity Thou- sands of loads	Value Thou- sands of £.	Quantity Thou- sands of loads.	Value Thou- sands of £.	Quantity Thou- sands of loads.	Value Thou- sands of £.
Hewn ...	946	Not stated.	1,185	4,040	1,505	4,777	1,957	5,403
Sawn ...	845		1,446	4,362	2,581	6,753	3,816	10,380
Staves ...	76		89	656	69	624	107	655
Totals ...	1,867	—	2,720	9,058	4,155	12,154	5,880	16,438

\* A Great Hundred = 120 pieces: each unit in the table, therefore, represents 120,000 pieces.

	1883-1892.		1893-1902.		1903-1912.	
	Quantity Thousands of loads.	Value Thousands of £.	Quantity Thousands of loads.	Value Thousands of £.	Quantity Thousands of loads.	Value Thousands of £.
Hewn ... ..	2,072	4,568	2,569	5,065	3,448	6,512
Sawn ... ..	4,411	9,981	6,092	14,832	6,002	16,495
Staves... ..	141	597	134	630	146	668
Totals ... ..	6,624	15,146	8,795	20,527	9,596	23,675

The great increase in the national consumption of timber over a period of seventy years is most easily realised when these figures are presented graphically (Fig. No. 1).

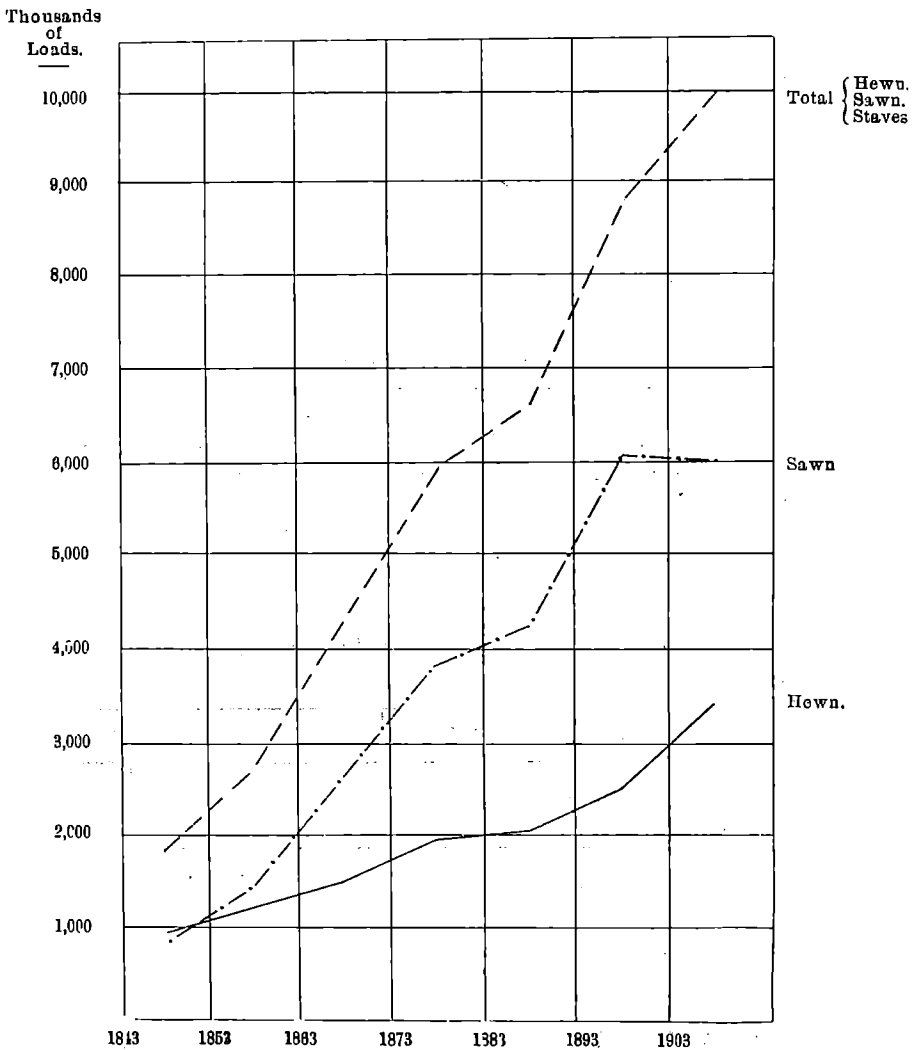


FIG. NO. I.—QUANTITIES OF UNMANUFACTURED TIMBER IMPORTED.

In order to complete for recent years the figures for the imports of unmanufactured timber the following table showing the imports of furniture woods is added. It has been compiled upon the same lines as the preceding one, but it has not been possible to continue it back beyond 1873. It will be noticed that, compared with the other classes of unmanufactured timber, both quantities and values are relatively unimportant, and that their addition to the figures for the three classes of timber included in the previous table would not affect the broad conclusions which may be drawn from the latter:—

TABLE showing Average Annual Imports of Furniture Woods during each decade from 1873-1912.

	1873-1882.		1883-1892.	
	Quantity Thousands of tons.	Value Thousands of £.	Quantity Thousands of tons.	Value Thousands of £.
Mahogany ... ..	51	477	48	430
Unenumerated ... ..	38	372	69	538
Totals ... ..	89	849	117	968

	1893-1902.		1903-1912.	
	Quantity Thousands of tons.	Value Thousands of £.	Quantity Thousands of tons.	Value Thousands of £.
Mahogany ... ..	76	587	98	804
Unenumerated ... ..	178	1,000	187	1,187
Totals ... ..	254	1,587	285	1,991

In the next table the quantities and values of imports of unmanufactured timber are given in detail for the period, 1903-1912. The great preponderance of coniferous timber will be noted at a glance. In the year 1912 the imports returned as fir and pit wood (which consists principally, if not entirely, of coniferous timber) represented £21,800,000 or approximately 77 per cent. of the total value.

