FORESTRY
COMMISSION

Census of Woodlands 1965-67

A Report on Britain's Forest Resources

By G. M. L. Locke, B.Sc.
Forestry Commission

LONDON :
HER MAJESTY'S STATIONERY OFFICE
1970

PREFACE

This *Report* on Britain's forest resources has been compiled by Mr. G. M. L. Locke, Census Officer in the Commission's Management Services Division, following an extensive stocktaking of woodlands under private ownership. Information on the Commission's own forests has been included, so as to present the complete picture. This report includes details of the areas occupied by different kinds of tree of various ages, and also estimates of their timber volume.

The Commission is happy to acknowledge the help given to its surveyors by private woodland owners throughout the country. Thanks are also due to the Director-General, Ordnance Survey, for assistance with maps and area figures, and also for permitting the reproduction of Figure 1 and the map sheet in Plate 6. Plate 4 was kindly provided by Maurice Nimmo, and Plate 8 by the Council for Small Industries in Rural Areas. The remaining photographs and diagrams are the work of the Commission's own staff.

FORESTRY COMMISSION,
25 SAVILE ROW, LONDON, W1X 2AY
1st September 1969

SBN 11 710123 0

CONTENTS

APPENDICES

LIST OF PLATES

See centre pages

---

* The conifers listed are pines, spruces, larches, Douglas fir and Other Conifer. The hardwoods listed are oak and beech together with the two other species which are individually most important in terms of area in the conservancy; the remainder are grouped under "other broadleaved".

† As for the note to Appendix VII above, except that in the broadleaved species only oak, beech and "other broadleaved" are listed.

LIST OF FIGURES IN TEXT

CHAPTER 1

INTRODUCTION

Since the last complete woodland survey in 1947, many changes have taken place in the total area and character of British woodlands and, with the exception of the periods covered by the two world wars, these have probably been greater and more far reaching than in any comparable period in the history of this country. Some of these changes are known in fairly full detail, others can only be estimated, and although records of planting, felling and thinning can greatly assist the task of making estimates of the position at given points in time, they cannot be considered as being a satisfactory long-term alternative to periodic physical stock-takings. In order to have better knowledge of these changes, and their effect on the overall pattern of volume production for the future, it was decided to carry out a new census and this report summarises the main area and volume findings of the survey which was made between July 1965 and April 1967. The information on Yield Class distribution, from which increment can be most easily calculated, and maps showing species distribution will be published separately. The census was concerned solely with the area and physical condition of British woodlands and it is not the purpose of this report to consider factors which may affect management, or to make recommendations for the future.

Background and Objects

The last nation-wide census of woodlands to be carried out in this country was in 1947.* It covered all woodlands, whether owned privately or by the Forestry Commission, which were 5 acres and over in extent and 1 chain (66 feet) or more in width. The main purpose of the census was to provide a complete picture of the condition of the country's woodlands after the ravages of the war, and to provide a basis on which policy decisions in the future could be made. The results of the census were disheartening, for no less than 1·3 million acres, or 40 per cent, of the total area of 3·4 million acres were classed as unproductive; of the approximately 2 million acres of productive crops that remained there was a heavy preponderance of young coniferous woodland, which was too young to yield much in the way of marketable produce, and of old hardwood crops for which there was only limited demand.

The reason for this state of affairs was that the heavy war-time fellings, which at their peak accounted for about two-thirds of our timber consumption, made serious inroads into the mature and often immature reserves of standing timber, and by far the heavier burden was laid on privately owned woodlands because of their preponderance of older plantations: the Forestry Commission woodlands escaped relatively lightly because they were too young to produce usable material in quantity.

---

* *Census of Woodlands 1947–1949* (1952) Cens. Reps. For. Commn. **1–5** H.M.S.O. (Out of print).

The demand for timber for post-war reconstruction was immense, and although there was an immediate increase in imports after the end of the war, the use of home-grown timber declined only gradually. Thus, even while the 1947 census was in progress, there were still substantial areas being felled and it became obvious that unless the level of felling was reduced, certain categories of timber would soon be exhausted. In 1950 control over fellings and the sale of growing trees for felling, passed from the responsibility of the Board of Trade to the Forestry Commission; but it had been evident for some time that the emergency controls introduced in war time to administer timber licencing were unsuitable for permanent use. Accordingly in 1951 a Forestry Act was passed, the main provisions of which were to prohibit the felling of any growing trees with certain exceptions, such as garden and orchard trees, trees under specified diameters, etc., unless a licence had been granted by the Forestry Commissioners, and that any such areas felled under licence (or alternative areas in lieu) should be re-stocked. The quota system, whereby a limit was placed on the volume of coniferous and broadleaved trees which could be felled or thinned, was retained and, so far as was practicable, clear felling was restricted to over-mature or poor quality stands. The amount of the quota was reviewed and adjusted annually in the light of current developments.

The major purposes of the 1951 Act were to conserve stands of immature timber, to delay, where possible, the felling of mature stands so as to build up a reserve of growing stock and to ensure that any areas that were felled were not permitted to lie derelict, and so add to the already considerable existing area of unproductive forest land. It was never intended that this reserve concept should be of a permanent nature, but rather that it should tide the nation over a critical period until the inter-war plantations, owned by private owners and the Forestry Commission, could make their contribution to timber supplies.

It is appropriate at this point to mention that although fellings were being restricted at one end of the scale, endeavours were being made to correct the imbalance in the age-class structure by encouraging planting at the other, and also to promote more intensive management of private woodlands as a whole. This was effected by means of the Dedication Scheme which was introduced in 1948. Under this scheme the owner signs a covenant that his woods will be used in perpetuity for the production of timber in accordance with the practice of good forestry, and that he will work to a plan of operations approved by the Forestry Commission, maintain the necessary records, and employ skilled supervision. In return, the Forestry Commission gives financial assistance towards the running of these woods, part of which is a grant to offset the costs of afforesting bare land or replanting felled areas. A planting grant system had, in fact, been introduced after the first world war, and had continued in force, but it was later linked to the Dedication Scheme when the latter was in full operation. Planting grants are also available, under appropriate conditions and subject to certain constraints, to owners who do not wish to enter the Dedication Scheme. (Details in Forestry Commission pamphlet: *Grants for Woodland Owners*, post free from 25 Savile Row, London W1X 2AY).

The revision of forest policy in 1958 resulted in the abolition of the quota system and there were a number of reasons for this decision. First, there was a growing feeling that forestry should be regarded more for its contribution to economic prosperity than for its strategic role. Secondly, the large post-war

planting programmes ensured that there would be increasing supplies of timber available in the near future. Thirdly, although pressure for felling conifers continued unabated, the hardwood quota had not been taken up for a number of years owing to lack of markets and low prices.

The large post-war plantings on both private and Forestry Commission land, which, at their peak reached about 90,000 acres per annum, are now coming into the productive stage Total home-grown production in 1965 was about 97,000,000 hoppus feet, of which 52,000,000 hoppus feet were softwood and the remainder hardwood. It is estimated that by 1970 the potential softwood production will be one and a half times as great, by 1980 more than double, and by the year 2000 between four and five times the current level. Hardwood production, which is currently about 45,000,000 hoppus feet, is unlikely to change very much over this period because the reserve of older timber is not of high commercial value and also because of the relative scarcity of young crops.

The processing of such large quantities of timber will be beyond the capabilities of the existing wood-using industries in this country. The expansion of existing mills, and the formation of new ones, will undoubtedly result in these industries requiring material of particular species cut to particular specifications, and under these circumstances the regional pattern of timber supplies becomes of paramount importance.

Forecasts of production for private woodlands in the past 15 years have been based on the 1947 census data, but it was realised that the fairly rapid rate of change in this sector would result in such estimates becoming less precise and in some cases might even become misleading. The growth in the number of enquiries received made it obvious that a revised estimate of the situation was urgently required, because private woodlands account for over half the area in production and in many parts of the country still form the bulk of available supplies.

An up-to-date assessment in Forestry Commission woods was unnecessary because the basic information required for forecasting is under continual revision.

The decision to undertake a new assessment of private woodlands was therefore taken in 1963 and in the following year preparatory work on the design of the census was started by the staff of the Planning and Economics Branch of the Forestry Commission.

At that time two main objectives of the census could be defined. The first was to collect data to enable estimates to be made of potential production in private woodlands. This information was required to assist, in conjunction with the Forestry Commission forecasts, in planning the location of new industries and to enable existing industries to expand in step with increasing production. Such an objective implies knowledge of regional woodland distribution. The second was to see what changes had taken place in the area and condition of private woodlands since 1947, and thus to provide general information which would be of value to such bodies as private woodland owners associations and those connected with the planning of the countryside.

CHAPTER 2

TYPE OF SURVEY

Once it had been decided that a woodland census should be undertaken, the next major decision was what type of survey to adopt. A complete assessment on the lines of the 1947–49 census was never seriously considered for two reasons. First, such a survey is primarily concerned with collection of data for local management purposes and since 40 per cent. of the private woodland area was already under some form of agreed plan, it would have resulted in a considerable duplication of data; secondly, complete assessments are very expensive and lengthy undertakings, and one must always balance the value of the final information obtained against the cost of collecting it. The records collected as a result of the implementation of the 1951 Forestry Act gave a good indication of general trends in private woodlands, so that the essential requirements were data to substantiate the information already in our possession and to provide supplementary information on certain aspects of it.

A sample survey on the other hand can supply information which is adequate for planning purposes at a very much lower cost than a complete assessment and the intensity of sampling determines to a large extent the size of region for which reliable information can be obtained. It should not be thought, however, that the costs of such a survey decrease pro rata with a reduction in the area surveyed for not only does the cost of maintaining a surveyor in the field increase but supervisory costs, map costs and administrative complexity likewise rise. However, the advantages of a sampling system in this particular case were very obvious and attention was therefore directed to the type of information which was required and the best means of collecting it.

The primary need at the time was to obtain estimates of the area of forest type, species and age class, so as to provide an up-to-date picture of the current situation on which reliable forecasts of potential production could be made. A secondary requirement was to provide information on standing volume, which would indicate which categories contained large quantities of mature timber currently untapped, or those in which present exploitation rates might result in deficits in the future.

The second aspect was the choice of regions or sub-divisions of Great Britain for which data were to be collected. It was obviously essential that information be collected for regions as large as individual countries, but for marketing purposes much smaller regions were obviously desirable. The difficulty of delineating market regions is that they are never static, and vary according to the size and character of the wood-using industries in them at any one time. Also, certain industries are selective in their intake, both in terms of species and sizes, so that there can be a considerable movement of material across regional marketing boundaries. The main objective was therefore to select regions which, in part, reflected the current marketing position but whose boundaries could be adjusted to cater for changes in the intake of existing mills and also to cater for the establishment of new ones. It was therefore desirable that the sampling intensity rather than the precision of the results should be the same in

each region so that if need be the regional boundaries could be altered at a later stage without too much work. The intensity adopted would be the one that would give reasonable results for the region containing the smallest woodland area, so that the bigger the area of woodland in a region the more precise would the results become.

It should be remembered, however, that if small regions are adopted the level of sampling required to provide answers of a given precision is much greater than that for a larger region. There is thus a minimum size of region beyond which many of the benefits of sampling techniques are wasted. Conservancies, which are the regional administrative units of the Forestry Commission, seemed to be the obvious sub-division of the country to accept, but these were discarded for three reasons. First, the re-allocation of their boundaries was under consideration at that time and therefore their permanence was suspect (subsequently the alterations consisted of the amalgamation of the Dean Surveyorship with South West England and the New Forest Surveyorship with South East England with the other conservancy boundaries remaining virtually unchanged); secondly, rather more regions than the thirteen conservancies then in existence seemed desirable, and thirdly, conservancy boundaries are based primarily to cater for the distribution of Forestry Commission woodland and not that of private woodland. It was therefore decided to group the counties of Great Britain into regions which:

(*a*) reflected the current marketing situation;

(*b*) consisted of whole counties except in those cases where a minor alteration would make them conform with an existing conservancy boundary;

(*c*) did not overlap a country boundary.

This approach resulted in there being 18 regions, of which 10 were in England, 6 in Scotland and 2 in Wales and their boundaries are shown in Appendix I. No attempt was made to adjust the boundaries of the regions so as to include either approximately equal land areas or approximately equal woodland areas. The regions simply comprised convenient building blocks on which to base the design of the survey, and it was realised at the outset that these boundaries were in no way permanently fixed.

On the question of precision, it was decided that we should aim for a precision of about $\pm 2\frac{1}{2}$ per cent. on total private woodland area in each region, and on the basis of information already in our possession, it was estimated that this should ensure that the precision of forest types should be within about ± 5 per cent. to $\pm 7\frac{1}{2}$ per cent. and for major species and age classes within about ± 10 per cent.* Such precisions should ensure that the estimate of total woodland area would be within about ± 1 per cent. for the country as a whole. It should be remembered, however, that in most cases the regional results would be the ones in which we were primarily interested and ensuring their accuracy was the more important decision.

---

* These precisions are at the 95 per cent. confidence level which means that the percentages are likely to be exceeded by chance only once in every twenty times.

CHAPTER 3

CHOICE OF SAMPLING UNIT

The framework of the census having been established, the next task was to select a sampling unit which would give the desired information at least cost.

The first factor which had to be considered was that our knowledge of the whereabouts and condition of all woods in Great Britain is incomplete, largely because the maps covering this country are of varying revision dates and also because certain types of woodland, e.g. felled woodland, are not shown on the maps as such. If the total woodland area and also the whereabouts of each wood making up this total had been known, all that would have been required was an assessment of a proportion of the woods in each region. However, since this knowledge was lacking, it was first necessary to establish the total woodland area by sampling the superficial land area of the country and then, and only then, analysing the woodland area found in the sample in order to sub-divide the total into various forest types, species and age classes.

The second point for consideration was the geographical distribution of private woodland in Great Britain, because it is a resource which is not evenly distributed over the countryside. There are certain areas with high concentrations of woodland, for example in South East England and North East Scotland, and, at the other extreme, there are areas such as parts of North West Scotland where privately owned woodland is virtually absent. Quite apart from the variation in geographical distribution between regions, there is a wide variability in species and age distribution within regions and indeed often within the same wood. The size and number of the sampling units had therefore to be set at levels which would ensure that there were sufficient of them to cover the whole range of conditions but not so many as would lead to a disproportionate amount of time being spent in their measurement.

Quite a lot of work on a suitable size of sampling unit had, in fact, been done between 1958 and 1960 for another investigation, and we were able to use these findings for this census. Briefly, the investigation was concerned with the examination of units likely to be suitable in the sampling of woodlands, and a number of them, varying in size from 3,840 acres to 640 acres, were tested on the 1947 census data, which, since it was a full survey, provided a check on the various estimates. The experimental work on this project was never published, but the findings indicated that the sampling unit would require to be less than one square mile in extent and random selection of the units, which enables estimates of Standard Error to be made, was preferable to systematic selection.

In 1962, an investigation into the volume of pole-stage crops was undertaken on a sampling basis, and it was in the preliminary work for this survey that the use of the kilometre grid square was first considered. Here was a sampling unit of just under 250 acres in extent and therefore small enough to be acceptable, and which had the merit of already being marked on most of the Ordnance Survey maps. In the field survey there appeared to be no major practical difficulties in its use, but it is one thing to use such a sampling unit over a limited area of the country for one particular category of timber and quite

another to use it for a national inventory over a wide range of conditions and crop types.

One of the first tasks was therefore to see what sort of intensity of sampling would be required to give answers of the desired precision for a number of selected regions, using the kilometre grid square as the basis of the sample. For this investigation use was made of the 1947 census data, for which the county results were already known and thus provided very convenient data on which to carry out tests. Briefly, the procedure was first to define the boundaries of the region and then to select a series of kilometre squares at random from within it, until approximately 5 per cent. of the land area had been included. The acreage of woodland on each individual square was then measured from the 6-inch-to-1-mile Ordnance Survey map by means of an acre grid and the information for each wood extracted from the 1947 census data. The total woodland area thus found was broken down into its constituent forest types, the totals multiplied by the multiplying factor, in this case 20, and the figures then checked against the actual results shown by the 1947 census. If the total differed by more than $\pm 2\frac{1}{2}$ per cent., or if the major forest types differed by more than ± 5 per cent. from the true figures, a further $2\frac{1}{2}$ per cent. sample of land area was then included by selecting further co-ordinates. This procedure was followed until the differences between the two sets of figures were at an acceptable level. In all, three regions were selected for testing, the first being South East England with its heavy but localised concentration of woodlands, the second being East Anglia with its rather more scattered distribution, and the third being North Scotland where the bulk of the woodland is concentrated on the eastern seaboard. Despite the differences in physical characteristics between the regions, all three required at least a 10 per cent. sample of land area and none needed greater than a $17\frac{1}{2}$ per cent. sample.

Since the regions selected for this investigation were generally larger than the average size of region to be adopted for the census, it was considered that a 15 per cent. sample of land area should give answers of the desired precision in practically all regions, and where it did not, for example, in regions with a relatively small woodland area, the differences were unlikely to be substantial.

It was therefore decided that the kilometre grid square should be adopted as a sampling unit and that the intensity of sampling should be 15 per cent. of land area or approximately 1 acre in every 7.

Having taken the decision on the size of the sampling unit and on the intensity of sampling, the next task was to define the ownership categories and the minimum size of wood to be included in the survey.

On the first point it was decided that since Forestry Commission woodlands are subject to regular assessments, that the survey would be confined to private woodlands, and for the purpose of this census these can be defined as all woods which are not either owned by or leased to the Forestry Commission. It therefore includes all woods owned by individuals, private companies or other corporate bodies, and by other Government departments such as the Ministry of Defence.

It was also decided at this stage, that since nearly as much time would be spent getting to the individual kilometre squares and determining ownership within them, as would be spent in the actual collection of the information, that the minimum size of wood to be included in the survey would be as small as

1 acre. This would ensure that the final results of the survey would be on the same basis as the private woodlands records of planting and thinning currently maintained by the Forestry Commission, and it also seemed logical to collect as much information as possible whilst the surveyors were actually working in the sampling unit. The basis of the survey thus differs from that used in 1947, when all woods of 5 acres and over were assessed, although woods of between 1 and 5 acres were covered by a supplementary sampling survey in 1951.*

A third point which had to be settled was the extent of the survey, i.e. was it to cover the whole of Great Britain or were there areas which had such small areas of woodlands, or were so difficult of access, that the cost of survey would not be justified. Attention was naturally directed to the islands which would occupy a disproportionate amount of time for the woodland areas involved. In 1947 the islands included in the survey were the Isle of Wight, Anglesey, Arran, Bute, Gigha, Great Cumbrae, Islay, Jura, Mull, Skye, Raasay and Scalpay, while the Orkneys, Shetlands and the Isles of the Outer Hebrides were excluded. In all, these islands contained 29,500 acres of private woodland, or just over 1 per cent. of the total. The exclusion of these areas from the current survey would therefore result in a very considerable saving in time and cost without, however, affecting the results to any significant extent. It was accordingly decided that the survey should cover the whole of the mainland of Great Britain, together with those islands such as Anglesey in Wales, and Island of Seil in Scotland, which had road connections with the mainland, and that all other islands should be excluded. Although no survey would be undertaken on these islands, their total woodland areas could still be estimated by assuming that the change in area between the 1947 census and the present survey would be similar to the change in their mainland counterparts, e.g. if Hampshire showed a reduction of 3 per cent. in total woodland area between 1947 and 1965, then one would assume that the woodlands in the Isle of Wight would also show a similar reduction in area. Because the area of woodland involved was small in relation to the country totals, it was also assumed that the type, species and age class distribution of the crops on the islands would be similar to those of the mainland. Estimates for unsurveyed islands were included in final totals; see p. 30.

In Wales, the woodlands at Lake Vyrnwy, which are owned by the City of Liverpool and are worked on a profit-sharing basis with the Forestry Commission, had already been assessed and information on their age and species distribution was available. Consequently these woodlands were also omitted from the Census but their area has been included in the summary totals in this Report.

---

* *Hedgerow and Park Timber and Woods under Five acres 1951* (1953) Cens. Rep. For. Commn. 2. H.M.S.O. (Out of print).

CHAPTER 4

SELECTION OF THE SAMPLING UNITS

National Grid

Before discussing how the sample was selected it is necessary to describe briefly the national co-ordinate grid system currently used in this country for map referencing and numbering.

The national grid is a Transverse Mercator projection and consists of a series of lines drawn parallel and at right-angles to a central meridian, whose origin is Longitude 2° West and Latitude 49° North, forming a rectangular figure that completely encloses Great Britain. The false origin of the grid lies west of the Isles of Scilly and all grid references are calculated on distances from this point. The international metre is the unit on which the grid is based and to ease identification the grid system is first split up into 500 kilometre × 500 kilometre squares, each of which is designated by a letter; a second letter then designates the particular 100 kilometre square lying within the 500 kilometre block. Two letters are therefore used to identify each 100 kilometre square. Within this square, an individual kilometre square is designated by the distances of its South West corner from the West and South margins respectively of the 100 kilometre square. These distances are given in kilometres. For example, grid reference NT5283 is a point which is 52 kilometres East and 83 kilometres North of the intersection of the grid lines of the 100 kilometre square, whose South West corner is 300 kilometres East and 600 kilometres North of the false origin. Two letters and four figures can therefore define the position of any point in the country to the nearest kilometre, two letters and six figures give the position to the nearest 100 metres and so on. Provided the full grid reference is given in each case (and the figures are traditionally in the order of eastings and northings) the designated point is unique and no other point can have the same grid reference. (See Fig. 1.)

The National Grid is marked on most Ordnance Survey maps but the spacing varies with scale. On the 1 inch to 1 mile and 6 inch to 1 mile maps, the two scales used in this survey, the lines are shown at intervals of 1 kilometre.

England and Wales and parts of Scotland are now covered by 6 inch to 1 mile National Grid sheets, but in the remaining areas the County Series is the latest available edition. This map series, which is gradually being replaced by the more up-to-date system, is based not on one central meridian but on a number of separate meridians and does not therefore fit the present National Grid pattern of numbering or location.

The numbering of 1 inch sheets is independent of the National Grid but the system of numbering maps at a scale of 6 inches to 1 mile follows the pattern set out above. Two letters are used to designate the particular 100 kilometre square and 2 figures to designate the particular 10 kilometre square. Each 10 kilometre square is represented by 4 sheets lettered NW, NE, SW or SE, according to the quadrant concerned. Each sheet, at a scale of 6 inches to 1 mile, normally represents an area of 25 square kilometres, although on coastlines

THE NATIONAL REFERENCE SYSTEM OF GREAT BRITAIN

Diagram showing 100 kilometre squares, the figures used to designate them in the former system, and the letters which have replaced the figures.

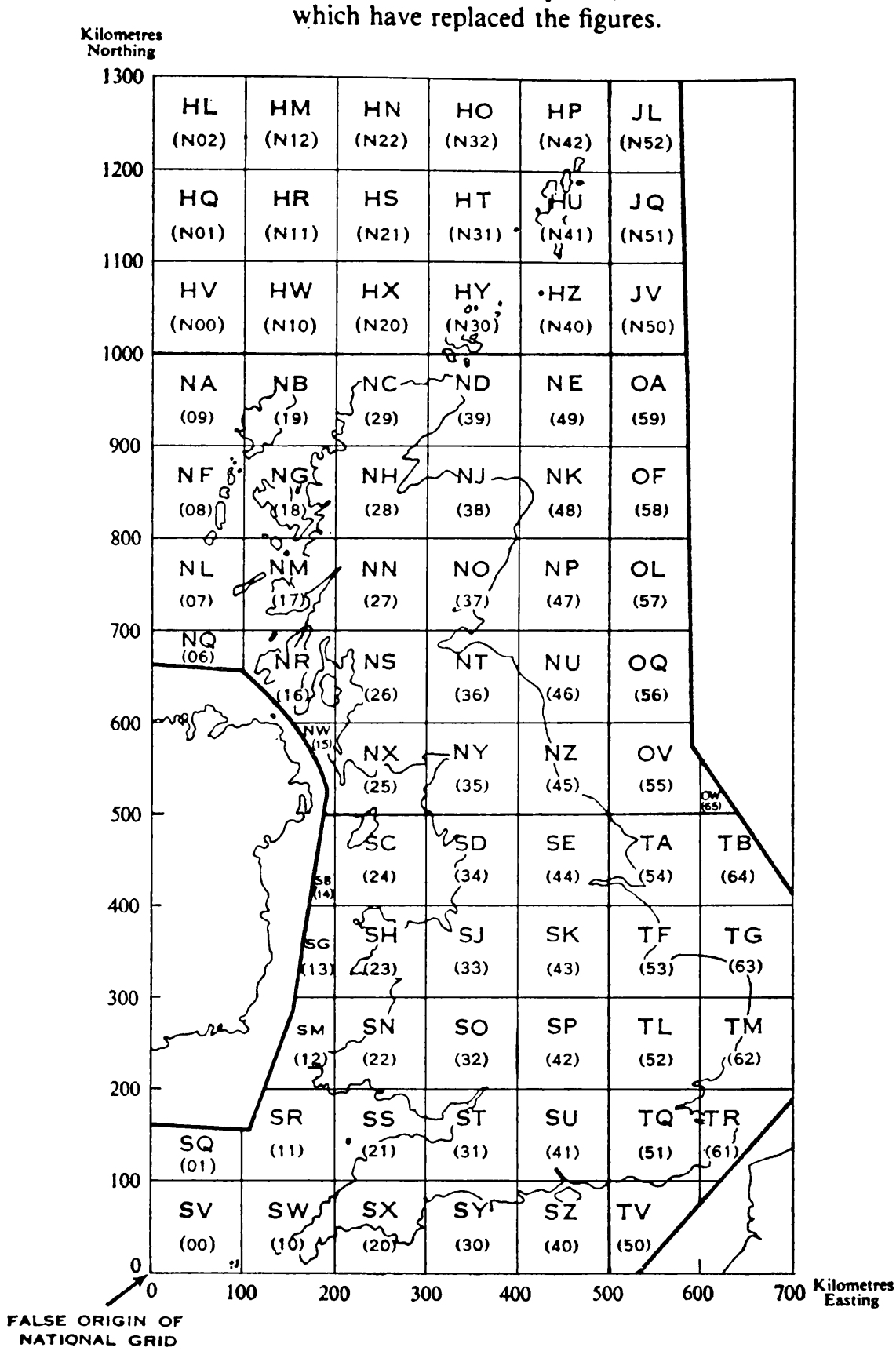


Fig. 1. The National Reference System of Great Britain

sheets are occasionally larger so as to avoid the expense of producing sheets containing small land areas.

For a number of reasons it was found desirable to modify the standard numbering of the grid system for the census, the main one being to ease the handling of the data on the computer. These modifications entailed two alterations, first to give the co-ordinates as full numerical grid references, i.e. by replacing the two letters of the reference by figures, and second, by inserting the hundred kilometre square number before the northings in place of its customary position immediately following the 500 kilometre square number. For example, using the modification described above the reference NT5283, which can also be written as 36/5283, becomes 352683, i.e. the kilometre square whose South West corner is 352 kilometres East and 683 kilometres North of the false origin of the grid.

Having decided on the method of identification of the kilometre squares the next task was to programme the computer to generate a series of six-figure non-repeating random numbers, each of which would represent one kilometre square, until the total number selected constituted a 15 per cent. sample of the land area of Great Britain. The land area included in the sample was about 54 million acres or 218,500 square kilometres so that a 15 per cent. sample represented about 33,000 separate grid references. To select and plot these co-ordinates on a national basis would have been cumbersome and in order to form units of more manageable size each marketing region was treated as a separate entity. These marketing regions, which have been discussed in greater detail in Chapter 2, generally followed county boundaries for two main reasons; first, because information on the land areas of individual counties was readily available and secondly, to enable broad comparisons to be made with the 1947 Census in which the information was collected and presented on a county basis.

Selection of Random Grid Co-ordinates within a Region

The next stage was to take each region individually and, using the framework of the National Grid, to define the co-ordinates of the figure which would wholly enclose the region. The computer was then programmed to generate six-figure non-repeating co-ordinates, and as each was produced a check was made to see whether it fell within the defined area or not. If it did, the co-ordinate was accepted, and if it did not then the co-ordinate was rejected. Obviously the easiest check would be applied to a simple rectangular frame placed over the region, but owing to the shape of the land area forming regions it would have resulted in a large number of the selected co-ordinates being invalid through falling in the sea or in adjoining regions. Consequently the framework of the region consisted of a series of rectangles, which were made as large in area and as small in number as conveniently possible to minimise the number of checks the computer would have to undertake to determine whether the co-ordinate was valid or not. An example of the grid framework for one region is shown in Fig. 2. From this it will be seen that knowing the co-ordinates of the corner of each rectangle, it is an easy matter to determine the total number of kilometre squares within the sampling frame and thus for the computer to be programmed to stop when it had selected the number of co-ordinates equivalent to a 15 per cent. sample of the whole area. The six-figure numbers so generated were, of

course, in random order and would have been difficult to plot. The computer was therefore programmed to sort the numbers into ascending order of northings within ascending order of eastings, i.e. the numbers when printed were in a form whereby they could be plotted on one North–South meridian at a time.

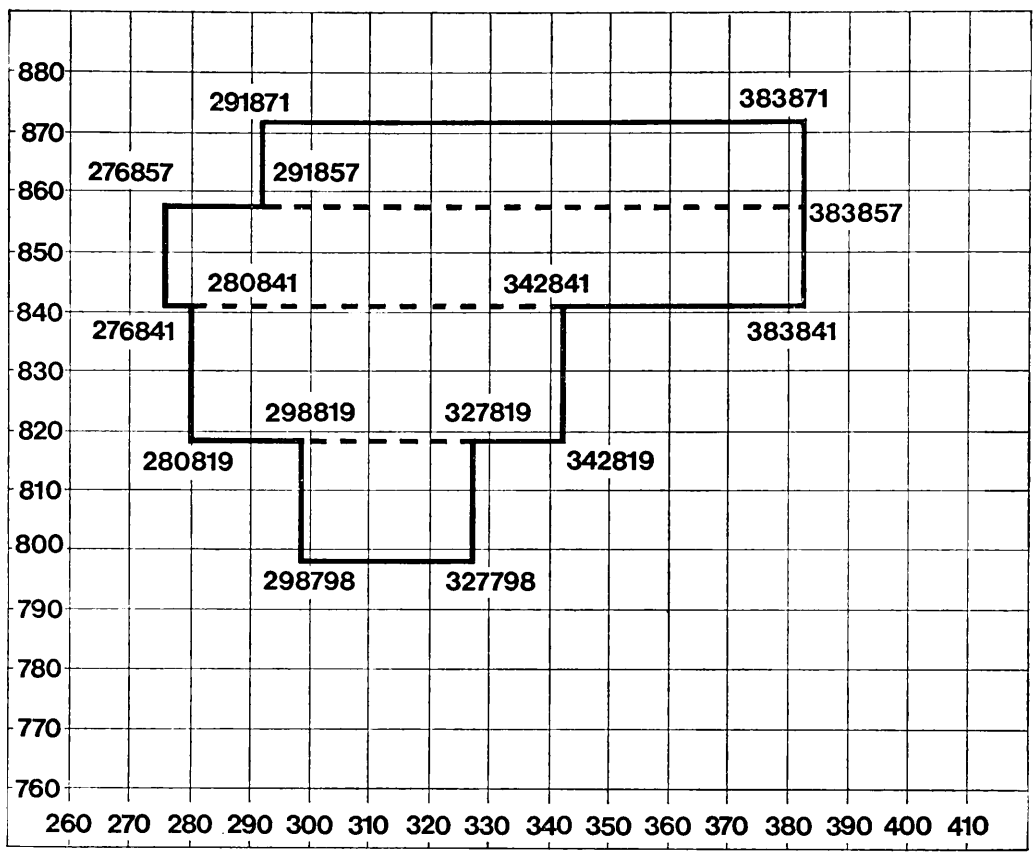


Fig. 2. Grid Framework for Region III: Counties of Nairn, Moray and Banff, Scotland

In order to ensure that there was no risk of over-sampling on regional boundaries or under-sampling coastlines, certain conventions had to be accepted (See Fig. 3.) First, if the selected kilometre square fell within the region and was wholly on land, partly on land and partly on inland water, or wholly on inland water, it was accepted as a valid co-ordinate. Secondly, if the kilometre square fell wholly in the sea, wholly or partially on an island not connected to the mainland by bridge, wholly in an adjoining region, or if the origin, i.e. the South West corner of the square, arose in an adjoining region, it was rejected. Thirdly, if the origin arose in the sea and the square overlapped land, or if the origin arose in the region under consideration and the square overlapped either an adjoining region or the sea, then it was accepted. The valid co-ordinates were then plotted on 1-inch-to-1-mile maps so as to show the overall sampling pattern. This exercise performed three major functions. First, it showed the position of the kilometre squares included in the sample. Secondly, it showed whether the selected squares were likely to contain woodland or not, and thirdly, it showed the squares which either overlapped the sea or county boundaries for which estimates of land area were required.

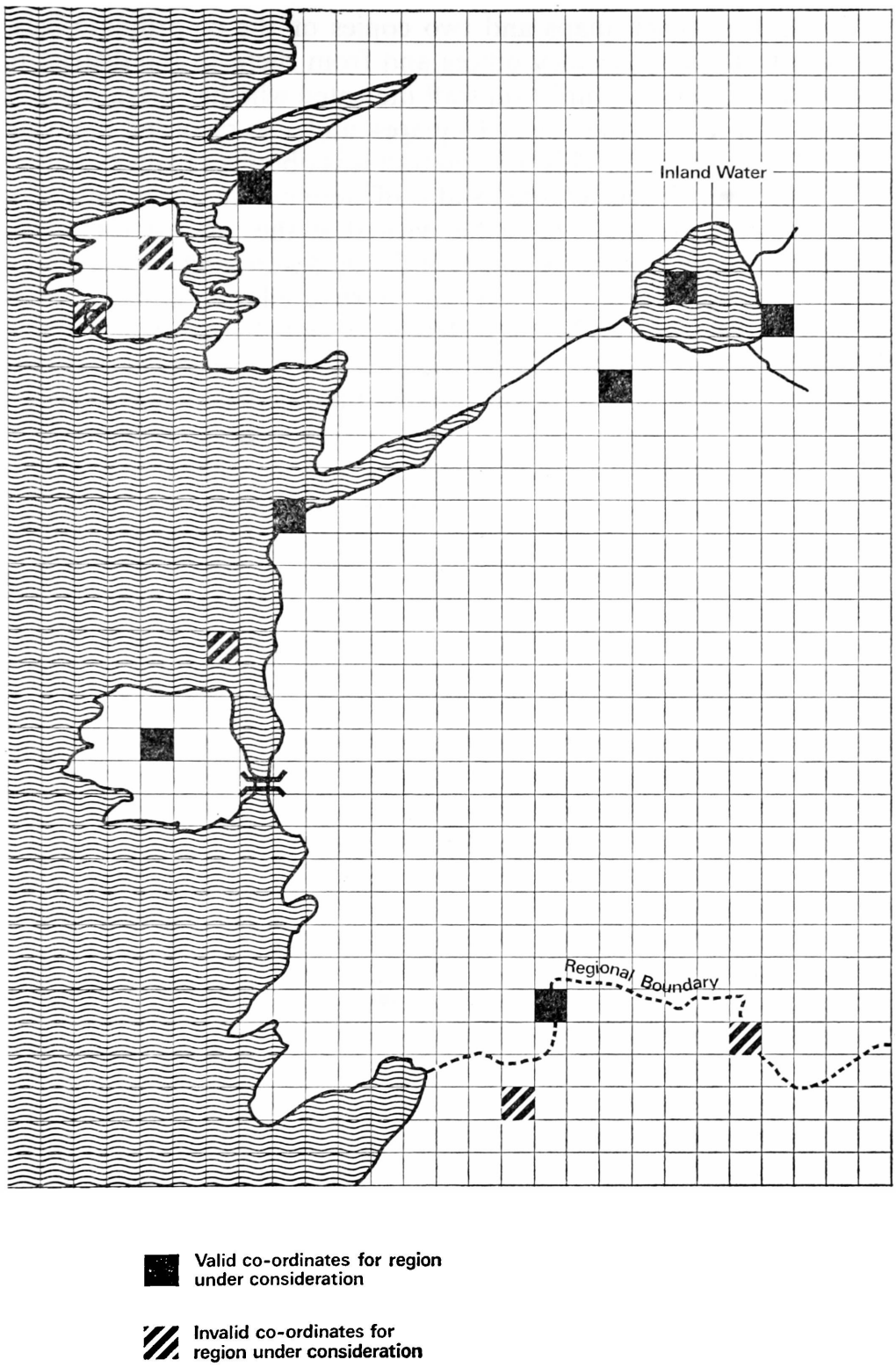


Fig. 3. Conventions adopted to prevent bias in sampling

Preparation of the Co-ordinate Lists

The method of selection naturally resulted in a proportion of the selected squares containing no woodland, the proportion varying between 10 per cent. and 80 per cent. of the total number selected, depending on the density of woodland in the region concerned. The presence or absence of woodland on the 1-inch-to-1-mile maps was not, in itself, an infallible guide, owing to their varying

revision dates. The 1-inch maps and two copies of the co-ordinate lists were therefore sent to the conservancy offices and from there to the district offices, where the local Forestry Commission staff indicated whether private woodlands were present or absent on the selected squares, and also recorded the owners of the woodland where known. This information was obtained from existing maps, records, or local knowledge. Where local staff were not sure whether woodland was present or not, the area was either visited at the time or else classed as doubtful, a decision which, for purposes of detailed sampling, meant that it was classed as having woodland. This stratification reduced the number of sampling units to be visited from over 30,000 to less than half this total. The completed co-ordinate lists gave the information required for the selection and ordering of the 6-inch-to-1-mile maps subsequently used by the field surveyors.