## UNMANUFACTURED TIMBER IMPORTS INTO THE UNITED KINGDOM.

## Quantities and Values, 1903-1912.

	1903.	1904.	1905.	1906.	1907.	1908.	1909.	1910.	1911.	1912.
HEWN.										
Fir, other than	Quantity (Thousands of loads)	515	476	483	562	548	554	544	507	578
Pit Wood.	Value (Thousands of £)	1,542	1,259	1,348	1,495	1,277	1,178	1,250	1,259	1,682
Oak ...	Quantity (Thousands of loads)	192	146	173	220	218	157	177	198	226
...	Value (Thousands of £)	1,184	876	1,070	1,386	1,352	962	1,104	1,269	1,506
Teak ...	Quantity (Thousands of loads)	68	61	62	55	31	34	59	55	51
...	Value (Thousands of £)	887	877	958	877	509	540	956	907	858
Pit Wood	Quantity (Thousands of loads)	2,321	2,120	2,452	2,627	3,041	2,628	2,821	2,896	2,926
...	Value (Thousands of £)	2,535	2,237	2,713	3,049	3,579	2,930	3,137	3,376	3,660
Unenumerated	Quantity (Thousands of loads)	56	54	77	48	42	56	46	74	55
...	Value (Thousands of £)	231	226	323	181	161	175	182	265	234
Total ...	Quantity (Thousands of loads)	3,237	2,857	3,247	3,512	3,880	3,429	3,647	3,730	3,836
...	Value (Thousands of £)	6,379	5,475	6,412	6,988	6,878	5,785	6,629	7,076	7,940
SAWN.										
Fir	Quantity (Thousands of loads)	6,553	5,798	6,495	5,802	5,321	5,565	5,839	5,383	5,575
...	Value (Thousands of £)	17,415	14,470	17,704	16,308	13,818	14,815	16,304	15,147	16,463
Unenumerated	Quantity (Thousands of loads)	190	189	197	183	168	157	157	190	194
...	Value (Thousands of £)	778	786	831	839	703	654	712	817	879
Total ...	Quantity (Thousands of loads)	6,743	5,987	6,692	5,985	5,489	5,722	5,996	5,573	5,769
...	Value (Thousands of £)	18,193	15,256	18,535	17,147	14,521	15,469	17,016	15,964	17,342

STAVES ...	{ Quantity (Thousands of loads) Value (Thousands of £) ...	130 571	132 528	119 553	139 633	172 736	147 682	126 546	167 694	160 775	169 962
TOTAL. Hewn, Sawn and Staves.	{ Quantity (Thousands of loads) Value (Thousands of £) ...	10,110 25,143	9,305 21,593	8,963 21,284	10,078 25,580	9,669 24,871	9,516 22,081	9,277 21,800	9,810 24,339	9,463 23,815	9,774 26,244
FURNITURE WOODS.											
Mahogany ...	{ Quantity (Thousands of tons) Value (Thousands of £) ...	89 797	104 893	97 821	84 723	104 893	119 1,013	76 609	96 786	105 886	112 917
Unenumerated	{ Quantity (Thousands of tons) Value (Thousands of £) ...	176 1,182	198 1,152	197 1,171	195 1,206	200 1,327	190 1,211	197 1,183	175 1,081	175 1,162	173 1,196
Total ...	{ Quantity (Thousands of tons) Value (Thousands of £) ...	265 1,979	302 2,045	294 1,992	279 1,929	304 2,220	309 2,224	273 1,792	271 1,867	280 2,048	285 2,113
UNMANUFACTURED TIMBER OF ALL KINDS. Total Value (Thousands of £) ...		27,122	23,638	23,276	27,509	27,091	24,305	23,592	26,206	25,863	28,357

*Imports : Manufactured Timber.*

It is only for recent years that satisfactory figures for the total imports of manufactured timber can be obtained. Figures are available for the value of the imports of household furniture of wood and cabinet ware for the decade 1861 to 1870, the yearly average being £93,000 approximately. From 1871 onwards this heading disappears, and figures for house frames, fittings and joiners' work are given instead. The value of the imports shown under the new heading in the first year of the period is only £23,000, falling to £14,000 in 1873, and thereafter rising steadily to £271,000 in 1885. After that year separate figures for these three articles are not available, cabinet work being added to the heading: the total under the new heading is £545,000 in the first year (1886). The average annual value of the new group for the decade 1886-1895 is £617,000, and for the decade 1896-1905 £1,139,000.\* In 1900 a new heading appears, the various articles of wood manufacture which had previously been included under "Goods Unenumerated" being now shown as "Manufactures of Wood and Timber: Other Sorts." In 1903 the classification at present adopted is introduced, "Furniture and Cabinet Ware" being differentiated from "House Frames, Fittings and Joiners' Work," with which they had previously been included, "Other Sorts" being still continued. Separate figures for "Matches," which one may suppose to consist practically entirely of wood, are available from 1886, in which year the imports were valued at £418,000: until the year 1903 the figures showed little tendency to rise, but, as shown in the following table, there has since been a marked increase.

It follows from what has been said in the previous paragraph that only since 1900 are figures obtainable which represent the great bulk of the imports of manufactured timber. The annual totals show considerable fluctuations, the minimum being £2,472,000 (in 1907) and the maximum £3,393,000 (in 1912). For the period 1900-1912 the annual average is nearly £2,750,000, and for the decade 1903-1912 a little over £2,743,000. Detailed figures for the period 1903-1912 are given below:—

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\* This figure may not be quite reliable. Although the classification observed since 1903 purports to make the differentiation subsequently mentioned, yet the figures for subsequent years are so remarkable as to raise doubts whether what previously had been considered furniture and cabinet ware or house frames, fittings and joiners' work, has not since been considered as "other sorts." Thus the average value of imports of house frames, &c., and furniture, &c., together was £1,116,400 during the three years 1900-2, or approximately 50 per cent. of the total value of imports of manufactured timber; in 1905 the value was £894,000, approximately 45 per cent.; in 1908, £658,000, approximately 33 per cent.; falling in successive years to 28, 26 and 24 per cent., until in 1912 the values were £588,000 for furniture, &c., and house frames, &c., out of a total of £2,833,000, the percentage being only 21.



## IMPORTS OF MANUFACTURED TIMBER INTO THE UNITED KINGDOM.

*Values (in thousands of £) 1903-1912.*

	1903.	1904.	1905.	1906.	1907.	1908.	1909.	1910.	1911.	1912.
House Frames, Fittings and Joiners' Work.	469	333	317	273	225	210	185	205	180	172
Furniture and Cabinet Ware.	707	588	577	613	565	448	391	406	420	416
Matches ...	467	465	582	579	551	609	599	480	460	520
Other Sorts ...	1,169	1,162	1,073	1,131	1,131	1,313	1,478	1,727	1,952	2,285
<b>Total ...</b>	<b>2,812</b>	<b>2,548</b>	<b>2,549</b>	<b>2,596</b>	<b>2,472</b>	<b>2,580</b>	<b>2,653</b>	<b>2,818</b>	<b>3,012</b>	<b>3,393</b>

### *Imports: Wood-Pulp.*

Besides the articles which are usually regarded as manufactured timber, another timber product has figured largely in the import returns during recent years, viz., wood-pulp. It is first separately entered in 1887, when 79,500 tons, valued at a little over half a million pounds, were imported: ten years later the quantity had risen to 388,000 tons, valued at nearly two million pounds: in 1912 the quantity reached the maximum figure of 925,500 tons, valued at more than £4,400,000.

The average quantity annually imported in the period 1893-1902 was 379,000 tons, valued at £1,912,000, and in the period 1903-1912, 707,000 tons, valued at £3,331,000.

Wood-pulp enters largely into the manufacture of paper; but it is impossible to state what proportion of the paper imported is made from this article. The average annual figures\* for paper imports since 1883 are as follows:—

	1883-1892.	1893-1902.	1903-1912.
Quantity (Thousands of tons) ...	1,905	4,828	9,351
Value (Thousands of £.) ...	1,758	3,501	5,765

It is obvious that these figures must represent very large quantities of wood-pulp.

### *Imports: Miscellaneous Articles.*

Besides paper, there are various other imported articles in the manufacture of which wood enters largely, the most important being "Toys and Games" and "Brooms and Brushes." "Toys" were first separately distinguished in 1870, when the total imports

\* These are exclusive of the small amounts of "unenumerated and articles of paper" which have only been separately distinguished since 1910.

were valued at £239,000, subsequently rising to £1,233,000 in 1901. In the year following "Games" were included with "Toys," the combined total being £1,240,000; since that date the annual value has remained fairly constant, reaching a maximum of £1,439,000 in 1909, and falling to £1,100,000 in 1904: the average annual value for the decade 1903-1912 was a little over £1,260,000. "Brooms and Brushes" have only been separately recorded since 1897, when the declared value was £258,000. In the fifteen years following the value has shown a constant tendency to rise, reaching a maximum in 1912 of £426,000: the average annual value for the decade 1903-1912 was £374,000.

As in the case of paper, it is not possible to estimate what proportion of the value of any of these articles represents the wood used. A large proportion of their value, as in the case of all manufactured products, must represent the labour employed subsequent to the placing of the raw material upon the market: but it is necessary in any survey of the timber trade to take some notice of these and similar articles, which, although representing individually insignificant quantities of timber, in the bulk must account for a appreciable proportion of the total quantity of products derived from wood imported into this country.

#### *Total Timber Imports.*

The total value of timber of all kinds (inclusive of wood-pulp but exclusive of paper and other miscellaneous articles mentioned above) during the years 1903-1912 is shown in the next table. The average annual value was nearly 32 millions during the period, the lowest figure being 28½ millions (in 1905) and the highest over 36 millions (in 1912).

**TOTAL VALUE (in thousands of £) of TIMBER IMPORTED into the UNITED KINGDOM, 1903-1912.**

—	1903.	1904.	1905.	1906.	1907.	1908.	1909.	1910.	1911.	1912.
Unmanufac- tured ...	27,122	23,638	23,276	27,509	27,091	24,305	23,592	26,206	25,863	28,357
Manufac- tured	2,812	2,548	2,549	2,596	2,472	2,580	2,658	2,818	3,012	3,393
Wood Pulp...	2,507	2,521	2,760	2,915	3,312	3,626	3,509	4,003	3,743	4,418
Total ...	32,441	28,707	28,585	33,020	32,875	30,511	29,754	33,027	32,618	36,168

If the estimate given in an earlier chapter (p. 11) may be regarded as approximately correct it follows that the present annual imports of timber into the United Kingdom represent more than the total value of all the timber growing in England and Wales, including the value of the land upon which it is grown. And, if we take the annual production of timber in woods in Great Britain at the liberal figure of 20,000,000 cubic

feet (*see* p. 75 n. below), it will be found that the annual imports into the United Kingdom of the principal kinds of unmanufactured timber\* alone amount to approximately twenty-four times this volume.

*Exports: Unmanufactured Timber.*

The exports of unmanufactured timber have always been small in amount, and, in the period for which figures are available, have consisted chiefly of re-exports of Colonial and Foreign produce. In 1861 the total value of such re-exports amounted to approximately £233,000, in 1871 £244,000, in 1881 £365,000, falling to £253,000 in 1891 and rising to £517,000 in 1901. Statistics for exports of unmanufactured timber produced in the United Kingdom are only available since 1893, when figures for timber rough hewn, sawn or split are available: up to 1903 the amount rarely exceeded 1,000 loads, but in the year named staves were included among unmanufactured timber, and the average quantity exported has since been about 20,000 loads, valued at £126,000. Since this figure represents a quantity equal to at least one-twentieth of the annual home production, some doubt must arise as to whether the exports are in all cases rightly described.

*Exports: Manufactured Timber.*

The statistics for exports of manufactured timber are fragmentary, but there is no reason to suppose that the trade has at any time been of any great relative importance. Figures for exports of furniture, into the manufacture of which timber enters largely, are, however, available over a long series of years, and the following table gives the average value for each decade since 1853:—

**EXPORTS of FURNITURE from the UNITED KINGDOM.**

*Values Thousands of £.*

1853-1862.	1863-1872.	1873-1882.	1883-1892.	1893-1902.	1903-1912.
259	255	464	665	605	931

A small fraction of these sums represents Foreign and Colonial produce re-exported. The average annual export of other kinds of manufactured timber has been £452,000 in the decade 1893-1902, and £636,000 in the decade 1903-1912: during the former decade staves were included and omitted during the latter.

The next table gives details of the chief items of the export trade in timber during recent years. The very large figures for exports of unmanufactured timber of home production accentuate the doubt expressed above as to whether this class of export is not sometimes wrongly described.

\* *See* Table on p. 66: the average annual imports were approximately 9,600,000 loads or 480 million cubic feet during the period 1903-12.

TIMBER EXPORTS from the UNITED KINGDOM for certain years from 1900 to 1912.

(Quantities and Values to the nearest hundred.)

Year.	Foreign and Colonial Produce.											Home Produce.				Total Trade.			
	Hewn.			Sawn.			Slaves.	Furniture Woods.		Manufactured.			Total Value.	Rough, Hewn, or Split.	Manufactured.		Total Value.		
	Fir.	Oak.	Teak.	Total.	Fir.	Unmerited.		Mahogany.	Unmerited.	House Frames.	Furniture.	Other Sorts.			Furniture.			Other Sorts.	
																			Quantities in Loads.
1900	Quantity	1,000	600	6,400	8,300	14,100	3,200	5,100	15,700	16,500	—	—	—	—	1,300	—	—	—	
"	Value £	6,500	5,100	91,000	104,200	68,800	36,200	44,100	163,200	140,800	38,400	—	—	—	8,800	636,600	439,600	1,085,000	1,794,300
1910	Quantity	2,600	1,900	6,700	12,200	25,500	800	7,900	38,600	11,600	—	—	—	—	22,100	—	—	—	—
"	Value £	15,800	14,000	115,200	151,400	112,400	5,500	63,000	358,600	123,100	2,300	32,900	211,800	1,061,000	129,300	987,300	848,500	1,965,100	3,026,100
1911	Quantity	2,700	1,900	6,100	10,900	26,100	1,000	5,700	28,000	11,500	—	—	—	—	31,000	—	—	—	—
"	Value £	19,200	16,000	109,200	145,100	118,800	9,400	45,600	293,700	140,100	3,900	40,100	235,800	1,032,500	199,100	1,280,100	757,200	2,286,400	3,268,900
1912	Quantity	900	8,000	5,800	9,500	22,900	2,900	6,900	39,000	12,800	—	—	—	—	47,800	—	—	—	—
"	Value £	5,100	23,800	91,000	123,100	115,700	17,400	61,400	407,100	159,300	3,100	36,600	274,500	1,199,200	324,000	1,343,300	715,500	2,362,800	3,532,000

In addition to items figuring in this table, exports of matches, brooms and brushes, and toys and games are of some importance, the average annual value being £86,000, £193,000, and £569,000 respectively during the decade 1903-1912.