Marking the Sampling Units on the Maps

The kilometre squares selected for sampling were then marked distinctively on the appropriate 6-inch-to-1-mile maps and on the top of each map were listed the co-ordinates of all squares on the map, whether they contained woodland or not, and the land acreage of each square, split where it was necessary between land and sea, or between adjoining counties. Split land acreages were computed, using an acre grid, and areas were recorded to the nearest whole acre. The sum of the areas for each square totalled 247 acres, the acreage equivalent to 1 square kilometre rounded to the nearest whole acre. (One Hectare=2·47105 acres.) Where tidal water was present, land acreages were computed to the High Water Mark Medium Tides. All land acreages were then recorded on a master copy of the co-ordinate list. For areas where no maps had been ordered because woodland was absent on the sample squares, the land areas were computed either from existing 6-inch maps in our possession or 1-inch-to-1-mile maps. In areas where National Grid maps were not available, the boundaries of the kilometre squares had first to be located on the County Series maps and then drawn in, using a special template. Once the marking-up of the squares and the recording of the land acreages had been completed, the maps were then ready for issue to the field surveyors.

Analysis of the results showed that the random selection of co-ordinates had resulted in fairly widely differing sampling intensities between counties. The lowest sampling fraction was Renfrew with 12·12 per cent. and the highest Cambridge with 16·97 per cent. The sampling percentages for countries were England 14·60 per cent., Scotland 14·11 per cent. and Wales 14·97 per cent. with an overall Great Britain percentage of 14·48 per cent. The lower than average figure for Scotland may in part be due to the long and indented coast-line in relation to total land area, which resulted in a larger proportion of the peripheral squares being excluded than elsewhere.

CHAPTER 5

METHOD OF SURVEY

The staff employed on the field work were trained Foresters who, prior to the Census, were mainly engaged on Working Plan duties in Forestry Commission woodlands. By discontinuing Working Plan assessments for the duration of the Census field work, we were able to call on staff who were already well versed in survey and assessment techniques so that further training was minimal, and as these Foresters were already employed by the Planning and Economics Branch the administrative facilities for controlling and servicing the field parties were already in being.

The leader of each field party attended a meeting at the Forest Research Station at Alice Holt in May, 1965 at which the objects and procedures to be employed in the Census were explained and discussed; this was done to ensure that they would be conversant with the system of data collection and recording when they started work on the survey.

Each group of surveyors, normally three or four in number, were allocated a number of counties around the centre from which they were currently working and the survey normally started in the county in which their base was situated. This ensured that initially, the surveyors would be working within daily travel of their homes, and wherever possible the outermost limits of their regions were allocated to the unmarried members of the party, or to mobile teams.

For administrative convenience, field parties in England and Wales were under the control of the Census Officer at Alice Holt whilst the Scottish field parties were controlled by the Assistant Planning Officers stationed in Edinburgh.

The first county was started in July, 1965 and field parties were phased into Census work as they completed their current duties. This enabled the staff to be built up gradually and they could thus be trained in relatively small numbers at a time with consequent easing of the supervisor's task. Each party received a visit from a supervisor shortly after they had started work on the Census so as to ensure that the procedures were fully understood, and at regular intervals thereafter, to ensure that standards were being maintained and that any difficulties in classification could be resolved as soon after they were encountered as possible. As parties became more conversant with techniques, the frequency of supervisory visits was reduced.

Before any county was started a press release was issued so that local landowners would have advance notice of the survey either through the medium of national or local newspapers or by radio. Journals primarily connected with woodland or estate management also carried notification of the start of the survey.

Collection of Area Statistics

The field party leader had in his possession the one-inch-to-one-mile maps covering his area so that he could see the overall distribution of sampling units,

the 6-inch-to-1-mile maps on each of which was at least one square containing woodland, the co-ordinate list showing ownership where known, and a supply of special forms for recording the data. He then sub-divided the immediate working area into blocks of maps, normally four to sixteen maps in each block depending upon woodland density, and allocated a block to each member of his party. Initially the field surveyors worked in pairs using one vehicle, but as they became more proficient they tended to work singly, using either one or two vehicles depending on the distribution of the woodland. In heavily wooded areas it was often possible to leave one person to complete a large wood and for the other member to go to another part of the same square or to a nearby square, thus using only one vehicle. In lightly wooded areas, however, such a practice proved to be wasteful of both time and effort and it was usually more convenient for the surveyors to work independently of one another using two vehicles.

The surveyor first inspected the 6-inch-to-1-mile map to see whether woodland was present in the square under consideration and, if there was, he would then examine the co-ordinate list to see whether the name and address of the owner were known. Where details were available the owner was either approached directly at the time of survey, or else a standard letter was sent to him either by the conservancy office or by the surveyor himself. This letter set out the purpose of the Census and requested the co-operation of the owner in giving access to the woodland and also in supplying any information on dates of planting and felling, methods of working, etc., which might be relevant to the Census. The surveyor then called on the owner or agent personally some days later to get permission to carry out the survey on a mutually agreeable date. If there was no record of who owned the woodland the surveyor made local enquiries at farms, houses, etc., until the owner had been traced. He was then contacted either personally or by letter and his permission obtained to enter the woodlands.

Cases of absolute refusal to admit the surveyors on to land were very rare indeed. A more common state of affairs in certain parts of the country was that entry at the time of contact was inconvenient on account of sporting or other interests and where this was the case an alternative date of survey was usually agreed. In a few cases certain estates had to be held over for some weeks but the delays were seldom serious. Although Forestry Commission staff are empowered under Forestry Acts to enter land to inspect trees, surveyors were specifically instructed not to enter land without the approval of the land owner or his agent. Tracing ownership often proved to be a time-consuming practice but every effort was made to get the necessary permission prior to entry.

The surveyor then examined any woodlands belonging to the owner which occurred on the square in question or on nearby squares, and he included in the survey all woods which were one acre or over in extent and one chain in width or more. The basic unit of classification was the "stand" which was defined as an area of woodland one acre or more in extent, which is uniform for the purposes of description. Thus, in practice, a one-acre wood constituted one stand and larger woods could consist of one or more stands depending on their composition.

Having satisfied himself that the boundaries of the woods as marked on the map were correct, and if not, drawing the boundaries to show the present position, the surveyor then proceeded to sub-divide the wood into stands,

marking their boundaries on the map. He then visited each stand and recorded the relevant information on a Stand Assessment form. The initial information recorded related to the geographical situation of the stand and size of the kilometre square and consisted of first, county code number, secondly, the eight-figure grid reference, which indicated the position of the stand within the kilometre square and thirdly, the land area of the square in which the stand fell; this area was recorded in acres and adjusted where necessary for the presence of sea or adjoining counties. The remaining information on the form related to the stand description and consisted of:

(*a*) Stand area in acres computed by acre grid to the nearest acre.

(*b*) Forest Type. Ten of these were recognised and were as follows:

(i) Conifer High Forest
(ii) Broadleaved High Forest
(iii) Coppice with Standards
(iv) Worked Coppice
(v) Unworked Coppice
(vi) Utilisable Scrub
(vii) Unutilisable Scrub
(viii) Felled between 1963 and 1965
(ix) Felled prior to 1963
(x) Disafforested.

High Forest crops and Standards over Coppice were sub-divided by age class into even aged, uneven aged, or two storied, and further classified by planting year class into P.61 and younger, P.51 to 60, P.41 to 50, P.31 to 40, P.21 to 30, P.11 to 20, P.01 to 10, P. 1861 to 1900, and pre-1860. (P. Year denotes year of planting so that a crop planted in 1922 would fall into the P.21 to 30 class.) In the absence of definite information crops were placed subjectively into one of the nine planting year classes but use was made of such aids as stump counts and local knowledge wherever possible. When the actual planting year was known this was recorded in addition to the planting year class.

High Forest Crops and Standards over Coppice were also classified into four stem straightness classes based on the percentage of stems that were straight and free of basal sweeps and other evident defects; two thinning classes, whether thinned within the period 1963 to 1965 or not, and five stocking classes, whether the crop was grossly over stocked, over stocked, average, under stocked or grossly under stocked. Since stocking may be uniform or irregular, an entry was made where relevant showing the percentage of area which was not stocked with trees, because it is possible to have a crop which contains gaps which by reason of their size cannot be separately classified. By means of this entry a surveyor could indicate what proportion of the stand was stocked with trees and what was bare.

Coppice crops, whether under standards or classed as Simple Coppice, were allocated to one of three classes of vigour, good, average or poor.

Scrub woodland, hitherto always treated as being one category, was in this survey sub-divided into Utilisable and Unutilisable Scrub. The former may seem

to be a contradiction in terms but it was designed to cover low quality broadleaved crops whose stem form was too poor for the stand to be classified as High Forest, overgrown coppice crops which were in the transition stage between coppice and High Forest, and conifer stands on very exposed situations where the stem form was abnormally poor. The criterion in all cases was that the crop was unlikely to produce utilisable bole lengths of 10 feet to a 3-inch diameter top or to the spring of the crown, which ever occurred first, but that 50 per cent. of the trees were likely to produce bole lengths of between 6 feet and 10 feet. Unutilisable Scrub, on the other hand, consisted of scrub crops such as hawthorn or rhododendron which seldom form boles of timber size, and of tree crops where less than 50 per cent. of the stems had utilisable bole lengths of 6 feet or more.

All crops bearing tree or other woody cover were then classified by species. A maximum of four species together with their percentage occurrence were recognised in any one stand except in two-storied High Forest, or Coppice with Standards where a maximum of eight species, four in each storey, could be listed. Twenty coniferous and twenty-two broadleaved species or species groups were recognised as well as a mixed conifer and mixed broadleaved category to cover situations where a wide range of species was present.

If a stand had been classed as disafforested because the land was no longer under woodland and had been converted to some other form of land use, the cause of disafforestation was recorded either as agriculture, building, quarrying, military use, power lines, or other. The difficulty of using this information directly is that only those areas which had been converted since the maps were last revised could be recognised and since the dates of map revision vary markedly it is virtually impossible to obtain an accurate estimate of the rate at which disafforestation is taking place. The data collected can, however, in conjunction with previous surveys, indicate probable rates of disafforestation over a period of years.

The last item of information to be recorded was the presence or absence of grazing animals. The purpose of this classification was to determine what percentage of the woodland area had a dual land use and applied particularly to unfenced stands classed as Scrub or as Felled which were obviously being used as shelter for stock or for grazing.

Height and Volume Data

Having completed the assessment of a stand the surveyor then proceeded to record information on height and volume in all crops of measurable size in High Forest, Coppice with Standards, and Utilisable Scrub. Measurable stands were those in which more than 50 per cent. of the stems were $2\frac{1}{2}$ inches Breast Height Quarter Girth or over and had minimum straight sound stem lengths of 6 feet, irrespective of their position in the tree; crooked trees with less than 6 feet of sound timber, dead trees or trees with substantial decay in the lower part of their stems were disregarded.

If the stand fell into one of the above categories the first task was to obtain estimates of Top Height which is defined as the average height to tip of the forty trees of largest girth per acre. The purpose of obtaining these estimates was twofold. First, to enable the productive capacity of the stand to be established

and recorded as a Yield Class* and secondly, to enable volume estimates to be made based on the Top Height/Tariff relationship.† This was done by selecting within each stand three positions at random in pure crops and four in crops in which two or more species were present, and at each of these points laying out a 1/40th acre plot. The height of the tallest tree of each of the more important species recorded in the stand was then measured by hypsometer. Heights of species of minor importance were estimated using the measured heights as a guide. This information was recorded on a Plot Volume form and the eight-figure grid co-ordinates of the stand in question were entered so that the area and volume data could be related. If the representation of species in these randomly selected plots did not agree fairly closely with those listed on the Stand Assessment form, then the plot site was discarded and another chosen at random to replace it until the requisite number had been obtained.

Having established estimates of Top Height the next task was to obtain information on Breast Height Quarter Girth distribution and number of stems per acre, and for this purpose one of the plot sites already used for establishing Top Height was selected at random for further measurement. In order to avoid measuring too many or too few trees in each plot, the plot size was related to the number of stems per acre so that approximately ten to twenty trees would be measured for girth. The smallest plot size adopted was 1/40th of an acre, which was used for crops containing more than 400 trees per acre, and for crops containing between two hundred and four hundred, one hundred and two hundred, and less than one hundred trees, the plot sizes were 1/20th, 1/10th and 1/5th acre respectively. If the plot site selected was unrepresentative of the stand in question then one of the other height plot positions was selected at random to replace it.

The surveyor then girthed all the trees in the plot and recorded them on the Plot Volume form, keeping the data for each species separate. If any species occurred in the plot area for which heights had not previously been assessed then the height was estimated and recorded on the form. For broadleaved species Height to First Stop was also recorded and was defined as the length of straight sound prime timber, in feet to the nearest foot, from ground level to the first major branch, or to the point on the stem where there was a marked change in girth. Its purpose was to give some indication of the relative straightness and quality of the butt section. This information was collected for four stems in pure crops and for up to a maximum of three stems of each species in mixed crops, the trees being selected at random from those measured for girth.

Stump Diameters

If the crop had been thinned in the two years prior to 30th September 1965 data on stump diameters within the plot area were collected. The object was to

---

* Bradley, R.T., Christie, J. M., and Johnston, D. R., (1966) *Forest Management Tables* Bookl. Forestry Commission **16**. H.M.S.O. 30s.

† Hummel, F. C. (1955) *The Volume—Basal Area Line* Bull. Forestry Commission Lond **24**. H.M.S.O. (Out of print.)

Hummel, F. C., Locke, G. M. L., and Verel, J. P., (1962) *Tariff Tables* Forest Rec., Lond **31**. H.M.S.O. 3s.6d.

Finch, H. D. S., (1957) *New Ways of Using the General Tariff Tables for Conifers* Forest Rec., Land **32**. H.M.S.O. 1s. 3d.

provide information on the current outturn of thinnings and a two-year period was selected in case one of the years had been abnormal. The plot size was not necessarily the same as that used for the collection of data on girth, but the same plot centre was used and a plot size adopted which would give approximately ten to twenty stumps. All stumps occurring within this revised plot area were measured for underbark diameter to the nearest inch, on two diameters at right angles to one another, and the data recorded on a similar but separate form from that used for the girth and height data.

Measurements were also taken in stands felled between 1963 and 1965 so as to provide regional information on current levels of felling. One plot position, chosen at random, was laid out in a similar fashion to those used for stands thinned within this period, the plot size again varying according to the number of stumps per acre. The average diameter of each stump was then recorded for all stumps falling within the plot area. Where possible these data were recorded by species but if this was not practicable the information was allocated to one of three classes, coniferous, broadleaved, or mixed.

Data Checking

All information collected by the surveyors was sent for checking at monthly intervals to the Research Station at Alice Holt Lodge, Farnham, or to the office in Edinburgh. This ensured that errors or omissions could normally be dealt with whilst the information was still fresh in the mind of the surveyor and, if additional data were required, these could be obtained without travelling long distances to the woods in question. A check list of the kilometre squares completed, together with the number of forms relating to each, was submitted by the party leader each month so that a running record of progress was available.

As each county was completed a thorough check was made to ensure that the total number of squares had been completed, that the correct number of forms were present for each co-ordinate and that the plot volume information was in the same co-ordinate sequence as the Stand Assessment forms. These two points were essential for the processing of the data which was the next stage of the operation.

CHAPTER 6

DATA PROCESSING

In any large scale census numerous planning activities have to be completed before the field work can start, and one of the most important of these is the choice of method of data processing. This is because the ways in which data must be sorted and tabulated often have a direct effect on how much information is collected, and in what order it is recorded.

At the planning stage of this census there were three main methods by which data could be captured in the field survey. First, on ordinary printed field forms from which data could be punched directly on to paper tape; secondly, on cards, either by punching holes on port-a-punch cards or by making conductive marks in designed positions on a punch card, and thirdly, on specially designed and printed forms which could then be read by an optical scanning device at a later stage.

Each system has its own advantages and disadvantages. For example, punching the data from field forms is a straightforward if tedious operation, but would have meant either employing additional staff for a relatively limited period or having it done under contract. In the case of punch cards, the system caters very satisfactorily with sorting and classifying data but it is somewhat restricting where certain other operations are involved. After considerable deliberation of the three courses open to us our choice finally fell on Lector, which is an optical scanner which "reads" pencil markings and records the presence or absence of these on forms which are subdivided into boxes of a predetermined size.

Existing Facilities and their Availability

A second-generation Sirius computer was already installed at the Alice Holt Research Station and it therefore seemed logical to use this machine for checking and sorting the data, and for compiling the results. By modern standards Sirius is a small computer and consequently has limitations in both storage capacity and in its rate of input of data. It was appreciated that the first of these factors would result in the data having to be read into the computer a number of times in order to produce all the tabular statements that would be required, while the second limitation meant that the through-put rates would be slow, so that a large county could take hours, rather than minutes, to process. A more powerful computer could, of course, do the work very much faster but the advantage of having the computer in the same building seemed overwhelming since it was difficult to foresee how the service bureau could provide the same facility to control the order in which work was done, to enable us to check and if necessary re-run the data when desired, and to amend or re-write programmes when needed. It was therefore decided that the Research Division computer, despite the limitations of its speed and size, should be used both for programme development and for the processing of the data.

During the period 1965–1967 the census was unable to claim exclusive use of the computer at Alice Holt but the position was eased in September 1967 by the acquisition of a second Sirius computer, which enabled the through-put to

be substantially increased. A further complication was a continuous lack of programming staff able to devote all their time to developing suitable systems for the census.

The Use of Lector

The adoption of Lector as a data-capture system caused considerable initial difficulties in the design of the field forms because it was important that the recording of the data should be done in a logical sequence. It also resulted in the use of coding systems which were radically different from any used in the past. Training of field parties in the use of this new system of recording took some time, and the incidence of errors and omissions was moderately high in the first returns from each party; however, once they became familiar with the system the error rate fell markedly and subsequently remained at a low level. Many of these field recording errors were picked up in the checking system before the forms were processed on Lector.

The Lector system also generated errors under certain circumstances; these could usually be traced to forms which contained one or more defects of which the following were the commonest:

(*a*) The density of the printing was too heavy,
(*b*) The format was not correctly aligned with the edge of the forms,
(*c*) The field markings were too light, and
(*d*) The presence of indentations in the paper resulting from too heavy marking of the previous form.

The error rate was not high but the procedure needed to trace and amend these errors took very much longer than envisaged at first. Initially the forms were processed on a bureau Lector but in December 1967 we acquired our own machine and were thus able to control both the order and the standard of work very much more closely.

These processing difficulties, combined with those on the programming and computer output side, seriously upset the predetermined data-flow arrangements which had been originally planned for the production of the final results.

Procedures and Programmes Used

Figure 4 shows the main flow of the numerous stages which the area and volume data of the census underwent. However, the main sequences can be summarised briefly as follows:

(*a*) Collection in the field.
(*b*) Office check.
(*c*) Conversion of field forms to 7 track computer tape on Lector.
(*d*) Conversion of 7 track tape to 5 track tape.
(*e*) Amendment of errors.
(*f*) Computation of the sample results.
(*g*) Calculation of the summary tables by multiplying the sample results of each county by its appropriate multiplying factor, i.e. the ratio between land plus inland water area of the county to the land plus inland water area sampled.
(*h*) Summation to conservancy, country and Great Britain levels.

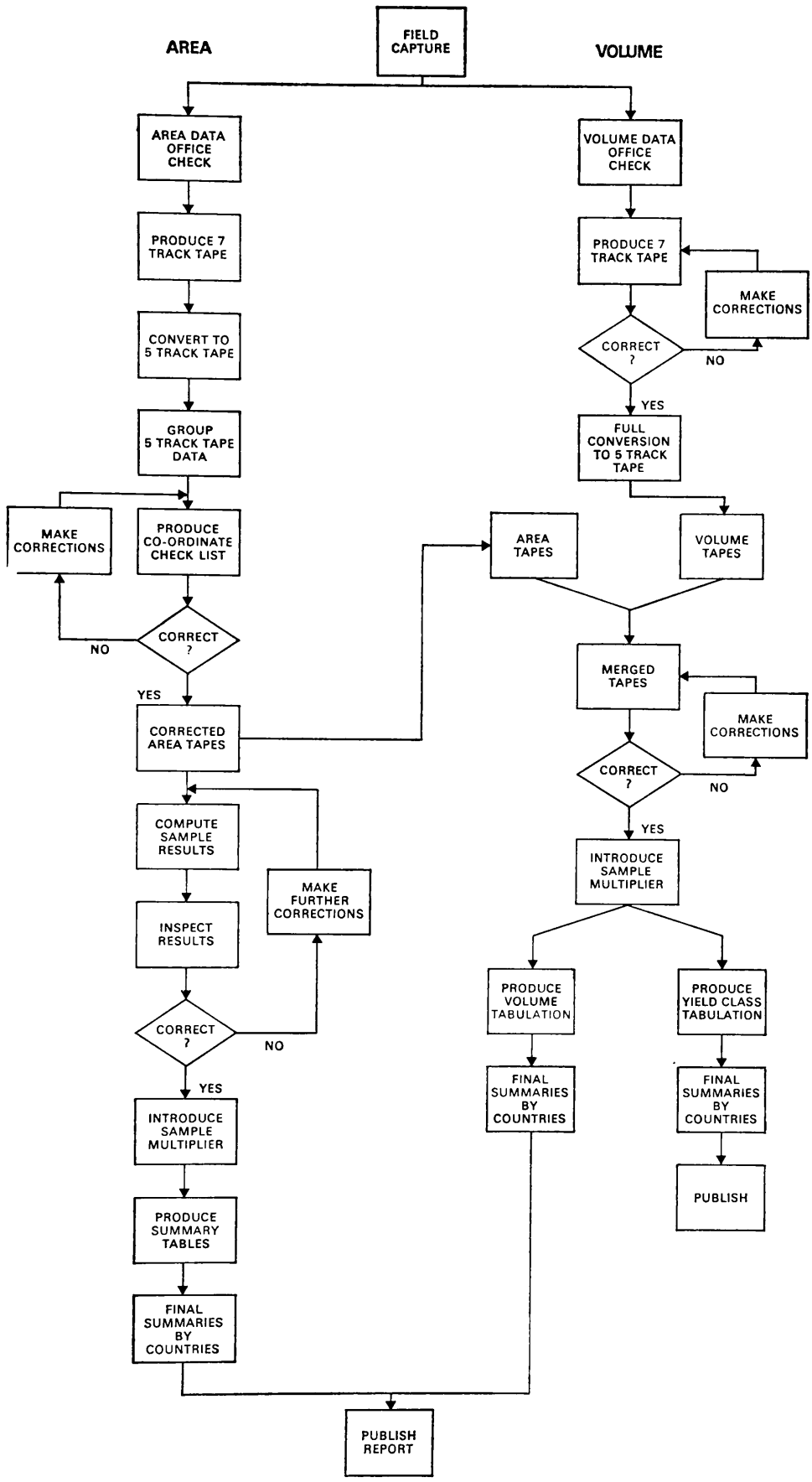


Fig. 4. General Processing Sequence for the Census data

CHAPTER 7

TOTAL WOODLAND AREA

In order to provide a composite picture of the total woodland area in Great Britain it is necessary to combine the data from private and Forestry Commission woodlands. Data for the latter category were not specifically collected for census purposes at the same time as those for private woodlands, and are not therefore exactly comparable. Also, as is explained in the relevant chapter, certain adjustments had to be made to the Forestry Commission data in order to bring them to the same base year as those for private woodlands.

It may be wondered, with the surveys which last 18 months or more, why the mean date of the census cannot be taken at half-way through the survey period rather than at the beginning, but whilst it is true that standing crops have to be classified according to their state at the time of assessment, irrespective of the length of the survey, the condition of crops which are being felled or being planted are more easily related to some point of time in the past rather than one in the future. The information, therefore, relates wherever possible to the position at 30th September 1965, and where substantial changes in the character of privately owned stands had taken place since then, the description and assessment reflected the position at the earlier date.

The acreages shown in the following tables include an estimate of the area of private woodland contained on the islands or other areas which were excluded from the survey. This area, shown in Table 1, amounts to about 27,000 acres or about 0·6 per cent. of the total area, and about 1 per cent. of the private woodland area. With the exception of the woodland area at Lake Vyrnwy for which information was available, the remaining acreage has been apportioned pro rata to the various types and sub-types within the countries concerned. Forestry Commission woodland occurring on the islands has, however, been surveyed and is included in the appropriate totals.

Total Area of Woodland

Table 1 shows the estimated total woodland area in Great Britain by countries; Monmouth has, in all cases, been included in the Welsh totals.

TABLE 1

ESTIMATED TOTAL WOODLAND AREA AS AT 30TH SEPTEMBER 1965

Thousands of Acres

Country	Estimated Woodland Area from Sample	Estimated Woodland Area excluded from Survey	Total	% of Total
England . .	2,184·9	4·5	2,189·4	51
Scotland . .	1,602·3	17·7	1,620·0	38
Wales . .	490·9	4·8	495·7	11
Great Britain .	4,278·1	27·0	4,305·1	100

Add 10k p.a.

The total woodland area of Great Britain, in woods of 1 acre and over in extent at 30th September 1965, is estimated to be 4,305·1 thousand acres. Of this total England with 2,189·4 thousand acres has 51 per cent. of the whole; Scotland, with 1,620·0 thousand acres has 38 per cent. and Wales with 495·7 thousand acres has 11 per cent.

Comparison with Total Land Area

When the total woodland area of 4,305·1 thousand acres is compared with the total land area of Great Britain of 56,203 thousand acres the percentage under woodland is 7·6 per cent. The percentages for the individual countries are England 6·8 per cent., Scotland 8·5 per cent., and Wales 9·7 per cent., the details being shown in Table 2.

TABLE 2

TOTAL LAND AREA AND WOODLAND AREA AS AT 30TH SEPTEMBER 1965

Thousands of Acres

Country	Total Land Area(1)	Total Woodland Area	% of Total
England	32,035·4	2,189·4	6·8
Scotland	19,068·8	1,620·0	8·5
Wales	5,098·9	495·7	9·7
Great Britain	56,203·1	4,305·1	7·6

(1) Total Land Area excluding Water, as at April 1965.
Source: Director General, Ordnance Survey.

Certain counties, particularly those in North East Scotland and South East England, have always had woodland densities which are higher than average but of recent years certain other counties have shown marked increases. It should be remembered that replanting existing woodland areas does not affect woodland density in any way and that increases can mainly be attributed to afforestation by either private owners or the Forestry Commission.

The counties which now have 12 per cent. or more woodland cover are shown below:

England	*per cent.*	*Scotland*	*per cent.*	*Wales*	*per cent.*
Surrey	19	Moray	25	Brecon	13
Sussex	17	Nairn	19	Glamorgan	13
Hampshire	16	Kincardine	19	Montgomery	13
Northumberland	13	Kirkcudbright	18		
Kent	12	Aberdeen	12		
		Perth	12		

Comparison with Other European Countries

Table 3 shows the comparative position of Great Britain in terms of woodland area, percentage under woodland area and acres per head of population in relation to some European countries and Europe as a whole.

TABLE 3

WOODLAND AREA IN RELATION TO TOTAL LAND AREA AND POPULATION FOR SELECTED COUNTRIES IN EUROPE, CIRCA 1965

Country	Total Woodland Area Millions of Acres	Percentage of Land Area	Area per Head of Population. Acres
Great Britain	4·30	7·6	0·08
Northern Ireland	0·10	2·9	0·07
United Kingdom	4·40	7·3	0·08
Irish Republic	0·48	2·8	0·17
Norway	22·21	28·0	5·68
Denmark	0·99	9·1	0·20
Fed. Republic of Germany	17·68	29·0	0·30
Netherlands	0·63	7·2	0·05
Belgium	1·52	19·0	0·15
France	28·68	20·0	0·49
Spain	65·98	30·0	1·23
Portugal	7·68	36·0	0·74
Europe as a Whole	355·83	29·0	0·74

Sources: F.A.O. *World Forest Inventory* 1963 for figures other than United Kingdom.

From this table it will be seen that of the countries listed only the Irish Republic, Northern Ireland and the Netherlands have a lower percentage of their land surface under woodland, and that only Northern Ireland and the Netherlands have a lower area per head of population. The European average shows a woodland percentage four times that of Great Britain and an area per head of population which is nearly 10 times as great.

Ownership

Distribution of area between private woodland and Forestry Commission woodlands is shown in Table 4.

TABLE 4

TOTAL WOODLAND AREA BY OWNERSHIP CATEGORIES

Thousands of Acres

Country	Private Woodlands		Forestry Commission Woodlands		Total Woodlands	
	Area	% of Total	Area	% of Total	Area	% of Total
England	1,611·9	74	577·5	26	2,189·4	100
Scotland	868·7	54	751·3	46	1,620·0	100
Wales	206·1	42	289·6	58	495·7	100
Great Britain	2,686·7	62	1,618·4	38	4,305·1	100

This table shows that in Great Britain 2,686·7 thousand acres or 62 per cent. of the total is privately owned and 1,618·4 thousand acres or 38 per cent. are owned by the Forestry Commission. The proportions in each country vary very markedly. England still has three-quarters of the total under private ownership, Scotland just over half, while Wales now has less than half its area in private hands. Table 5 shows the change in the relative holdings in the individual countries since 1947.

TABLE 5

COMPARISON OF THE HOLDINGS OF PRIVATE AND FORESTRY COMMISSION WOODLANDS IN 1947 AND IN 1965 ON A PERCENTAGE BASIS

Country	Private Woodlands		Forestry Commission Woodlands	
	1947	1965	1947	1965
England	84	74	16	26
Scotland	81	54	19	46
Wales	71	42	29	58
Great Britain	82	62	18	38

The present relative proportions in England show a substantial change in comparison with 1947 but it is in Scotland and Wales that the effects of the major Forestry Commission afforestation programmes are most marked. A decline in the proportion of privately owned holdings does not, of itself, necessarily imply a reduction in total acreage, but as will be seen later there has been some contraction in the area of privately owned woodlands since 1947 and this, coupled with a large increase in the Forestry Commission holding, accounts for the rapid change in the proportional representation.

TABLE 6

AREA OF WOODLAND CLASSIFIED BY FOREST TYPE
TOTAL WOODLANDS, 1965

Thousands of Acres

Forest Type	England		Scotland		Wales		Great Britain	
	Area	%	Area	%	Area	%	Area	%
Coniferous High Forest	822·4	38	1,121·0	69	323·2	65	2,266·6	53
Broadleaved High Forest	704·6	32	97·1	6	62·6	13	864·3	20
Total, High Forest	1,527·0	70	1,218·1	75	385·8	78	3,130·9	73
Coppice with Standards Simple Coppice	72·9	3	—	—	0·2	—	73·1	2
Total, Coppice	72·9	3	—	—	0·2	—	73·1	2
Scrub Felled	589·5	27	401·9	25	109·7	22	1,101·1	25
Total	2,189·4	100	1,620·0	100	495·7	100	4,305·1	100

Distribution by Forest Type

Table 6 on p. 33 sets out the type distribution in three categories, namely, High Forest, Coppice crops and Scrub and Felled woodland. This abbreviated form of classification has been used because the Forestry Commission data cannot conveniently be subdivided into the same categories as those adopted for private woodlands but, since the area of Forestry Commission woodland classed as Coppice and unproductive is small, the groupings adopted give a clear picture of the overall pattern of distribution.

Table 6 on p. 33 shows that 73 per cent. of the total area was classed as High Forest, 2 per cent. as Coppice and 25 per cent. as Scrub or Felled woodland. Wales has the highest proportion under High Forest crops at 78 per cent. and England, at 70 per cent., the least. In England approximately half the High Forest area is coniferous and half broadleaved but in both Scotland and Wales conifers occupy at least 80 per cent. of the total.

Coppice crops are of declining importance in Great Britain and the only areas now classed as coppice are those which are either still worked under the traditional Coppice with Standards or Simple Coppice systems or else do not permit of any other classification. Areas which are no longer worked on a coppice system have been usually reclassified as High Forest or as Scrub according to their condition.

The large area of Scrub and Felled land, amounting to over 1 million acres, requires some clarification at this stage. As has been pointed out earlier, the Scrub category in private woodlands has been sub-divided into Utilisable and Unutilisable categories and the former can be considered as being of low grade High Forest. Thus, if the Utilisable Scrub, amounting to 159·9 thousand acres, is added to the categories of High Forest and Coppice the unproductive area is reduced to 941·2 thousand acres or 22 per cent. of the total.

The breakdown of the 3,130·9 thousand acres of High Forest by planting year classes (abbreviated where necessary to "P.") and composition, is shown in Table 7.

The major point of interest is the high proportion of the area in Great Britain contained in the younger planting year classes, for no less than 16 per cent. of the total area is 5 years of age or less, 44 per cent. is 15 years or less and 54 per cent. is 25 years or less. If Coniferous High Forest is considered alone the percentages are 21 per cent., 58 per cent. and 71 per cent. It is this category which reflects the very intensive afforestation and re-planting programmes which have taken place since the end of the last war, and in particular since 1951. All three countries show substantial acreages of young conifer plantings, the proportions in Wales and Scotland being higher than in England, but the last named holds the bulk of the relatively small area of recent hardwood planting or regeneration which has taken place.

At the other end of the age class structure it will be seen that coniferous crops are but poorly represented and that almost two-thirds of the area of Broadleaved High Forest is in the oldest age class. Approximately 50 per cent. of this total is aged at least 100 years and this fact, coupled with the small area being planted, means that a decline in the area of broadleaved forest is likely to take place. Table 8, p. 37, shows breakdown of coniferous and broadleaved totals by species. Generally it is based on the principal species occurring in a stand but in the case of Forestry Commission woodlands the acreage of mixtures has

TABLE 7

HIGH FOREST BY PLANTING YEAR CLASSES AND COMPOSITION
TOTAL WOODLANDS, 1965

Thousands of Acres

Country	Composition	Planting Year Class																Total	
		P.61–65		P.51–60		P.41–50		P.31–40		P.21–30		P.11–20		P.01–10		Pre-1901			
		Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%
England	Coniferous	161·5	20	267·3	32	112·3	14	108·1	13	103·0	12	18·9	2	21·6	3	29·7	4	822·4	100
	Broadleaved	18·9	3	53·8	8	32·8	5	33·6	5	31·1	4	34·5	5	56·8	8	443·1	62	704·6	100
	Total	180·4	12	321·1	21	145·1	10	141·7	9	134·1	9	53·4	3	78·4	5	472·8	31	1,527·0	100
Scotland	Coniferous	248·8	22	426·3	38	128·7	11	119·9	11	87·6	8	21·1	2	22·4	2	66·2	6	1,121·0	100
	Broadleaved	0·6	1	4·1	4	4·0	4	3·2	3	3·7	4	3·0	3	5·9	6	72·6	75	97·1	100
	Total	249·4	21	430·4	35	132·7	11	123·1	10	91·3	8	24·1	2	28·3	2	138·8	11	1,218·1	100
Wales	Coniferous	73·1	23	131·9	41	46·5	14	43·6	13	20·9	6	2·1	1	3·0	1	2·1	1	323·2	100
	Broadleaved	1·3	2	7·6	12	2·1	3	1·9	3	2·3	4	2·0	3	6·2	10	39·2	63	62·6	100
	Total	74·4	19	139·5	36	48·6	13	45·5	12	23·2	6	4·1	1	9·2	2	41·3	11	385·8	100
Great Britain	Coniferous	483·4	21	825·5	37	287·5	13	271·6	12	211·5	9	42·1	2	47·0	2	98·0	4	2,266·6	100
	Broadleaved	20·8	2	65·5	8	38·9	5	38·7	4	37·1	4	39·5	5	68·9	8	554·9	64	864·3	100
	Total	504·2	16	891·0	28	326·4	10	310·3	10	248·6	8	81·6	3	115·9	4	652·9	21	3,130·9	100

Notes. (1) P.61–65 = Planted in the years 1961–1965 (and so on).
(2) The first vertical column covers five planting years, the following columns ten years each, and the last column an indefinite period.

been apportioned to individual species in the ratio in which they occurred. As pure crops are much commoner than mixed it is unlikely that this will have had an appreciable effect on the results. In this table certain coniferous species in Forestry Commission woodlands and certain broadleaved species in private Woodlands have had to be included in the "other conifer" or "other broadleaved" group, because they were not of sufficient importance in either ownership category to be individually recognised.