*Consumption of Timber.*

While figures for the total amount of timber imports and exports are valuable as indicating the general progress of the trade, yet data relating to the actual consumption of timber per head of population provide the surest indication of its future development. It is fortunate that the most certain index of the consumption per head is provided by the figures for the imports of unmanufactured timber, which are available in a continuous series from 1843 onwards. In using them, however, it should be remembered that the home production of timber, which is comparatively insignificant of recent years, must have had considerably greater relative importance in the early part of the 19th century. Yet, if we may regard the home production as fixed in amount for the last sixty years, we find that the annual consumption per head of timber grown in Great Britain—which is now a little more than one-third of a cubic foot—was only about double that quantity in 1851.\* If regard were had to strict statistical accuracy it would be necessary to make an allowance for re-exports; but, as stated above, the amount of re-exports is comparatively insignificant. In the following table the quantity and value of imports of the principal kinds of unmanufactured timber are given for each decennium from 1843: the population, however, has been reckoned at the figure for the census year falling within each period: thus, for the period 1843-1852, the population figures for 1851 have been adopted. While this is not a perfect statistical method, it suffices to show with approximate accuracy the manner in which the consumption of timber has increased:—

TABLE showing AMOUNT PER HEAD of POPULATION of the CHIEF KINDS of UNMANUFACTURED TIMBER IMPORTED into the UNITED KINGDOM.

Year.	Population.	Timber (Hewn, Sawn and Staves) imported in corresponding decennium.		Timber Imported per head of Population.	
		Quantity.	Value	Quantity.	Value.
	Thousands.	Thousands of loads.	Thousands of £.	Load.	£
1851 ...	27,724	1,867	—	·07—	—
1861 ...	29,321	2,720	9,058	·09+	·31—
1871 ...	31,845	4,155	12,158	·13+	·38+
1881 ...	35,241	5,880	16,438	·17—	·47—
1891 ...	38,105	6,624	15,146	·17+	·39+
1901 ...	41,977	8,795	20,527	·21—	·49—
1911 ...	45,371	9,596	23,675	·21+	·52+

\* The estimated production of timber in Great Britain in the twelve months ending June, 1908, was 14,845,000 cubic feet: this total did not include wood used for pit props, small thinnings, cord wood, faggots, bavins, &c. Doubt has been thrown on this figure since it represents a production of only 5·3 cubic feet per acre of woodland.

It is probably a fair deduction from these figures that the average individual consumption of timber has nearly trebled in sixty years: and although the rate of increase slackened considerably during the second half of the period covered by the table, yet it is only reasonable to anticipate that the individual demand will still further increase in the future.

*Movements in the Price of Timber.*

The movements in the price of timber may be most satisfactorily exhibited in the values returned for the principal kinds of imported timber which have already been utilised above to illustrate the general features of the whole trade. The following table shows the average value per load of each kind of timber named during each decade from 1853 onwards:—

—	1853- 1862.	1863- 1872.	1873- 1882.	1883- 1892.	1893- 1902.	1903- 1912.
	£	£	£	£	£	£
Hewn ... ..	3·41	3·17	2·76	2·20	1·97	1·89
Sawn ... ..	3·01	2·62	2·72	2·26	2·43	2·75
Staves... ..	7·37	9·04	6·12	4·23	4·70	4·58

It will be noticed that the price of hewn timber has consistently fallen throughout the whole period. Sawn timber has fluctuated, reaching its lowest point in 1883-1892, but subsequently it has reached its highest point since 1853-1862. Staves are of small importance compared with the other two items; but it may be noted that they too reached their lowest point in 1883-1892. If it may be assumed that a load represents in each case a quantity approximately the same, the quantities and values of all three species may be totalled for each decade, and it will then be found that the average price per load fell consistently till 1883-1892, since when there has been an upward tendency. The exact figures are as follows:—

—	1853- 1862.	1863- 1872.	1873- 1882.	1883- 1892.	1893- 1902.	1903- 1912.
	£	£	£	£	£	£
Price per load (all kinds).	3·33	2·92	2·79	2·28	2·33	2·47

If the table given above (p. 68) showing in detail the quantities and values of all imports of unmanufactured timber during the decade 1903-1912 be examined, it will be found that within that period, although there have been considerable fluctuations, the prices of nearly all kinds of timber have tended to rise: this is well illustrated in the cases of pit props and sawn fir, the two largest items, and also in the case of hewn timber, sawn timber and staves, taken together. Too much stress, however, should not be put upon figures for so brief a period as ten years.

While it is difficult to ascribe causes in all cases for these movements in price, it is doubtless safe to ascribe the general fall in price until the decade 1883-1892 to the great development in transport facilities in the second half of the nineteenth century, and to the opening up of very large new sources of supply. The reverse tendency since that period may be due to the reckless manner in which large areas of virgin forest have been denuded, with a consequent shrinking of the sources of supply.

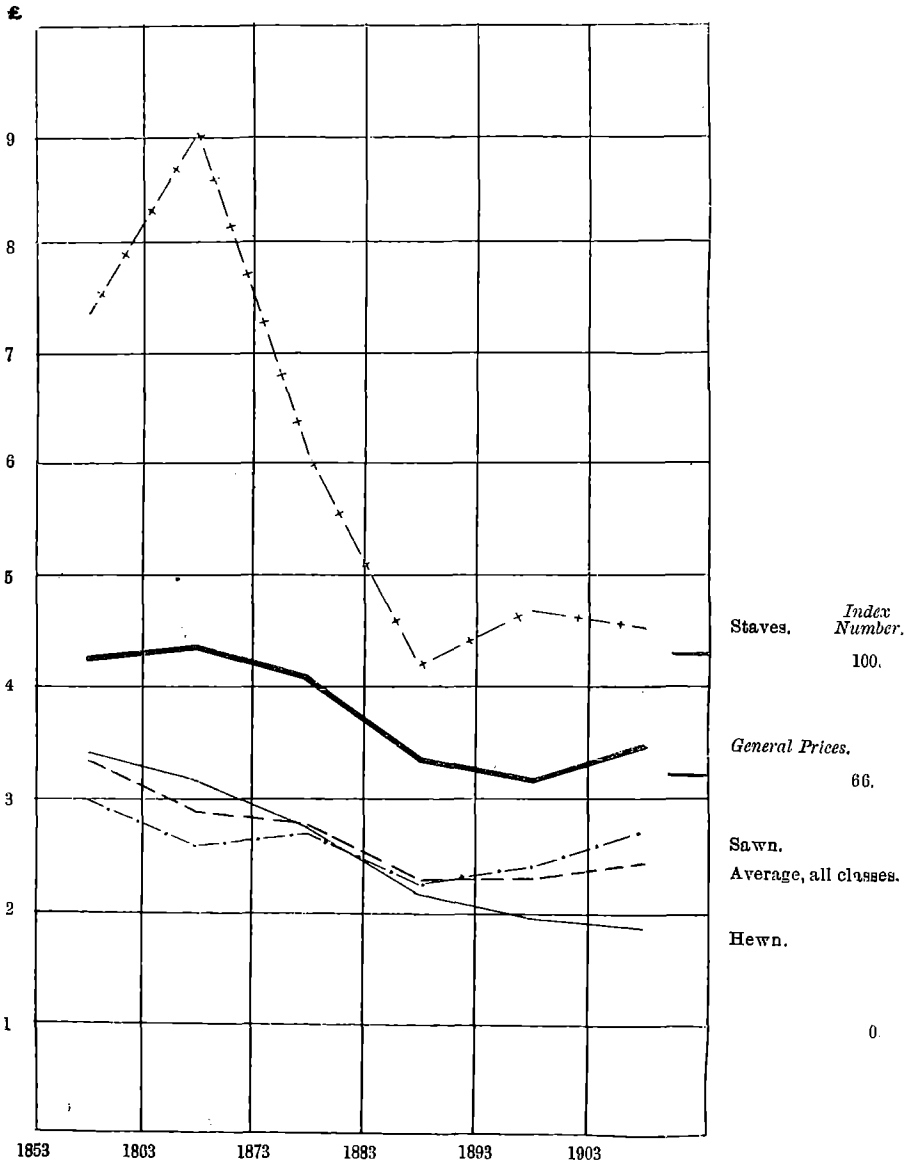


FIG. NO II.—PRICE OF TIMBER (PER LOAD) IN RELATION TO GENERAL PRICES.

The course of prices of timber during the last half-century appears, however, to have followed approximately the course of general prices;\* and the rise in timber prices during the last two decades may be due to little more than the general movement of prices. Yet it may be noted that there appears to be a general consensus of opinion that the quality of timber on the market has become on the whole progressively inferior; and the statement that timber prices have increased relatively to general prices might, therefore, to some extent be justified.

### *Conclusion.*

Apart from the fact that timber is likely always to be considered the most suitable material for most of the purposes to which it is now put, recent years have seen it adopted for a number of new purposes. The wood-pulp industry is, for example, still capable of extensive development, and it may be anticipated that wood will be still more largely used for the purpose of paving. The increasing population of undeveloped territories and the progressive urbanisation of populations throughout the world will undoubtedly tend to increase the aggregate demand for timber, and consequently to force up prices.

It is not easy to attempt to predict the course of timber prices. It is certain that the area under timber for the purpose of international trade will greatly diminish consequent on the utilisation of suitable land for agricultural purposes, and the wastage caused by fires, which always accompany the railroad and civilisation. We are also within measurable distance of the time when the more accessible virgin forests will have been cut over for the first time. On the other hand, more attention is being paid everywhere to the conservation of timber. Indirectly this has, however, the effect of increasing prices, since the fact that a community recognises the necessity of conservation, indicates that a better realisation of the value of timber has been reached, and that purchasers will have to pay accordingly.

There are factors—such as the preservative treatment of wood and the substitution of other materials for constructional purposes—which may tend to check the consumption of timber, but it is a feature of modern commercial progress that in spite of this the consumption *per capita* is steadily increasing. It is difficult, therefore, to avoid the conclusion that prices must on the whole continue to rise steadily.

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\* This has been exhibited graphically in Figure No. 2 by plotting the figures given above for the prices of imported timber in correlation with Sauerbeck's Index Numbers taken in similar decennial periods.



## APPENDIX I.

## TECHNICAL ADVICE IN FORESTRY.

For this purpose the country has been divided into five districts and an advisory officer has been attached to a teaching institution in each district, viz. :—

District.	Area.	Centre.	Advisory Officer.
I. Northern District.	Counties of Northumberland, Durham, Cumberland, Westmorland, Lancaster and York.	Armstrong College, Newcastle-upon-Tyne.	Mr. J. F. Annand.
II. Welsh District.	Wales (with the exception of Glamorgan), Cheshire and Shropshire.	University College of North Wales, Bangor.	Mr. Fraser Story.
III. Central & Southern District.	Counties of Derby, Stafford, Leicester, Warwick, Oxford, Buckingham, Berks, Surrey, Kent, Sussex, Southampton and Dorset.	University of Oxford.	Mr. B. B. Osmaston.
IV. Eastern District.	Counties of Lincoln, Nottingham, Rutland, Northampton, Huntingdon, Bedford, Cambridge, Norfolk, Suffolk, Essex, Hertford and Middlesex.	University of Cambridge.	Mr. C. Hankins.
V. South-Western District.	Counties of Hereford, Worcester, Gloucester, Monmouth, Wilts, Somerset, Devon, Cornwall and Glamorgan.	Royal Agricultural College, Cirencester.	Mr. H. A. Pritchard.

To each of the institutions named a grant not exceeding £500 per annum is made upon the conditions set out in the memorandum (A. 234/I.) printed below.

At Bangor, Newcastle, and Cirencester it was found possible to appoint an advisory officer to take up his duties on the 1st October, 1912, but at Oxford and Cambridge temporary arrangements had at first to be made. At Oxford the first candidate selected was to have entered upon his duties on the 1st February, 1913, but he was unfortunately incapacitated by ill-health and was forced to relinquish the appointment. The second candidate selected was unable to assume duty until the 1st July, 1913. Pending the appointment of a regular advisory officer, the Professor of Forestry, Sir Wm. Schlich, undertook responsibility for the work. At Cambridge the candidate selected was unable to enter upon his duties before the 1st April, 1913, the work being performed in the meantime by the Reader in Forestry and other members of the University.

The advisory officers not only give advice in the form of definite schemes of treatment for areas of woodland but they are also consulted in regard to insect pests, fungoid diseases, and miscellaneous forestry matters. They have also occasionally delivered lectures and demonstrations upon forestry to audiences interested in the subject.

Mr. Hankins, for example, assisted at a demonstration in May to about 120 persons at Westwick, Norfolk, the audience consisting of owners of woodlands, estate agents, foresters, and woodmen. Mr. Pritchard has addressed meetings of the Surveyors' Institution at Bristol and Bideford. Mr. Fraser Story has conducted a party of land agents over the experimental area at Chirk in Denbighshire. In the Northern District, Mr. Annand, and his assistant Mr. McLaren, have given forestry demonstrations at Jervaulx, Yorkshire, the Agricultural Show, Penrith, and Chopwell Woods: at these demonstrations from 40 to 70 persons, chiefly owners, agents, and foresters were present.