In Great Britain it will be seen that, when taken together, three species, namely Scots pine, Sitka spruce and oak, account for over half the total area. The two first-named species each occupy 20 per cent. and oak has 13 per cent. Only Norway spruce, Japanese and Hybrid larch, and beech, of the remaining species, occupy more than 5 per cent. each. It can reasonably be expected that the area under Sitka spruce will further increase so that it will become the leading species in Great Britain, a position hitherto held by Scots pine.

Within individual countries it will be seen that in England Coniferous High Forest occupies 822·4 thousand acres or over 50 per cent. of the total High Forest area, with Scots pine the most important conifer followed by Sitka spruce, Norway spruce and European larch, these four species occupying 67 per cent. of the coniferous area; of the broadleaved species oak has nearly half and beech one-fifth of the total.

In Scotland Coniferous High Forest accounts for 1,121·0 thousand acres or 92 per cent., with Scots pine the most important conifer at 33 per cent., followed closely by Sitka spruce, these two species occupying nearly two-thirds of the total. Of the remaining coniferous species only Norway spruce and Japanese and Hybrid larch are of individual importance. Half of the relatively small broadleaved total of 97·1 thousand acres consists of oak and beech.

In Wales, Coniferous High Forest amounts to 323·2 thousand acres or 84 per cent. of the total. Sitka spruce occupies nearly half the coniferous area and Norway Spruce and Japanese Larch together account for one-quarter. Hardwoods occupy 16 per cent. of the forest area, oak accounting for over half the total and beech for one-sixth.

The species distribution in all three countries is therefore now becoming heavily weighted by recent Forestry Commission plantings in which two or three species account for the greater part of the area. This pattern is likely to continue and with private estates moving towards greater use of such species as Sitka spruce in place of the more traditional ones as Scots pine and European larch, the process can be expected to be accelerated.

Because private woodlands account for the bulk of the area under Coppice, Scrub and Felled crops, detailed consideration of these types is deferred until Chapter 8.

TABLE 8

HIGH FOREST UNDER MAJOR TREE SPECIES WITH DETAILS FOR COUNTRIES
TOTAL WOODLANDS, 1965

Thousands of Acres

Species	England			Scotland			Wales			Great Britain		
	Area	Percentages		Area	Percentages		Area	Percentages		Area	Percentages	
		of Category	of all Species		of Category	of all Species		of Category	of all Species		of Category	of all Species
Scots Pine	243·5	30	16	366·2	33	30	13·7	4	4	623·4	27	20
Corsican Pine	74·6	9	5	7·5	1	1	8·5	3	2	90·6	4	3
Sitka Spruce	120·5	15	8	348·6	31	28	143·3	44	37	612·4	27	20
Norway Spruce	100·5	12	6	119·7	11	10	42·7	13	11	262·9	12	8
European Larch	84·5	10	6	37·4	3	3	7·5	2	2	129·4	6	4
Japanese and Hybrid Larch	75·9	9	5	106·2	9	9	50·8	16	13	232·9	10	7
Douglas Fir	58·9	7	4	22·9	2	2	24·8	8	7	106·6	5	3
Mixed and Other Conifer	64·0	8	4	112·5	10	9	31·9	10	8	208·4	9	7
Total Conifer	822·4	100	54	1,121·0	100	92	323·2	100	84	2,266·6	100	72
Oak	348·7	49	23	27·5	28	2	34·5	55	9	410·7	47	13
Beech	131·8	19	8	20·9	22	2	10·2	16	3	162·9	19	5
Mixed and Other Broadleaved	224·1	32	15	48·7	50	4	17·9	29	4	290·7	34	10
Total Broadleaved	704·6	100	46	97·1	100	8	62·6	100	16	864·3	100	28
Total	1,527·0	—	100	1,218·1	—	100	385·8	—	100	3,130·9	—	100

CHAPTER 8

PRIVATE WOODLANDS

Distribution by Forest Type

An analysis by forest type of the 2,686·7 thousand acres of privately owned woodland in Great Britain is shown in Table 9.

TABLE 9

AREAS OF WOODLAND, CLASSIFIED BY TYPES AND SUB-TYPES, IN EACH COUNTRY
PRIVATE WOODLANDS, 1965

Thousands of Acres

Type	England		Scotland		Wales		Great Britain	
	Area	%	Area	%	Area	%	Area	%
Coniferous High Forest	383·2	24	405·4	47	55·8	27	844·4	32
Broadleaved High Forest	598·4	37	91·4	10	48·4	23	738·2	27
Total, High Forest	981·6	61	496·8	57	104·2	50	1,582·6	59
Coppice with Standards	25·4	2	—	—	—	—	25·4	1
Worked Coppice	38·4	2	—	—	0·2	—	38·6	2
Unworked Coppice	7·0	—	—	—	—	—	7·0	—
Total, Coppice	70·8	4	—	—	0·2	—	71·0	3
Utilisable Scrub	123·9	8	9·9	1	26·1	13	159·9	6
Unutilisable Scrub	407·3	25	236·3	27	70·1	34	713·7	26
Total, Scrub	531·2	33	246·2	28	96·2	47	873·6	32
Felled 1963–65	8·2	1	3·3	—	0·3	—	11·8	—
Felled Pre-1963	20·1	1	122·4	15	5·2	3	147·7	6
Total, Felled	28·3	2	125·7	15	5·5	3	159·5	6
Total	1,611·9	100	868·7	100	206·1	100	2,686·7	100

From this table it will be seen that in Great Britain High Forest crops, of which just over half are coniferous, account for 59 per cent. of the total, Coppice crops for 3 per cent., Scrub for 32 per cent. and Felled woodland for 6 per cent.

The English woodlands are characterised by having the highest proportion of High Forest and Coppice and the lowest proportion of Felled woodland. Scrub at 33 per cent. has a similar percentage to that for Britain as a whole but the proportion classed as wholly unproductive is somewhat lower than average.

In Scotland 57 per cent. of the woodland is High Forest and about four-fifths of this total is coniferous. It does, however, have substantial areas of Scrub and Felled woodland, the latter accounting for nearly 80 per cent. of the Great

Britain total. The reason for this very high concentration in one country is due, in part, to the map editions being generally earlier than those used in other parts of the country and consequently showing some areas as High Forest which were perhaps felled fifty or more years ago. The consequences of using maps with varying revision dates are discussed in greater detail at a later stage.

In Wales about half the woodland area is High Forest divided fairly evenly between coniferous and broadleaved crops. There are only small areas of Coppice and Felled woodland but a substantial area of Scrub of which more than one quarter is classed as Utilisable. This is a higher proportion than in either of the other two countries but with 37 per cent. of its area classed as wholly unproductive, Wales in this respect occupies an intermediate position between England and Scotland.

Each forest type can now be considered in greater detail.

High Forest

Composition by Age, i.e. Planting Year, Classes

The High Forest area has been allocated to planting year classes in Table 10. Two points, however, must be emphasised in order that the allocation be fully understood. The first is that while some even-aged crops could be placed fairly definitely in a planting year class, either through knowledge of the actual year of planting, or from ages estimated from the stumps of recently felled trees, there were many crops which had to be placed subjectively in one of the classes because of lack of information. The allocation is therefore likely to be more correct in the younger classes than in the older ones although it is possible that some 1965–66 plantings may have been included inadvertently. The second point is that uneven-aged crops have been placed in the planting year class which contained the highest volume, irrespective of the age range of the trees composing the crop. Crops, however, which were uneven-aged by virtue of having a planted understorey have been allocated to the planting year class of the understorey on the assumption that it was the main crop, and that the overhead cover would eventually be removed, or at least occupy a place of diminishing importance in the stand.

This table shows more clearly than any other, the effect of the large post-war plantings carried out on private estates, and also the emphasis which has been placed on coniferous crops in this re-stocking programme. In Great Britain no less than one-third of the High Forest area has been planted or restocked since 1950, and as the P.61–65 age class (covering 5 years) is already two-thirds the size of the P.51–60 class (covering 10 years), it would seem likely that by 1970 at least 40 per cent. of the area will be aged 20 years or less. It should be realised that these figures also include areas of natural regeneration particularly on common land, and also crops with stocking as low as 20 per cent. The total area is therefore considerably in excess of that which has qualified for grant payment. At the other end of the scale the 1861–1900 and the Pre-1861 classes still contain a considerable proportion of the area and are predominantly broadleaved. Many of these crops are mature or over-mature but the relatively low prices offered for such crops give little encouragement for their removal and replacement; the area in these two classes can therefore be expected to decline slowly

TABLE 10

HIGH FOREST BY PLANTING YEAR CLASSES AND COMPOSITION
PRIVATE WOODLANDS, 1965

Thousands of Acres

Country	Composition	Planting Year Class																Total	
		P.61–65		P.51–60		P.41–50		P.31–40		P.21–30		P.11–20		P.01–10		P.1861–1900		Pre-1861			
		Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%
England	Coniferous	94·5	25	112·0	29	36·8	10	40·4	10	42·3	11	18·1	5	15·1	4	20·7	5	3·3	1	383·2	100
	Broadleaved	13·9	2	25·0	4	19·3	3	21·3	4	25·6	4	34·3	6	51·3	9	258·2	43	149·5	25	598·4	100
	Total .	108·4	11	137·0	14	56·1	6	61·7	6	67·9	7	52·4	5	66·4	7	278·9	28	152·8	16	981·6	100
Scotland .	Coniferous .	86·5	21	135·4	33	25·6	6	31·7	8	37·7	9	18·3	5	15·1	4	35·0	9	20·1	5	405·4	100
	Broadleaved	0·4	—	2·3	3	3·6	4	2·3	2	3·5	4	2·9	3	5·1	6	33·0	36	38·3	42	91·4	100
	Total .	86·9	17	137·7	28	29·2	6	34·0	7	41·2	8	21·2	4	20·2	4	68·0	14	58·4	12	496·8	100
Wales .	Coniferous .	19·8	35	20·0	36	1·9	4	3·9	7	4·7	8	2·1	4	1·6	3	1·7	3	0·1	—	55·8	100
	Broadleaved	0·6	1	1·2	2	0·8	2	1·3	3	2·0	4	1·9	4	5·2	11	18·4	38	17·0	35	48·4	100
	Total .	20·4	20	21·2	20	2·7	3	5·2	5	6·7	6	4·0	4	6·8	7	20·1	19	17·1	16	104·2	100
Great Britain .	Coniferous .	200·8	24	267·4	32	64·3	7	76·0	9	84·7	10	38·5	4	31·8	4	57·4	7	23·5	3	844·4	100
	Broadleaved	14·9	2	28·5	4	23·7	3	24·9	4	31·1	4	39·1	5	61·6	8	309·6	42	204·8	28	738·2	100
	Total .	215·7	14	295·9	19	88·0	6	100·9	6	115·8	7	77·6	5	93·4	6	367·0	23	228·3	14	1,582·6	100

Notes. (1) P.61–65 = Planted in the years 1961–1965 (and so on).
(2) The first vertical column covers five planting years, the following six columns ten years each, the next column forty years, and the last column an indefinite period.

and there seems little likelihood at the moment of much increase in the rate of felling. Consideration of the Great Britain coniferous total shows that no less than 56 per cent. of the coniferous area has been planted since 1950, and that the balance of the area is spread fairly evenly among the remaining classes; the broadleaved area is, however, predominantly in the two oldest age classes and only 6 per cent. of the total has been planted in the 15 years prior to the survey. It would therefore appear from the figures that coniferous species were being used for replanting, almost to the entire exclusion of broadleaved species, but many of the recent plantings do contain a hardwood element in their composition and when crops are classified under their principal species, as has been done in this table, the conifers tend to predominate by reason of their faster and more vigorous growth. An analysis of the distribution of coniferous and broadleaved species by proportional representation of the area, rather than by principal species, shows that approximately 11 per cent. of the area planted since 1950 can be expected eventually to be at least partially hardwood as against the 6 per cent. which the figures in the above table apparently show. There is no doubt, however, that there has been a general swing towards coniferous species primarily for economic reasons.

The general pattern by countries is similar to that for Great Britain.

In England 54 per cent. of the coniferous area has been planted since 1950 and this ratio is fairly general throughout the regions with perhaps a slight tendency for the central and southern regions to show a higher ratio than in the north. Certain counties, such as Sussex, Devon, Somerset, and Northumberland, all have substantial areas in each of the age classes being considered, but they are counties which already have considerable acreages of coniferous forest and the proportion of young to old does not differ markedly from the average. The acreage of young broadleaved crops planted or regenerated accounts for about 90 per cent. of the Great Britain total and, as would be expected, is confined to the central and southern portions of the country. England holds about 80 per cent. of the area of the older broadleaved crops which again mainly occur in this region.

In Scotland 54 per cent. of the coniferous area is in the two youngest age groups and once again the ratio is general in relation to the acreage of the type present in most parts of the country. Exceptions occur in Dumfries and Kirkcudbright where a very considerable increase in the area of Coniferous High Forest has taken place as a result of new planting and afforestation. Substantial areas have been planted in counties such as Inverness, Aberdeen and Perthshire, but these are counties where conifers have always predominated. Broadleaved species are of less importance than conifers and account for only 18 per cent. of the High Forest total. Most of the area occurs in the two oldest age classes and only minor quantities occur in the younger age groups.

In Wales, 71 per cent. of the area of Coniferous High Forest has been planted since 1950, a higher proportion than either of the other two countries, with South Wales showing a greater percentage than North Wales. Brecon and Carmarthen are two counties with sizeable areas of new planting, followed by Merioneth and Montgomery. Broadleaved crops follow the same pattern as Scotland, with only limited acreages in the younger age groups and a preponderance of semi-mature or mature crops which account for nearly three-quarters of the total.

TABLE 11

HIGH FOREST UNDER MAJOR TREE SPECIES WITH DETAILS FOR COUNTRIES
PRIVATE WOODLANDS, 1965

Thousands of Acres

Species	England			Scotland			Wales			Great Britain		
	Area	Percentages		Area	Percentages		Area	Percentages		Area	Percentages	
		of Category	of all Species		of Category	of all Species		of Category	of all Species		of Category	of all Species
Scots Pine	141·1	37	15	215·3	53	44	2·7	5	3	359·1	43	23
Corsican Pine	13·4	3	1	0·9	—	—	0·6	1	—	14·9	2	1
Sitka Spruce	20·4	5	2	62·8	16	13	21·4	37	20	104·6	12	7
Norway Spruce	41·8	11	4	41·0	10	8	6·5	12	6	89·3	11	5
European Larch	71·3	19	7	19·8	5	4	4·9	9	5	96·0	11	6
Japanese and Hybrid Larch	48·5	13	5	44·5	11	9	10·9	20	10	103·9	12	6
Douglas Fir	27·4	7	3	7·4	2	1	6·8	12	7	41·6	5	3
Mixed and Other Conifer	19·3	5	2	13·7	3	3	2·0	4	2	35·0	4	2
Total Conifer	383·2	100	39	405·4	100	82	55·8	100	53	844·4	100	53
Oak	308·4	52	31	26·0	29	5	30·2	62	29	364·6	49	23
Beech	86·1	14	9	19·8	22	4	3·8	8	4	109·7	15	7
Ash	67·0	11	7	1·3	1	—	5·7	12	5	74·0	10	5
Birch	18·2	3	2	11·0	12	2	1·4	3	2	30·6	4	2
Sweet Chestnut	11·3	2	1	—	—	—	0·1	—	—	11·4	1	1
Poplar	18·3	3	2	0·4	1	—	0·7	1	1	19·4	3	1
Sycamore	50·2	8	5	10·5	11	2	4·3	9	4	65·0	9	4
Elm	17·2	3	2	3·0	3	1	0·5	1	—	20·7	3	1
Mixed and Other Broadleaved	21·7	4	2	19·4	21	4	1·7	4	2	42·8	6	3
Total Broadleaved	598·4	100	61	91·4	100	18	48·4	100	47	738·2	100	47
Total	981·6	—	100	496·8	—	100	104·2	—	100	1,582·6	—	100

Composition by Principal Species

The general position is shown in Table 11 which shows for Great Britain and for the three individual countries the area occupied by the major coniferous and broadleaved species.

From this table it will be seen that, for the private woodlands of Great Britain, two species, Scots pine and oak with fairly similar acreages, account for nearly half the total area of High Forest. No other species is of major importance but six species together account for most of the remaining area. They are, in order of importance, beech which accounts for 7 per cent. of the total, Sitka spruce for 7 per cent., Japanese and Hybrid larch which together account for 6 per cent., European larch for 6 per cent., Norway spruce for 5 per cent. and Ash for 5 per cent. Japanese and Hybrid larch totals have here been combined because of the difficulty of distinguishing true Hybrid larch crops from mixtures of Japanese and European larch under field survey conditions and also because their growth rates are fairly similar. Most of the true Hybrid larch is in Scotland, and predominates in Perthshire, where it was first recognised.

Perhaps the most marked feature has been the change in emphasis from European larch and Norway spruce, which, with Scots pine, have in the past been the most commonly planted species on private estates, to Japanese larch and Sitka spruce which up to now have been usually associated with Forestry Commission planting, but whose faster rates of growth make them more attractive economically. Scots pine, our only indigenous conifer of value, has maintained and even enhanced its importance in private woodlands and is still the most widespread coniferous species and is present in virtually every county in the country, with the main concentration in North East Scotland.

In England broadleaved species account for just over 60 per cent. of the area of High Forest. Oak, with just over half the broadleaved total, is the most important species, followed by beech with 14 per cent., ash with 11 per cent. and sycamore with 8 per cent. Of the coniferous species Scots pine, with over one-third of the coniferous total, has the largest area, followed by European larch with 19 per cent., Japanese and Hybrid larch with 13 per cent. and Norway spruce with 11 per cent. The major coniferous species planted or regenerated since the war are, in order of importance, Scots pine, Norway spruce, Japanese larch and European larch, while in broadleaved species they are poplar, beech, birch, oak and sycamore. The rapid rate of growth of poplar makes it attractive to the private grower and it has been widely planted, not only in Eastern England in counties such as Norfolk and Essex, where its use is fairly traditional, but also in the western and southern parts of the country such as Hereford, Wiltshire and Sussex. Birch, too, is a species one would not expect to be high on the list but most of it is represented by the better stands on common land in the South East of England in which it is the major species at present. If the succession is allowed to continue longer-lived species such as oak and Scots pine may well become dominant but recurring fires usually prevent this.

In Scotland the High Forest area is predominantly coniferous and occupies over 80 per cent. of the total. Scots pine occupies over half the conifer total followed by Sitka spruce with 16 per cent., Japanese and Hybrid larch with 11 per cent. and Norway spruce with 10 per cent. Oak is the predominant broadleaved species, followed by beech, birch and sycamore. When the areas of individual species in the P.50–65 class are considered, the order is similar. Scots

pine is the most commonly planted species in the North and North-eastern parts of the country, with larch important in central and southern Scotland. Norway spruce is distributed fairly generally over the whole area and Sitka spruce, hitherto unimportant on private estates, is now of major importance in South Scotland, particularly in Dumfries and Kirkcudbright. Sitka spruce has also, however, been used quite extensively in other parts of the country especially on the moister West coast sites and also on the drier upland areas in East Scotland. Only small areas of broadleaved species have been planted or regenerated and birch has the highest area of any individual species, generally arising from the colonisation of felled land. There are, however, several hundred acres each of young oak, beech, poplar and sycamore, some of which have been planted and some arising from natural regeneration.

In Wales, where the coniferous area slightly exceeds the broadleaved, Sitka spruce is now the most important coniferous species, followed by Japanese and Hybrid larch, Douglas fir and Norway spruce. Scots pine, a major species in England and Scotland, is and always has been of minor importance in Wales. The pattern of planting in the last two decades follows the order for Wales given above. There are now substantial areas of Sitka spruce in the counties of Brecon, Carmarthen, Merioneth and Montgomery, and Douglas fir in Carmarthen, Montgomery and Denbigh. Japanese larch and Norway spruce are generally fairly widely distributed over the country. Oak is by far the most important broadleaved species with only limited quantities of ash, sycamore and beech. Only small amounts of broadleaved planting or regeneration have taken place in comparison with coniferous totals but crops of oak, beech, poplar and sycamore are being established.

TABLE 12

PRINCIPAL SPECIES IN HIGH FOREST IN RELATION TO PLANTING YEAR CLASSES
PRIVATE WOODLANDS—GREAT BRITAIN, 1965

Planting Year Class	Principal Species in Order of Area					
	First	%	Second	%	Third	%
P.61–65	Scots pine	25	Sitka spruce	19	Norway spruce	16
P.51–60	Scots pine	34	Japanese larch	16	Sitka spruce	13
P.41–50	Scots pine	30	European larch	10	Japanese larch	9
P.31–40	Scots pine	30	European larch	13	Japanese larch	12
P.21–30	Scots pine	29	European larch	14	Japanese larch	7
P.11–20	Scots pine	21	Oak	13	European larch	13
P.01–10	Oak	24	Scots pine	18	Ash	13
P.1861–1900	Oak	45	Beech	11	Scots pine	11
Pre-1861	Oak	45	Beech	16	Scots pine	9

Notes. Percentages are based on total High Forest areas with the Planting Year class concerned.
Japanese larch includes Hybrid larch.

Generally, therefore, there has been a swing towards faster growing coniferous species, particularly in Scotland and Wales, and the traditional species pattern of private woodlands planting has now undergone a radical change. The swing is even more obvious by reason of the very substantial acreage planted in the last two decades and Table 12 shows the importance of the three most important species by individual planting year classes in Great Britain.

This table shows that while Scots pine predominates in the younger and oak in the older classes of the private woodlands, species such as Sitka spruce and Japanese larch are becoming increasingly important and can be expected to occupy a larger share of the total in the future. It must be remembered, however, that the species distribution of the older crops has been markedly affected by fellings in the two wars, and the current representation does not necessarily reflect their original importance.

Minor Species

The 77·8 thousand acres classed in Table 11 as "mixed and other", comprising 35·0 thousand acres which were predominantly coniferous and 42·8 thousand acres predominantly broadleaved, were further analysed to obtain information on the distribution of minor species. The mixed conifer and mixed broadleaved categories are by definition incapable of detailed analysis, for this classification was introduced to cover those crops where the species are in intimate mixture and where no one species is individually important. Such stands frequently occur in policy or amenity woodlands, arboreta and other similar crops. These totalled 45·1 thousand acres of which mixed conifers accounted for 12·3 thousand acres and mixed broadleaved species for 32·8 thousand acres. These totals, however, also include crops which were predominantly coniferous but where a broadleaved species was individually the most important, and similarly broadleaved crops where a coniferous species was individually dominant. There thus remained 22·7 thousand acres of minor coniferous species and 10·0 thousand acres of minor broadleaved species for further analysis and the areas of the more important ones are shown in Table 13 by countries.

Table 13 shows that of the minor coniferous species in private woodlands, Lodgepole pine is the most important; it has been mainly used in Scotland in recent years, particularly in Inverness, Argyll and Aberdeenshire, for afforesting and replanting the more difficult sites. The "Other pine" category is primarily composed of *Pinus radiata* and occurs in the older age classes particularly in southern and South West England.

Western hemlock, Western red cedar and Lawson cypress have also been extensively used in recent private planting programmes, often as an understorey to existing crops, and of the *Abies* species Grand fir has been more commonly used than Noble fir.

The use of minor species, where they are suited to site conditions, has therefore extended markedly in the last twenty years and follows the general swing in private woodlands towards the adoption of faster growing species than those currently forming the middle-aged and older crops.

Of the minor broadleaved crops two species, namely alder and lime, form the bulk of the area. The former is a common constituent of crops along streamsides whilst the latter is fairly well distributed over central and southern England

TABLE 13

DISTRIBUTION OF MINOR CONIFEROUS AND MINOR BROADLEAVED SPECIES BY COUNTRIES

PRIVATE WOODLANDS, 1965

Thousands of Acres

Species	England	Scotland	Wales	Great Britain
Lodgepole pine	1·4	7·1	0·3	8·8
Other pines	0·8	0·1	—	0·9
Other spruces	—	—	0·1	0·1
Abies spp.	0·8	0·6	0·2	1·6
Western hemlock	3·6	0·3	0·8	4·7
Western Red cedar	3·4	0·1	0·2	3·7
Lawson cypress	2·0	0·1	0·1	2·2
Other Conifer	0·7	—	—	0·7
Total, Conifer	12·7	8·3	1·7	22·7
Alder	2·4	0·4	1·2	4·0
Lime	1·5	0·2	0·1	1·8
Willow	1·3	—	—	1·3
Horse chestnut	0·3	—	—	0·3
Hornbeam	0·4	—	—	0·4
Other Broadleaved	2·1	0·1	—	2·2
Total, Broadleaved	8·0	0·7	1·3	10·0

where it is sometimes of coppice origin. Cricket bat willow is locally important in eastern and central-southern England whilst hornbeam is largely confined to the counties near London. The "other broadleaved" category is made up of a number of species of which Turkey oak is the most important with lesser amounts of such species as red oak, field maple and aspen.

Composition by Stocking and Tree form

80 per cent. of the coniferous crops were classed as being of average stocking, 14 per cent. as being overstocked and 6 per cent. as understocked. The proportion classed as being overstocked is substantial but it must be remembered that thinning cycles tend to be rather longer on private estates than in Forestry Commission areas, and that many crops classed as overstocked would be awaiting thinning on the normal cycle for that particular estate. Only a very small proportion of the total was classed as being grossly over or grossly understocked, so that the condition of the coniferous crops is reasonably satisfactory.

Just over two-thirds of the broadleaved stands were classed as being of average stocking, 17 per cent. as overstocked and 16 per cent. as understocked. The rather higher proportion classed as understocked is, in part, known to be due to the stands previously classed as standards over coppice being allocated to the High Forest category. These occur predominantly in the two oldest planting year classes.

When tree form is considered approximately two-thirds of the coniferous stands were placed in the group in which 75 per cent. of the stems were of good

form and free from defects such as basal sweeps or bends, and over 90 per cent. in the group in which more than half the trees were of good form. In broadleaved species the proportions were 6 per cent. and 40 per cent. Exactly the same criteria were applied to both conifers and broadleaved crops so that differences are due to their different habits of growth rather than different standards of classification. Only 14 per cent. of the broadleaved total was classed as being of poor tree form but this category still allows for the presence of an adequate number of well-shaped trees which, if favoured in the future, could produce a crop of reasonable form, size and straightness.

Coppice and Coppice-with-Standards

The definition of coppice in the survey instructions included all coppice growth if averaging more than two stems per stool with a mean Quarter Girth at Breast Height not exceeding 6 inches. As, however, the coppice industry is one which has been declining over a long period of years it was necessary to sub-divide this category into two groups, the first consisting of crops which were known to be, or appeared to be, worked as coppice and secondly, crops which by definition qualified as coppice, but where it was known or suspected that the crops were no longer being cut regularly on rotation. These latter areas, if they remain uncut, are likely to develop into High Forest where the coppice is composed of vigorous tree species, while less vigorous crops are likely to become Scrub. These unworked coppice crops are therefore in a transition stage and time, and to some extent silvicultural treatment, will determine their future.

The associated category of Coppice-with-Standards was defined as areas carrying standards of actual or potential timber value in which the coppice has recently been worked or appeared to be capable of being so. Crops in which the coppice did not appear to be worked and where it was obviously over-mature, were classed as High Forest, or as Scrub, depending on the stocking of the standards and the straightness and vigour of the crop components. The tendency, therefore, was to allocate crops, which had at one time been regularly worked as Coppice or Coppice-with-Standards but were no longer so, to those forest types which seemed, by definition, to most conveniently accommodate their present stage of development. The Broadleaved High Forest and Scrub categories have therefore increased their area largely at the expense of the Coppice categories which are now only of local importance.

It must be remembered, however, that some coppice crops are not cut over on rotation but rather at irregular intervals in order to provide produce of a particular size. This policy, together with that of cutting coppice prior to replanting with High Forest species, must, in absence of knowledge of the owners' intentions, inevitably result in the area of coppice worked on rotation being over-estimated.

Table 14 shows the breakdown of the 71·0 thousand acres of coppice types which represent 3 per cent. of the total private woodland area in Great Britain.

25·4 thousand acres or 36 per cent. of the area is classed as Coppice-with-Standards and 45·6 thousand acres or 64 per cent. as Simple Coppice. Chestnut is seen to be the most important single coppice species, occupying nearly half the coppice area under standards and over half the area of simple coppice.

TABLE 14

PRINCIPAL SPECIES OF COPPICE, BY SUB-TYPES

PRIVATE WOODLANDS GREAT BRITAIN, 1965

Thousands of Acres

Sub-Type	Principal Species					Total
	Mainly Chestnut	Mainly Hazel	Mainly Oak	Mainly Hornbeam	Mixed and Other	
With Standards	11·3	8·5	0·1	1·8	3·7	25·4
Per cent.	*25*	*55*	*25*	*54*	*55*	*36*
Coppice only	33·7	7·1	0·3	1·5	3·0	45·6
Per cent.	*75*	*45*	*75*	*46*	*45*	*64*
Total	45·0	15·6	0·4	3·3	6·7	71·0

Coppice-with-Standards

Coppice-with-Standards is primarily confined to the South East of England, and, in particular, to Kent and Sussex, with lesser amounts in the counties of Hampshire and Surrey. There are, however, still areas where this type is of very localised importance, namely in Suffolk and Norfolk, Wiltshire, Gloucester and Dorset, and in the Furness district of Lancashire. It does not occur in Scotland, and there is only a very small area in Wales in the county of Monmouthshire.

Table 15 shows the distribution of principal species of standards and of coppice.

TABLE 15

COPPICE WITH STANDARDS, CLASSIFIED BY PRINCIPAL SPECIES, BOTH OF COPPICE AND OF STANDARD

PRIVATE WOODLANDS—GREAT BRITAIN, 1965

Thousands of Acres

Principal Species of Standard	Coppice: Principal Species					Total	%
	Mainly Chestnut	Mainly Hazel	Mainly Oak	Mainly Hornbeam	Mixed and Other		
Coniferous	—	0·1	—	—	0·3	0·4	2
Oak	11·0	8·1	0·1	1·7	3·4	24·3	95
Beech	—	—	—	—	—	—	—
Ash	0·1	0·2	—	0·1	—	0·4	2
Birch	—	—	—	—	—	—	—
Spanish Chestnut	0·2	—	—	—	—	0·2	1
Other Broadleaved	—	0·1	—	—	—	0·1	—
Total	11·3	8·5	0·1	1·8	3·7	25·4	100
Per cent. of Total	*44*	*34*	—	*7*	*15*	*100*	—

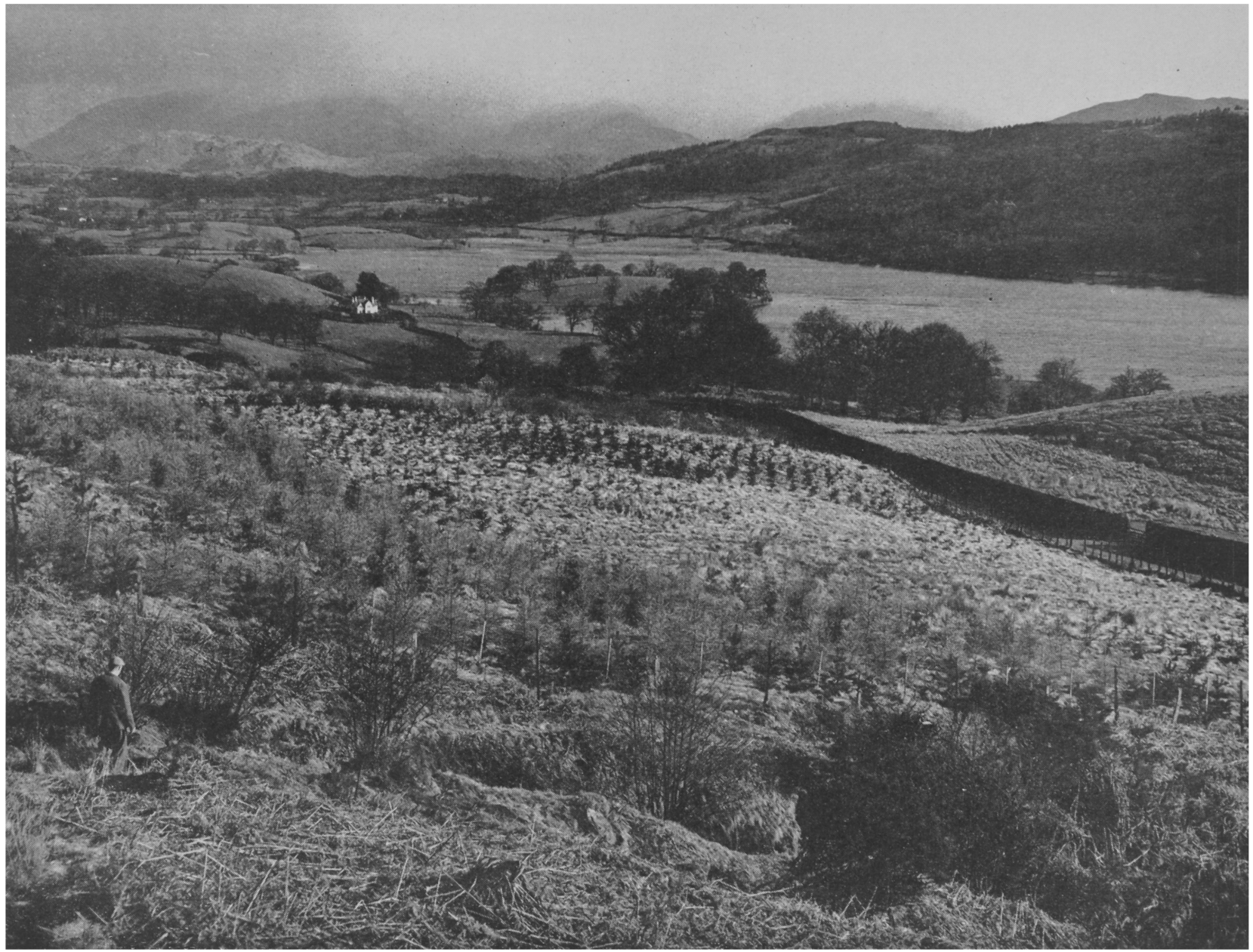


PLATE 1. A recently planted conifer crop on a private estate, Lancashire.