The following table gives, county by county, the number of estates for which definite schemes of treatment were drawn up, together with the number of miscellaneous cases which received attention; in the latter case it is not possible to give the figures for each county. The areas for which definite schemes were prepared varied from a few acres to more than 2,000 acres, about half being under 100 acres. In some cases more than one visit was paid and more than one report prepared.

Visits were also paid to estates for which definite schemes of treatment were not drawn up; in all cases, however, occasion was taken, where possible, to impress upon owners the advantage of systematic management of their woods.

District.	Definite Schemes of Treatment.			Miscellaneous Cases.	Total Number of all Cases.
	County.		Total.		
	Name.	Number of Cases.			
I. Northern	Cumberland ...	1	9	45	54
	Durham ...	1			
	Lancaster ...	2			
	Northumberland ...	1			
	York ...	4			
II. Wales	Brecon ...	1	10	35	45
	Carmarthen ...	1			
	Chester ...	1			
	Denbigh ...	1			
	Merioneth ...	1			
	Montgomery ...	2			
	Salop ...	3			
III. Central and Southern.	Berks ...	1	9	2	11
	Buckingham ...	1			
	Dorset ...	1			
	Kent ...	2			
	Oxford ...	2			
	Surrey ...	1			
	Sussex ...	1			
IV. Eastern	Essex ...	2	12	5	17
	Norfolk ...	7			
	Northampton ...	2			
	Suffolk ...	1			
V. South-Western	Cornwall ...	1	33	17	50
	Devon ...	14			
	Glamorgan ...	3			
	Gloucester ...	4			
	Hereford ...	2			
	Monmouth ...	1			
	Somerset ...	5			
Wilts ...	3				
Total ...			73	104	177

**MEMORANDUM REGARDING THE DISTRIBUTION OF GRANTS FROM THE DEVELOPMENT FUND IN RESPECT OF PROVISION OF TECHNICAL ADVICE IN FORESTRY.**

The Board of Agriculture and Fisheries have been informed that the Lords Commissioners of His Majesty's Treasury, on the recommendation of the Development Commissioners, have sanctioned the payment from the Development Fund of a sum of £2,500 per annum for three years to be distributed by the Board as Grants to certain Institutions in England and Wales to enable them to supply technical advice to landowners and others interested in forestry.

Owing to inadequate resources, Institutions possessing Forestry Departments have hitherto restricted their attention for the most part to imparting instruction to students. It is now proposed to attach an experienced forest expert to the Forestry Departments of two Universities and three Colleges, whose chief duty will be to supply to landowners and others advice as to the general and detailed working of their woods. Each Institution will, therefore, become for a given district, a centre for information, to which application may be made on all questions relating to the formation, treatment, utilization, and protection of woods.

It is essential that the staff to be employed in advisory work should command the confidence of landowners. The men selected should, therefore, be well acquainted with the practice and theory of forestry both at home and abroad. They should be prepared to study in detail the local conditions in their districts, and they must endeavour to impress the advantages of systematic management on those owners of woodlands with whom they come in contact.

In order to provide the data which are necessary for the foundation of efficient forest management the Board propose, with the co-operation of landowners, to establish a number of experimental plots dealing with the thinning, underplanting, and regeneration of woods. It will be one of the duties of the forest experts to be appointed by means of the grant to aid the Board's officers in the selection, treatment, and supervision of these plots, and in the collection of such statistics as may, from time to time, be required.

#### *Conditions of Grant.*

1. A grant of £500 per annum for three years from 1st October, 1912, will be made to each of five Institutions to provide the salary and travelling expenses of an advisory expert.

2. The grant in each case will be a grant-in-aid only. It must be used for the purpose of developing advisory work, and must not be used for the purpose of reducing existing expenditure.

3. It will be open to an Institution to employ a member of the present staff on advisory work, but in that case his place must be filled by a fresh appointment to the teaching staff.

4. The Board will require to be satisfied that the officers whom it is proposed to employ on advisory work possess the necessary qualifications. Where advice of minor importance is sought the case may be investigated by a junior officer, but in all cases the advisory officer must be responsible for the advice tendered.

5. Advisory officers may undertake a limited amount of teaching on condition that other members of the staff give an approximately equivalent time to advisory work.

6. The advisory staff will be expected to co-operate with the Board's officers both in experimental work and in the making of enquiries.

7. Each Institution in receipt of a grant from this fund will be expected to undertake the advisory work in a group of counties.

8. An Institution may, where this course appears to be desirable, charge a fee in respect of advice tendered under the Scheme. The charge may not exceed one guinea per day for each day's work in the field.

9. The advisory officer must supply to the Board a duplicate copy of the reports sent to persons seeking advice, or where verbal advice only is given a short statement of the case and of the advice given should be sent.

*T. H. Elliott.*

Board of Agriculture and Fisheries,  
Whitehall Place, S.W.  
February, 1912.

A 234/I.

## APPENDIX II.

TABLE showing the ACREAGE under COPPICE and OTHER WOODS in each COUNTY of ENGLAND and WALES, 1913.

Counties.	Coppice.	Other Woods.	Total.
	Acres.	Acres.	Acres.
ENGLAND AND WALES ... ..	541,000	1,343,100	1,884,100
ENGLAND ... ..	520,700	1,176,700	1,697,400
WALES ... ..	20,300	166,400	186,700
ENGLAND.			
Bedford ... ..	3,600	9,200	12,800
Berkshire ... ..	12,700	25,000	37,700
Buckingham ... ..	4,800	31,100	35,900
Cambridge ... ..	800	6,000	6,800
Chester ... ..	500	21,300	24,800
Cornwall ... ..	9,700	22,900	32,600
Cumberland ... ..	2,100	33,100	35,200
Derby ... ..	1,200	25,500	26,700
Devon ... ..	21,900	66,600	88,500
Dorset ... ..	20,500	17,700	38,200
Durham ... ..	500	29,800	30,300
Essex ... ..	8,500	27,000	35,500
Gloucester ... ..	20,800	35,500	56,300
Hampshire ... ..	56,900	62,600	119,500
Hereford ... ..	20,800	21,600	42,400
Hertford ... ..	4,300	16,700	21,000
Huntingdon ... ..	1,100	3,900	5,000
Kent ... ..	71,400	23,600	95,000
Lancaster ... ..	16,500	25,300	41,800
Leicester ... ..	1,100	13,100	14,200
Lincoln ... ..	7,100	37,800	44,900
London ... ..	200	100	300
Middlesex ... ..	400	3,000	3,400
Monmouth ... ..	21,200	8,600	29,800
Norfolk ... ..	6,400	51,700	58,100
Northampton ... ..	6,500	22,100	28,600
Northumberland ... ..	300	55,600	55,900
Nottingham ... ..	1,000	30,300	31,300
Oxford ... ..	5,300	20,800	26,100
Rutland ... ..	1,700	2,100	3,800
Salop ... ..	11,700	41,300	53,000
Somerset ... ..	15,100	31,800	46,900
Stafford ... ..	2,300	36,600	38,900
Suffolk ... ..	10,600	28,700	39,300
Surrey ... ..	22,900	33,000	55,900
Sussex ... ..	74,400	53,200	127,600
Warwick ... ..	7,800	12,000	19,800
Westmorland ... ..	4,200	13,100	17,300
Wiltshire ... ..	25,700	26,200	51,900
Worcester ... ..	10,600	11,200	21,800
York, E.R. ... ..	400	18,100	18,500
"  N.R. ... ..	2,800	53,700	56,500
"  W.R. ... ..	2,400	65,200	67,600
WALES.			
Anglesey ... ..	—	2,400	2,400
Brecon ... ..	900	13,400	14,300
Cardigan ... ..	1,800	16,600	18,400
Carmarthen ... ..	5,500	17,400	22,900
Carnarvon ... ..	500	15,500	16,000
Denbigh ... ..	500	18,500	19,000
Flint ... ..	100	7,500	7,600
Glamorgan ... ..	4,600	21,200	25,800
Merioneth ... ..	1,200	14,100	15,300
Montgomery ... ..	1,700	22,200	23,900
Pembroke ... ..	900	9,400	10,300
Radnor ... ..	2,600	8,200	10,800