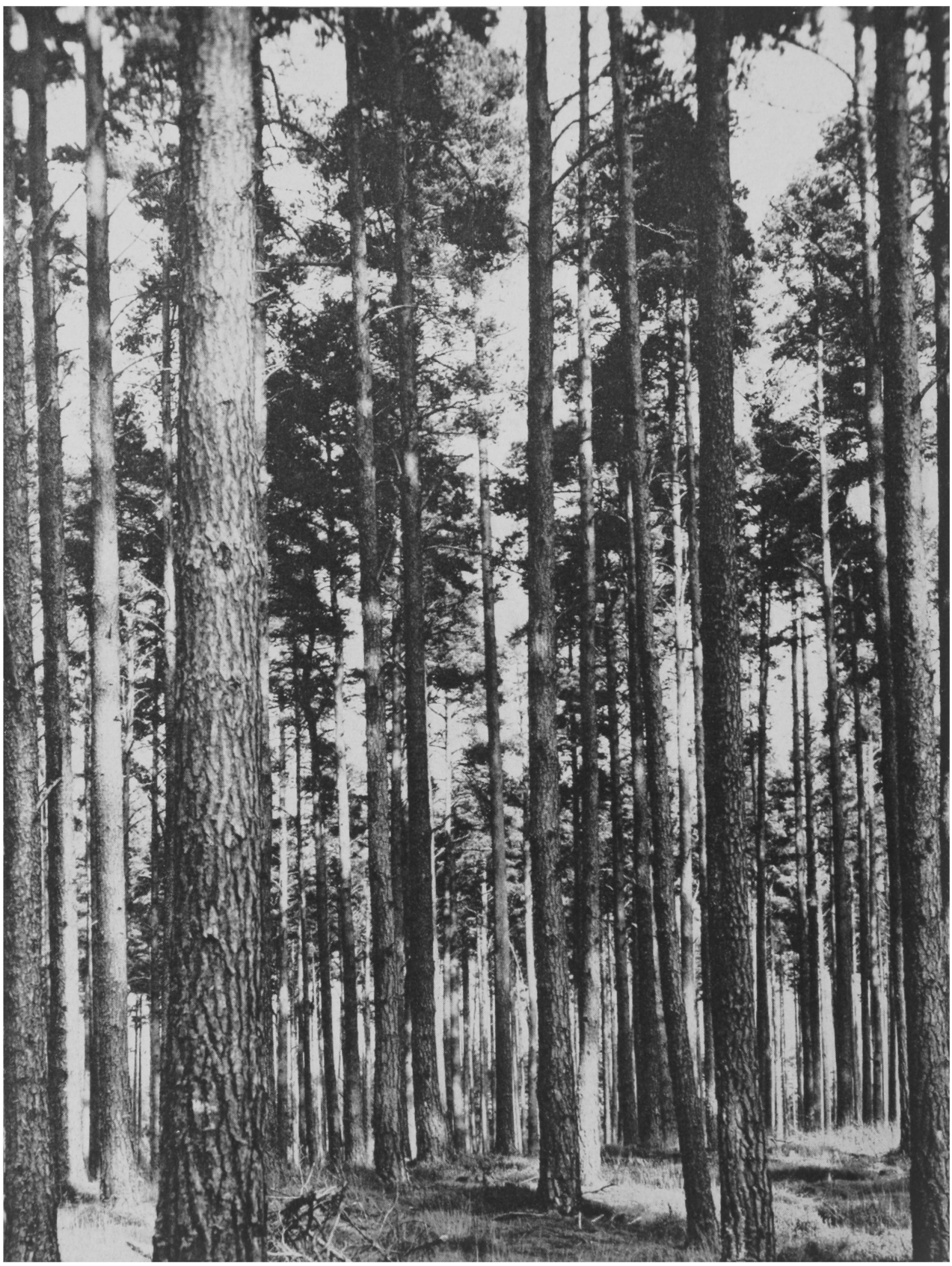


PLATE 2. A fine stand of mature Scots pine, Morayshire.

PLATE 3. An oak stand aged about 150 years which is fairly typical in terms of stocking and tree form of much of the old hardwood in Great Britain, Hampshire.

PLATE 4. A fine stand of old oak, Montgomeryshire.

PLATE 5. Oak standards over Sweet chestnut coppice, Sussex.

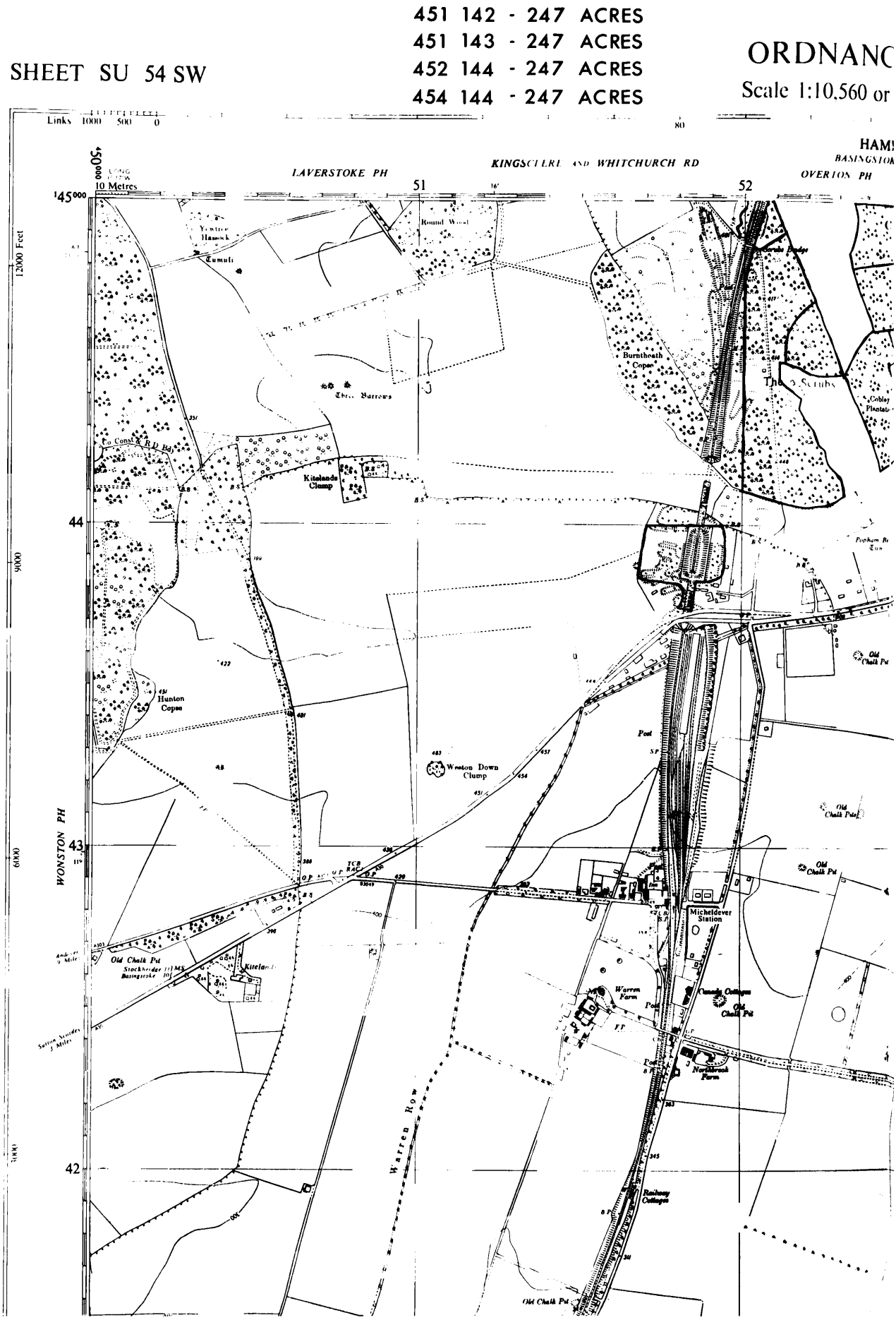
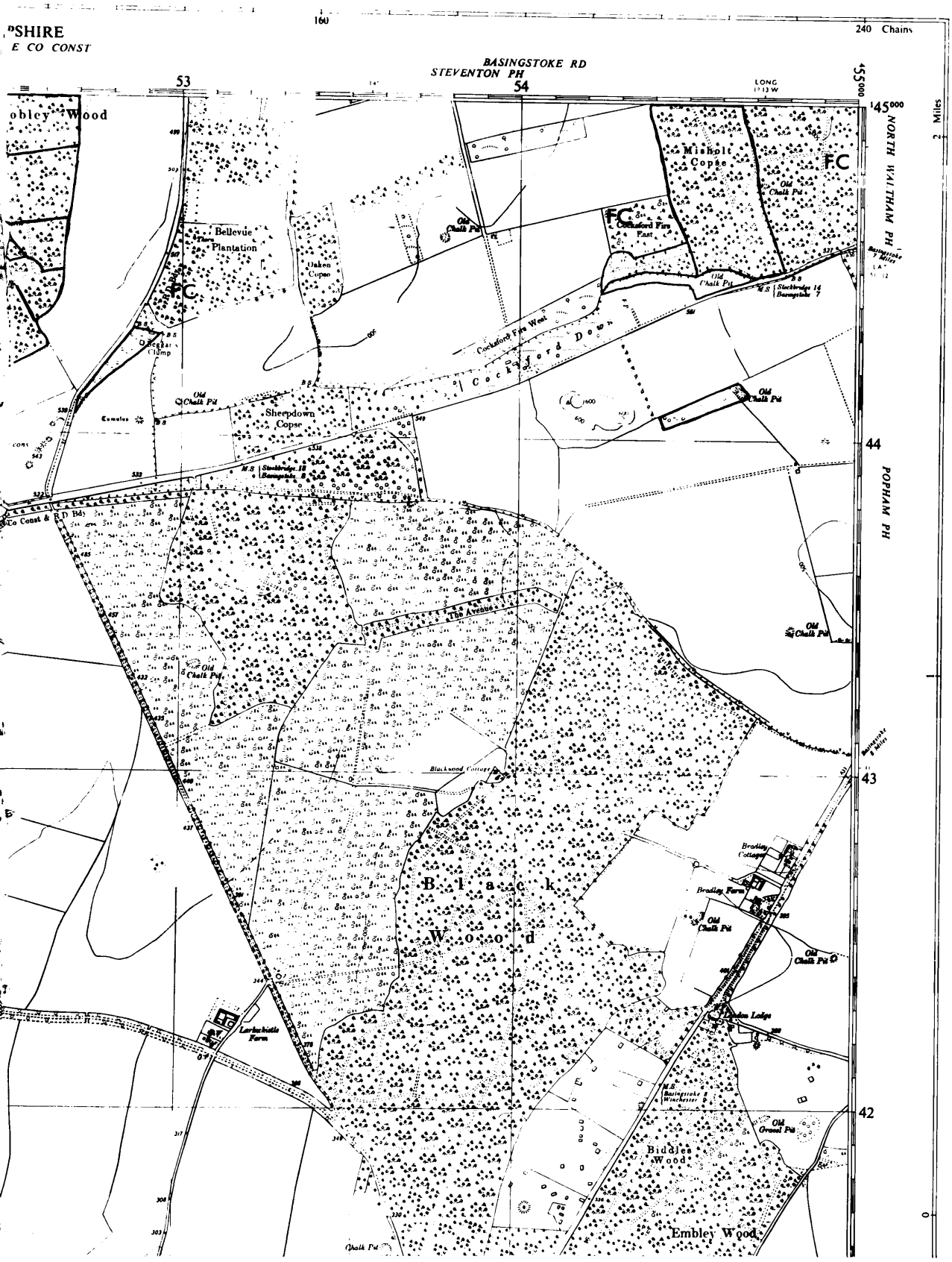


PLATE 6. Part of a 6-inch-to-1-mile Ordnance Survey map containing four kilometre squares as together with their respective land plus inland water areas. Kilometre square 451142 contains no which occurs on land not shown as woodland on the map. The other two squares contain both private a The top centre kilometre square shows how the stand boundaries were delineated. The location of

N.B. The first and fourth figures of the grid references, which identify the particular 100 Km. squ



ssessed on the Census. The six-figure co-ordinates of these squares are shown at the top of the map
woodland in blocks of 1 acre and over in size while kilometre square 451143 has only one stand
and Forestry Commission woodland (F.C.) but the latter has not been assessed.
individual stands within squares are designated by means of eight-figure co-ordinates, e.g. 45211449.
are concerned, are shown in exceptionally small print at the map corners.

PLATE 7. Sweet chestnut coppice being cut on rotation, Kent.

PLATE 8. Unworked ash coppice.

PLATE 9. Utilisable birch scrub which is too poor to be classed as High Forest, but which does contain some reasonably straight stems, Fife.

PLATE 10. Typical unutilisable scrub birch with poor stem and crown form, Inverness-shire.

PLATE 11. Hedgerow elms with some young trees grown from suckers; groups of park trees in the background, Berkshire.

It will be seen from this table that oak is by far the most important species of standard, occupying 95 per cent. of the area. Ash with 2 per cent. is the next most important individual species, followed by conifers which are largely composed of Scots pine and European larch, usually in association with oak.

Chestnut, much in demand for hop poles and fencing material, occupies the largest area of coppice, followed by hazel, these two species occupying nearly 80 per cent. of the total. There is a considerable area of mixed coppice, often containing birch as an intrusive species, which is unlikely to continue to be worked in the future.

An analysis of the age distribution of standards shows that 5 per cent. of the area is under standards of less than 60 years of age, 65 per cent. with standards aged 60–100 years, and 30 per cent. with standards aged over 100 years. These are, however, predominant ages since the method of working has tended to produce an overstorey with trees of varying ages.

Classification of the vigour of coppice under standards shows 77 per cent. recorded as average, 22 per cent. as poor and only 1 per cent. as good. This would imply that many of the existing areas of this type are now tending to go out of production as the standards are now overstocked and the overhead cover is extending to the point where the growth of coppice is being affected.

Simple Coppice

The distinction between Coppice-with-Standards and Simple Coppice is not always an easy one, since the stocking of standards is often very variable, but generally, where the density of standards fell below about 6 per acre, the overstorey was disregarded and the remaining crop treated on its merits. For a crop to qualify as coppice there had to be at least two stems per stool with a mean Quarter Girth at Breast Height not exceeding 6 inches. Crops with a mean girth larger than this were deemed to be no longer coppice and had either to be allocated to High Forest or to Scrub, usually Utilisable Scrub, depending on the form and vigour of the species concerned. The areas presently classed as Coppice, therefore, represent crops which are currently being worked as coppice or whose condition permits of no other classification despite the fact that they may be no longer worked on rotation.

Of the total acreage of 45·6 thousand acres classed as Coppice, none occurred in Scotland, and only a very small area in Monmouthshire in Wales. In England it is largely confined to Kent, Surrey, Sussex and Hampshire which together account for over 80 per cent. of the total, but other local concentrations occur in Gloucester and Wiltshire, in Essex, Norfolk and Suffolk, and in North West England. Table 16 shows the distribution of Simple Coppice by species, subdivided into worked and unworked coppice.

This table shows first that worked coppice occupies an area of 38·6 thousand acres or 85 per cent. of the total and unworked coppice, which consists of areas which are out of, or tending to go out of, production, occupies an area of 7·0 thousand acres or 15 per cent. of the whole. Some of the apparently unworked coppice may, however, be sporadically worked when prices are high.

Spanish chestnut, mainly in Kent and Sussex, occupies 74 per cent. of the coppice area and hazel, mainly in Dorset and Hampshire, occupies 16 per cent. The other coppice species may be locally worked for specific uses but their

TABLE 16

UTILISATION CLASS OF SIMPLE COPPICE

PRIVATE WOODLANDS—GREAT BRITAIN, 1965

Thousands of Acres

Principal Species	Worked Coppice	Unworked Coppice	Total	Worked Coppice as % of Species Totals
Oak . . .	0·3	—	0·3	100
Ash . . .	1·1	0·8	1·9	58
Birch . . .	0·2	0·1	0·3	66
Spanish Chestnut .	31·9	1·8	33·7	94
Alder . . .	—	—	—	—
Hazel . . .	4·2	2·9	7·1	59
Hornbeam . .	0·4	1·1	1·5	27
Other . . .	0·5	0·3	0·8	62
Total . . .	38·6	7·0	45·6	85

further decline in importance appears inevitable. Only a very small area of alder coppice was recorded and it is probable that many areas formerly so classified are now ranked as Scrub—see Table 18.

An analysis of coppice vigour shows that about 20 per cent. of the area has good vigour, 64 per cent. is classed as average and 16 per cent. is composed of weak or spindly stems often arising from ageing stools. The proportion of the area in each species which is classed as being of good vigour is highest in Spanish chestnut and alder and lowest in hornbeam, oak and birch.

The acreage under both Coppice types has declined markedly in the last twenty years but a recent increase in the demand for cleft fencing should result in some of the better chestnut areas coming back into production. Of the remaining species only hazel is likely to remain of individual importance. The area of both silvicultural types which is worked regularly on rotation is probably about 40 to 45 thousand acres, the balance either being worked sporadically or now going out of production.

Scrub Woodland

Scrub woodland amounts to 873·6 thousand acres or 32 per cent. of the total area of private woodlands and thus exceeds any other single forest type in area. It therefore requires rather fuller consideration than its importance in terms of productive capacity would otherwise warrant.

Scrub was defined as inferior growth which is at least 20 per cent. stocked but which is unlikely to develop into a satisfactory crop of coppice, poles, or timber. The normal criterion was that the crop was unlikely to produce utilisable bole lengths of 10 feet to a 3-inch minimum diameter top or to the spring of the crown, whichever occurred first. Such a classification of course can only be applied to the existing trees and most of the sites are certainly capable of growing more productive crops than those occurring on them at the present time. In some cases it is true that factors such as soil and exposure, do have an inhibiting influence on growth but there are very few sites which currently bear Scrub that are incapable of growing High Forest crops.

Scrub woodland occurs over a wide range of geographical conditions and consequently it takes many forms. Examples are high elevation scrub in the North and West which is unenclosed and forms shelter for stock, overgrown coppice, woods devastated during the war and not replanted, colonisation of commonland or of steep banks which cannot be cultivated and so on. Classification of such varied crops is difficult and must, of necessity, be somewhat subjective. An attempt was made, however, as is explained on page 23 to subdivide the Scrub category into two groups; the first, termed Utilisable Scrub, consisting of crops which had trees of actual or potential timber value, albeit at a fairly low density per acre, and the second, termed Unutilisable Scrub, which were crops composed of species which had little or no value. Table 17 shows the distribution of these two classes by country.

TABLE 17

SCRUB COMPOSITION BY COUNTRIES

PRIVATE WOODLANDS, 1965

Thousands of Acres

Country	Utilisable Scrub		Unutilisable Scrub		Total	
	Acres	%	Acres	%	Acres	%
England . .	123·9	78	407·3	57	531·2	61
Scotland . .	9·9	6	236·3	33	246·2	28
Wales . . .	26·1	16	70·1	10	96·2	11
Great Britain .	159·9	100	713·7	100	873·6	100

Of the 873·6 thousand acres classed as Scrub, 159·9 thousand acres or 18 per cent. were classed as Utilisable Scrub and 713·7 thousand acres or 82 per cent. as Unutilisable Scrub. England holds over three-quarters of the Utilisable Scrub total, Wales about 16 per cent. and Scotland about 6 per cent. The proportion of Utilisable Scrub as a percentage of total Scrub in individual countries is: England approximately 23 per cent., Wales about 27 per cent. and Scotland about 4 per cent. Utilisable Scrub therefore tends to be concentrated in the central and southern portions of Great Britain and generally reflects the better growing conditions for hardwoods which form the bulk of the total.

Utilisable Scrub

An analysis of the species distribution of Utilisable Scrub, which is given in Table 18, shows that birch is the most prevalent species, occupying over 40 per cent. of the area, followed by oak, ash and sycamore.

The high proportion of birch is due to the fact that it seeds fairly easily and on many sites can form fairly dense stands of pole-sized material, containing trees which are straight and of good form. The fact that even the better stands of birch are unsaleable at the present time, was not allowed to influence the classification.