OF THE HORTICULTURE BRANCH FOR 1912-13. [Cd. 7232] of Session 1914. Price 3*d.*, post free 2*s.* 4*d.*

OF LAND DIVISION FOR 1913:—

Part I. Small Holdings. [Cd. 7328] of Session 1914. Price 3*d.*, post free 4*d.*

Part II. Allotments and Miscellaneous. [Cd. 7336] of Session 1914. Price 3*d.*, post free 4*d.*

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FOR THE  
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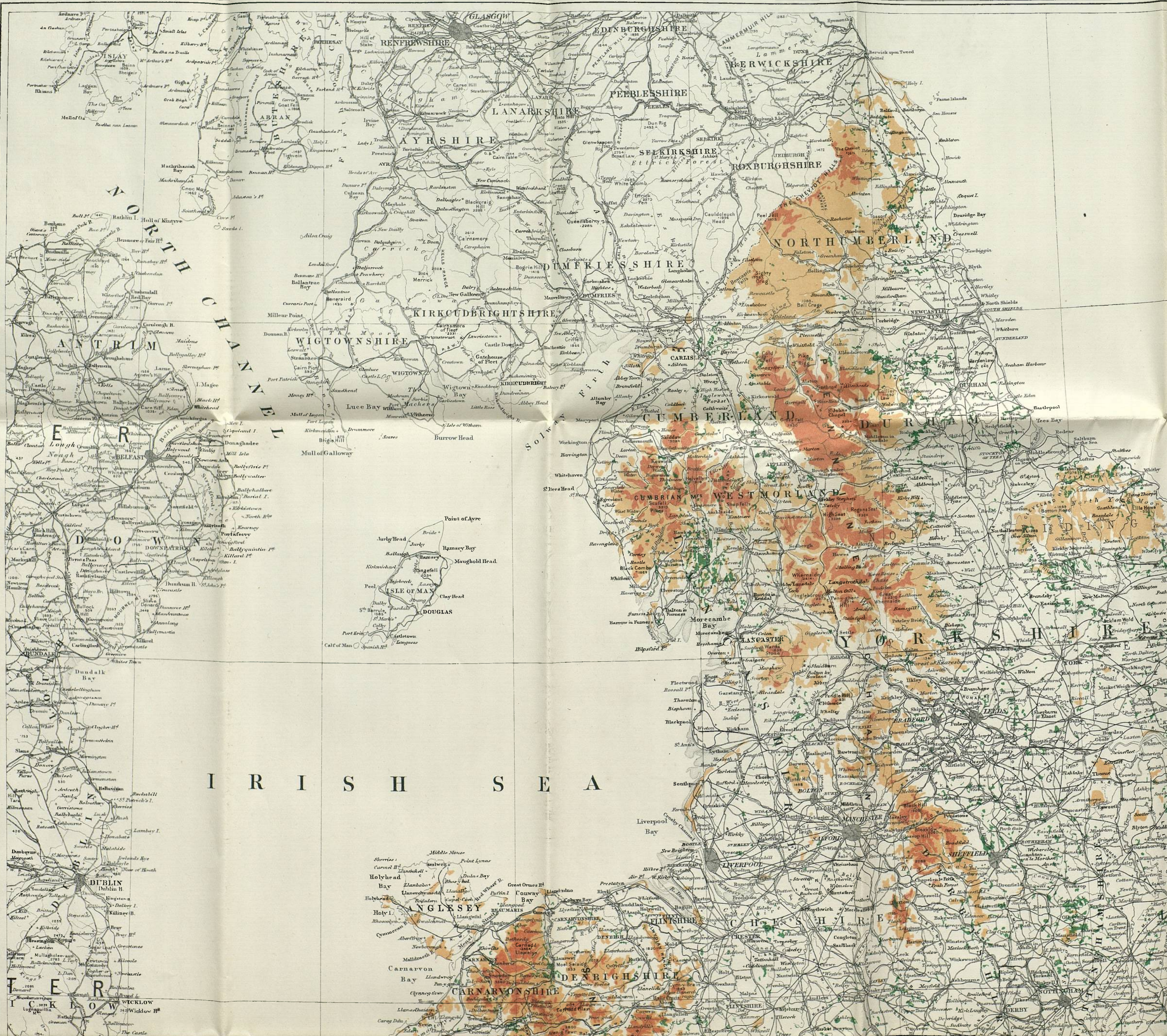


FISHERIES.

THE YEAR 1912-13

areas of) uncultivat  
bog, marsh, heath  
water mark.





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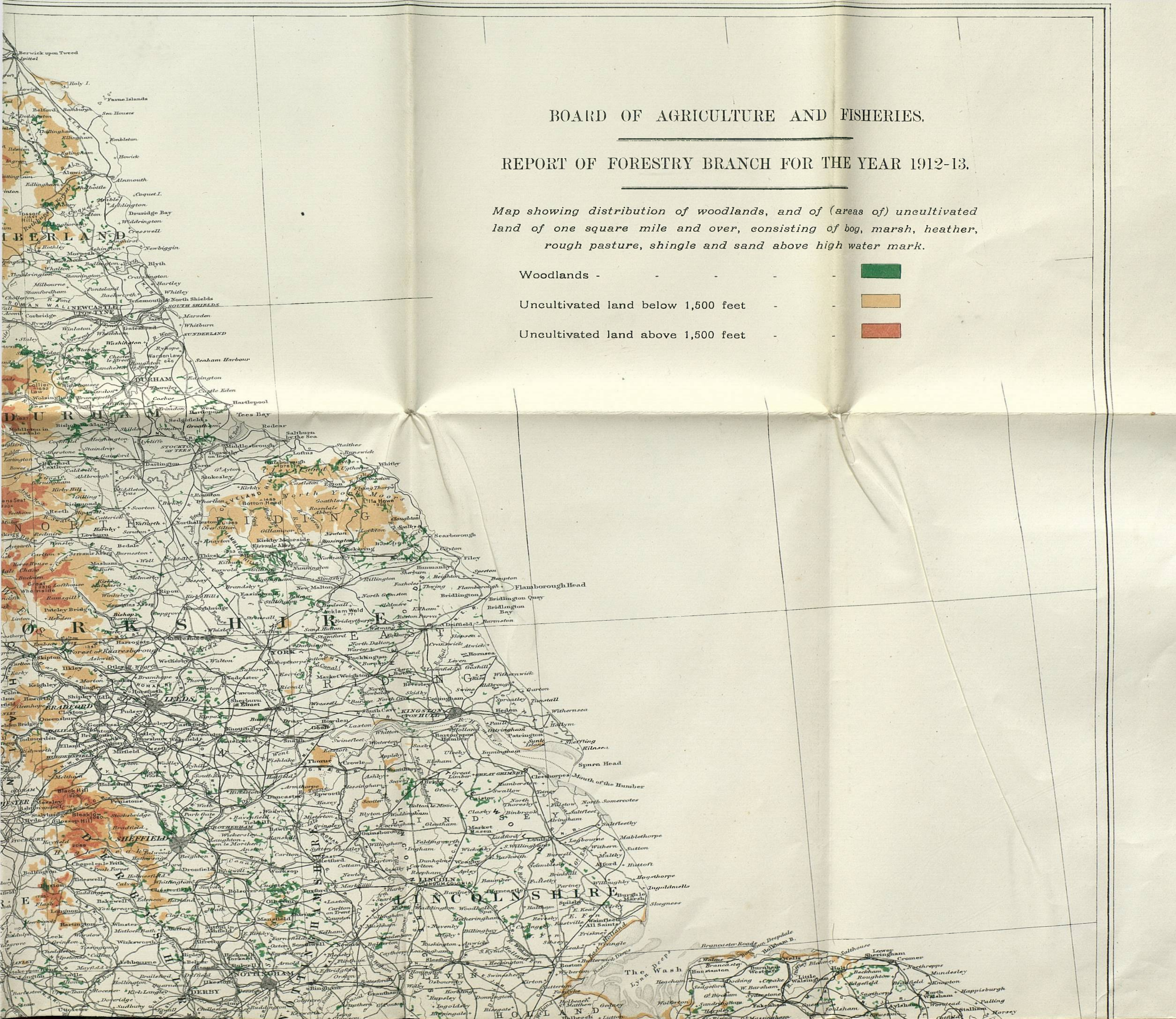
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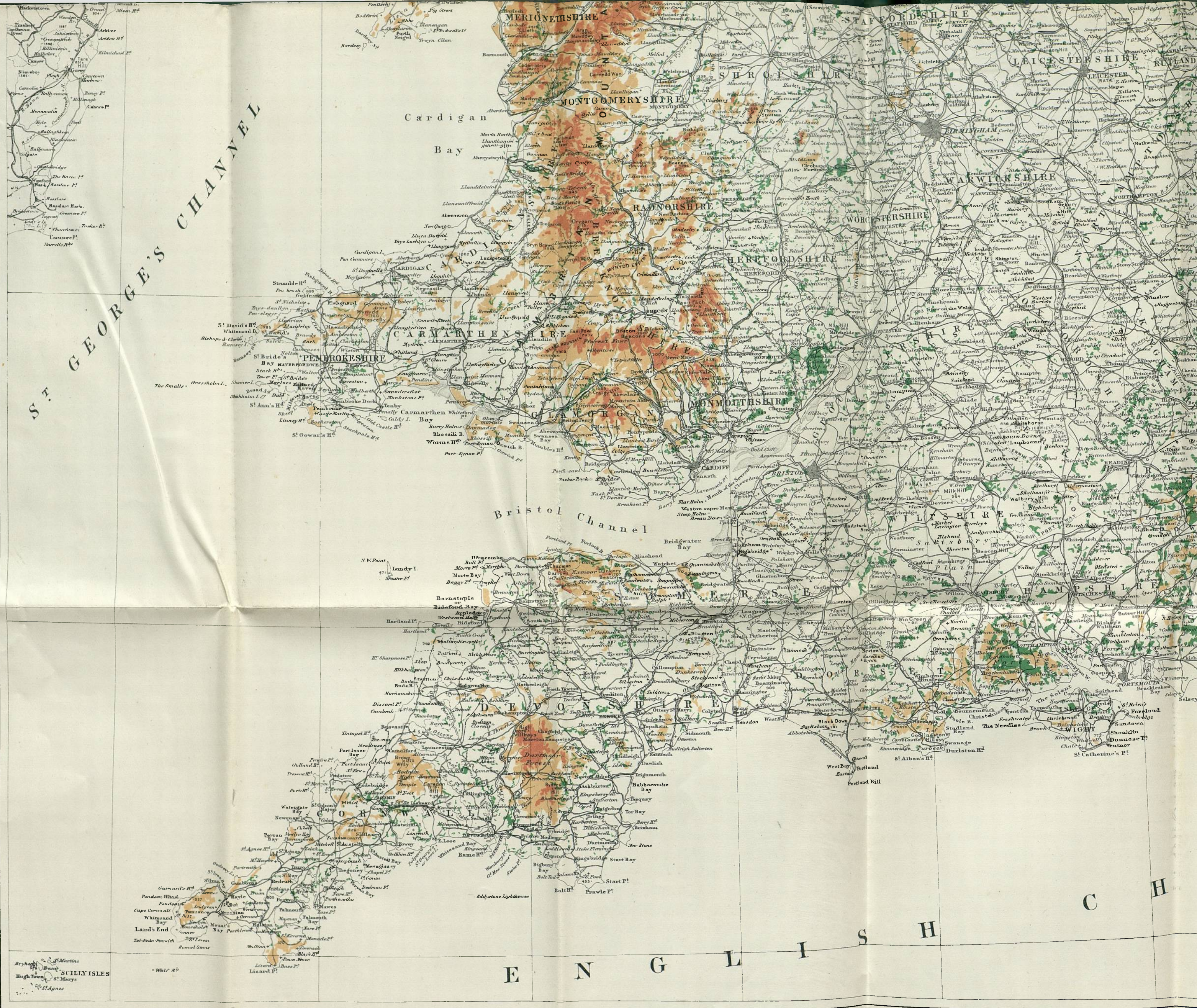
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Map showing distribution of woodlands, and of (areas of) uncultivated land of one square mile and over, consisting of bog, marsh, heather, rough pasture, shingle and sand above high water mark.

- Woodlands - 
- Uncultivated land below 1,500 feet - 
- Uncultivated land above 1,500 feet - 





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en Statute Miles - 1000.000

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