Much of the oak scrub classified as utilisable occurs in the western parts of the country, and particularly in West Scotland, South and West Wales and South West England. In Scotland and in South West England some of it is the remnants

TABLE 18

SPECIES COMPOSITION OF UTILISABLE SCRUB BY COUNTRIES

PRIVATE WOODLANDS, 1965

Thousands of Acres

Principal Species	England	Scotland	Wales	Great Britain	
				Total	%
Coniferous	0·2	0·1	—	0·3	—
Oak	13·1	4·8	12·0	29·9	19
Beech	4·4	0·6	0·2	5·2	3
Ash	18·3	—	4·4	22·7	14
Birch	57·7	3·5	5·6	66·8	42
Alder	5·5	0·5	1·7	7·7	5
Sycamore	10·2	0·2	1·7	12·1	7
Mixed and Other Broadleaved	14·5	0·2	0·5	15·2	10
Total	123·9	9·9	26·1	159·9	100

of stands originally coppiced for tan bark and for iron smelting, and it is also of fairly common occurrence along stream valleys and coastal slopes, often in mixture with birch, ash and sycamore. The stems, however, tend to be short-boled with spreading crowns and usually fail to meet the minimum requirements of tree form and stocking required for High Forest.

Ash and sycamore are also fairly widespread, some of the former being obviously of coppice origin, but both are species which, in certain areas, are ready colonising species, particularly on the better soils. They are also common in shelterbelts and on other relatively exposed sites.

There is a small area of coniferous Utilisable Scrub which is predominantly composed of pine, representing areas of very poor growth, often of natural origin, and much older than its appearance would at first indicate. The height of these trees is often less than 30 feet although their girths can be considerable, giving squat short-boled trees. There are also lesser amounts of European larch usually growing at high elevations, and of yew, which is a common constituent of the scrub crops particularly on the chalk downs in southern England.

The balance is made up of a fairly wide variety of species in which alder and willow are fairly common, occurring specially along streamsides and on undrained soils, while lime is of local importance in some areas. There is also a considerable acreage of derelict coppice hornbeam, particularly in Essex and the Home Counties, where it used to be in considerable demand for the London bakeries and also for agricultural purposes.

Unutilisable Scrub

Unutilisable Scrub occupies an area of 713·7 thousand acres or 82 per cent. of the Scrub total but represents tree crops of little or no economic importance. Many of the sites, however, are of considerable potential value but the cost of clearance is often a hindrance to their rehabilitation.

The species distribution is shown in Table 19.

TABLE 19

SPECIES COMPOSITION OF UNUTILISABLE SCRUB BY COUNTRIES

PRIVATE WOODLANDS, 1965

Thousands of Acres

Principal Species	England	Scotland	Wales	Great Britain	
				Area	%
Coniferous	7·0	6·2	0·2	13·4	2
Oak	24·1	16·8	24·9	65·8	9
Ash	22·0	2·1	6·6	30·7	4
Birch	137·4	172·4	12·6	322·4	46
Alder	14·2	8·9	8·0	31·1	4
Hazel	71·5	1·5	6·3	79·3	11
Thorn	41·0	0·3	2·3	43·6	6
Mixed and Other Broadleaved	90·1	28·1	9·2	127·4	18
Total	407·3	236·3	70·1	713·7	100

Birch again is the species with the greatest area, occupying just under half the total area. The stocking in many cases is low and continued burning and grazing in some areas have prevented regeneration and left the twisted and fluted stems commonly seen on the poorer soils and in upland areas. This type is fairly prevalent in the North, West and Central Highlands of Scotland, West Wales, and in the northern districts of England. It is also prevalent on the common lands in the South of England.

Hazel occupies about 11 per cent. of the whole and is, in some cases, coppice which was previously worked and has been allowed to become derelict, but it also occurs naturally in the higher rainfall areas in the west of the country, particularly in association with scrub oak, often forming dense thickets.

Oak, with about 9 per cent. of the total, is the only other single tree species of major importance and represents the poorer quality woodland, consisting of trees with short boles and heavy crowns. Much of this oak is over-mature and widely spaced, and gaps in the canopies are often filled with low quality birch and ash.

Hawthorn and blackthorn are common on the heavier soils in the Midlands and in the South of England where they are often the first colonising species of rough grazing, or abandoned agricultural land. They also occur as an understorey in many woods and flourish when the overhead cover is removed.

The "mixed and other" category contains a wide variety of species, very few of which are individually important, but one which requires mention is rhododendron, which, given the right conditions of soil and climate, can spread rapidly to form a dense impenetrable mass under which little or nothing can grow. Like most weeds, its eradication is expensive and it now occupies a fairly considerable area of land from which the High Forest cover has been wholly or partially removed.

The coniferous area consists predominantly of pine crops, either occurring on poor soil where it grows very slowly to produce short-boled, often twisted, stems or, on sandy soils such as the Bagshot sands in southern England, where

growth is relatively much faster but where successive ground fires either destroy or severely damage the stems.

European larch is another fairly common species, often planted for shelter, where the stem form is often so poor that it cannot even be considered as Utilisable Scrub, while yew is common on the chalk in southern England and often forms dense groves on parts of the South Downs.

Felled Woodland

Felled woodland was defined as all forest land which had been clear-felled to leave a canopy cover of less than 20 per cent. and where there was no obvious sign of conversion to other types of land use. Coppice crops which were being worked on rotation were excluded from this category.

The total area classed as Felled was 159·5 thousand acres or 6 per cent. of the woodland area in Great Britain.

There were two major factors which affected the area of Felled Woodland assessed during the survey. The first was that felled land is not a classification which is recognised by the Ordnance Survey and any areas encountered by their surveyors would probably be classed as bare land or rough grazing if there was no regrowth from stumps or colonisation of the site. Areas with woody growth on them would be shown as woodland and therefore picked up by the Census surveyors but bare or almost bare areas could well be missed unless they were adjacent to existing woods or the surveyors' attention was specifically directed to them. The second factor was the date on which the maps were last revised and this varied from region to region and often from map to map. In some cases the maps used were more than 60 years old and under these circumstances crops felled, for example, during the 1914–18 war could well be assessed while on a more recent edition they could be missed. The Census classification of Felled woodland therefore included all land on which stumps were still present, and on which there could be woody growth up to a maximum of 20 per cent., irrespective of when the felling took place and whether the areas were shown as woodland on the latest edition of the Ordnance Survey map or not.

In lowland Britain felled sites seldom remain bare for long for they are either replanted or else acquire a woody cover from stump regrowth or natural regeneration. In upland areas, however, particularly in eastern and central Scotland, felled areas often remain bare for many years, and it is these regions that are still covered by the older map editions. These two factors account for the relatively high area of felled land in Scotland compared with the other two countries.

There were two aspects to be considered in the collection of the data. The first was to establish the area classed as Felled at the time of survey and second to obtain information on the rate of felling during the period 1963–65. It was therefore necessary in certain cases to give crops a dual classification, one relating to the fact that the original crop had been cleared during this two-year period and the second relating to its condition at the time of survey. For example it was possible to have a crop classed both as young High Forest and as Felled. Under field conditions, however, it was often difficult to determine the actual year of felling, particularly where it had been spread over a considerable

period of time, and the surveyors had often to classify a crop subjectively either as Felled 1963–65 or as Felled pre-1963. The estimate of woodland felled in the period 1963–65 is therefore open to doubt and appears to be an underestimate.

Areas which were shown as woodland on the map but which had obviously been converted, or were undergoing conversion, to agriculture by the removal of stumps, re-seeding, etc. were excluded from the woodland totals by classing them as Disafforested. The presence of grazing animals on a felled area did not of itself mean that the area had been Disafforested, since many of these sites are used as grazing for sheep without necessarily intending that these areas be permanently used for this purpose.

Table 20 shows the distribution of felled areas by countries.

TABLE 20

FELLED WOODLAND BY SUB-TYPES AND COUNTRIES

PRIVATE WOODLANDS, 1965

Thousands of Acres

Country	Felled 1963–65			Felled Prior To 1963	Total Net Area Felled	Per Cent. of Total
	Gross Area Felled	Area Replanted or Regenerated	Net Area Felled			
England . .	12·5	4·3	8·2	20·1	28·3	18
Scotland . .	3·3	—	3·3	122·4	125·7	79
Wales . . .	0·5	0·2	0·3	5·2	5·5	3
Great Britain .	16·3	4·5	11·8	147·7	159·5	100

Of the 159·5 thousand acres currently classed as felled, Scotland is seen to hold almost 80 per cent. of the total with England containing 18 per cent. and Wales 3 per cent. Fairly similar percentages apply to the area classed as being felled prior to 1963.

When the area of 16·3 thousand acres felled within the two-year period 1963–65 is considered, it will be seen that England accounts for 77 per cent. of the total, Scotland for 20 per cent. and Wales for 3 per cent. The net acreage classed as felled within this period, remaining after allowances for replanting, or regrowth from stumps, colonisation, etc. amounts to 11·8 thousand acres, a drop of 4·5 thousand acres on the original figure. It should be realised that the difference between the net and gross figure is not necessarily due entirely to replanting, and that many of these areas will have to be cleared of scrub regrowth before the new crop can be established. In Scotland, the gross and net areas felled are shown as being the same but it only implies that the area felled and replanted within the two-year period is small, and that no such areas were picked up in the sample.

Disafforested Woodland

This type was defined as areas which are shown on the map as woodland but which have now been converted, or are obviously under conversion, to other uses such as housing, gardens, aerodromes, etc. Felled areas which were being

grazed were only classed as having been disafforested if they had been reseeded or had the stumps removed. Where houses had encroached into woodland that part of the wood which was included as garden ground was classed as disafforested.

As has previously been explained in Chapter 5 it is not possible from a direct analysis of the data to give an estimate of the area which has been disafforested since the last survey, nor what is the average annual rate of loss, because of the varying revision dates of the maps. What can be done, however, is to analyse the causes of disafforestation within the three counties bearing in mind that these relate to no specific period of time, and that certain factors may currently be of greater or lesser importance than the figures would indicate. These are shown in Table 21 below.

TABLE 21

PERCENTAGE CAUSE OF DISAFFORESTATION BY COUNTRIES
PRIVATE WOODLANDS, 1965

Cause of Disafforestation	England	Scotland	Wales	Great Britain
Agriculture	63	62	77	64
Building	20	7	9	17
Mining and Quarrying	4	5	5	4
Military Uses	3	—	—	3
Power Lines	1	12	2	3
Other	9	14	7	9

In Great Britain it will be seen that agriculture has been the major cause of disafforestation amounting to about two-thirds of the total followed by building at 17 per cent. These two categories therefore account for over 80 per cent. of the loss. None of the other categories is of major significance as the "other" category contains a very wide variety of causes ranging from caravan and tent sites to flooding for reservoirs.

In England certain counties have shown substantial losses to agriculture. These are Hampshire, Kent, Essex, Shropshire, Hereford and Yorks North Riding with Devon and Suffolk to a lesser extent. More than half the losses as a result of house-building and garden extension are in Kent, Hampshire, Surrey, Sussex and Berkshire. Mining and quarrying are locally important in Buckingham, Bedfordshire and Northumberland whilst military installations and training areas are mainly confined to Berkshire, Hampshire and Surrey.

In Scotland agriculture accounts for just over 60 per cent. of the losses with the main concentrations in East Perth, Fife, Aberdeen and Ayr. Losses due to power lines are high in Inverness and Argyll and to a lesser extent in Aberdeenshire whilst building losses are mainly confined to the counties with urban concentrations.

In Wales agriculture accounts for over three quarters of the loss and occurs predominantly in Monmouth, Brecon, Montgomery and Denbigh whilst losses due to building and to mining and quarrying are relatively high in Glamorgan.

Whilst no attempt has been made to compare the sites classed as disafforested in the 1965 Census with the classification of corresponding sites from previous

surveys, an estimate was made in 1962 of the annual rate of disafforestation based on certain counties which had been completely surveyed on two separate occasions. At that time it was considered that the rate of loss due to disafforestation was about 7,400 acres annually of which well over 80 per cent. occurred in England and Wales. Whilst the current survey has produced no information which can substantiate this figure it probably remains the best available estimate which can be made at the present time.

Presence of Farm Stock

The purpose of this classification was to find out what percentage of the woodland area had a dual land use and related especially to unfenced stands classed as Scrub or Felled which were being used as shelter or as grazing for sheep and other animals. The results have been expressed as a percentage of the area of the major forest types in each country.

TABLE 22

PERCENTAGE OF EACH FOREST TYPE OPEN TO FARM STOCK
PRIVATE WOODLANDS, 1965

Forest Type	England	Scotland	Wales	Great Britain
Coniferous High Forest . .	1	6	3	4
Broadleaved High Forest . .	3	15	29	6
Coppice and Coppice/Standards .	2	—	11	2
Scrub	6	50	20	19
Felled	12	48	52	42

This table shows that the highest percentages are naturally enough in Scotland and Wales and that in England only the Felled category is of importance. In Scotland 21 per cent. of the High Forest area is open to stock, most of it being composed of older stands, and whilst some of them have probably been unenclosed for many years, fences in the majority of cases have not been maintained once they had fulfilled their initial primary function. Almost 50 per cent. of the Scrub and Felled areas are now open but in the former case much of this woodland has never been fenced and is of natural origin. In Wales about one-third of the Broadleaved High Forest area, about 20 per cent. of the Scrub and over 50 per cent. of the Felled area are now open to stock. In both countries the dying out of the trade of drystone walling has no doubt contributed to the substantial area of woodland which now provides shelter for animals in inclement weather and also to the use of felled areas as additional grazing. In the latter case this reversion to agricultural use may be purely temporary but in others it seems likely that they will now remain as permanent grazing. Until such time, however, as the areas are reseeded or it is otherwise clear that they are permanently lost to forestry they must still be included in the woodland totals.

CHAPTER 9

FORESTRY COMMISSION WOODLANDS

No physical assessment was made of Forestry Commission woodlands because the basic information already available was closely comparable with those collected in the Census of private woods. Stocktaking in the form of survey work and crop assessment is a continuous process in Forestry Commission woodlands, and although the data for individual forests are normally revised at about 10-yearly intervals, every effort is made in the intervening years to keep the essential information up to date by adjusting the data for changes due to planting, felling, windblow, etc. At regular intervals, normally every 5 years, data from individual forests are combined into conservancy and country totals so as to provide the area information required for forecasting. The latest available summary of this type related to the position at 30th September 1967.

The figures were therefore adjusted to allow for changes which had taken place in the preceding two years so that the base date of the Forestry Commission data would conform with that for private woodlands. Assumptions had to be made for certain of these changes because the information, although available at forest level, is not normally summarised annually on a national basis. The other major differences between the Forestry Commission and private woodland data are as follows:

(*a*) the 1861–1900 and Pre-1861 planting year classes have been combined because the area in the two classes is so small in relation to the total that further differentiation is not really required.

(*b*) the areas of Coppice, Scrub and Felled land have been estimated because they are not summarised on a national basis.

(*c*) adjustments for felling have been made in the older planting year classes for the same reason.

(*d*) the area of mixtures has been allocated pro rata to the individual species concerned.

The data given for Forestry Commission woodlands in this section have been collected for purposes other than the national census and although not exactly comparable with those of private woodlands are sufficiently close to enable valid comparisons to be made.

Distribution by Forest Type

Table 23 shows that of the 1,618·4 thousand acres of Forestry Commission woodlands, 1,548·3 thousand acres or 96 per cent. are classed as High Forest, 2·1 thousand acres (with a negligible percentage) as Coppice, and 68,000 acres or 4 per cent. as unproductive. The bulk of the unproductive area is land which has been acquired from private ownership for restocking, or Forestry Commission plantations which have been felled and are scheduled for replanting. There is also, however, a small residual area which represents Scrub woodland

TABLE 23

AREAS OF WOODLAND, CLASSIFIED BY TYPES AND SUBTYPES IN EACH COUNTRY
FORESTRY COMMISSION WOODLANDS, 1965

Thousands of Acres

Type	England		Scotland		Wales		Great Britain	
	Area	%	Area	%	Area	%	Area	%
Coniferous High Forest	439·2	76	715·6	95	267·4	92	1,422·2	88
Broadleaved High Forest	106·2	19	5·7	1	14·2	5	126·1	8
Total High Forest	545·4	95	721·3	96	281·6	97	1,548·3	96
Coppice with Standards Simple Coppice	2·1	—	—	—	—	—	2·1	—
Total Coppice	2·1	—	—	—	—	—	2·1	—
Scrub Felled	30·0	5	30·0	4	8·0	3	68·0	4
Total	577·5	100	751·3	100	289·6	100	1,618·4	100

along streamsides, etc. which is unplantable, and areas retained for amenity or on common land, where planting is often prohibited. The proportion of unproductive land in each country is fairly constant at about 4 per cent.

An examination of the High Forest area shows that in Scotland and Wales, coniferous forest accounts for almost the whole of the High Forest area and that broadleaved species are relatively unimportant. In England, about 20 per cent. of the High Forest area is broadleaved, most of it located in the southern part of the country.

The area shown as Coppice is small and mainly represents areas of chestnut coppice which were acquired from private ownership and are still worked under the traditional system.

High Forest

Composition by Age, i.e. Planting Year, Classes

Table 24 shows the age-class distribution of the 1,548·3 thousand acres of High Forest.

The first point of interest is the very high proportion of the area in the youngest classes. For example, in Great Britain 19 per cent. of the area has been planted since 1961, 57 per cent. since 1951 and 72 per cent. since 1941. The proportions in the younger age classes are higher in Scotland and Wales, where the bulk of the planting is now being undertaken, than in England.

TABLE 24

HIGH FOREST BY PLANTING YEAR CLASSES AND COMPOSITION
FORESTRY COMMISSION WOODLANDS, 1965

Thousands of Acres

Country	Composition	Planting Year Class																Total	
		P.61–65		P.51–60		P.41–50		P.31–40		P.21–30		P.11–20		P.01–10		Pre-1901			
		Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%
England	Coniferous	67·0	15	155·3	36	75·5	17	67·7	15	60·7	14	0·8	—	6·5	2	5·7	1	439·2	100
	Broadleaved	5·0	5	28·8	28	13·5	13	12·3	11	5·5	5	0·2	—	5·5	5	35·4	33	106·2	100
	Total	72·0	13	184·1	34	89·0	16	80·0	15	66·2	12	1·0	—	12·0	2	41·1	8	545·4	100
Scotland	Coniferous	162·3	23	290·9	41	103·1	14	88·2	12	49·9	7	2·8	—	7·3	1	11·1	2	715·6	100
	Broadleaved	0·2	3	1·8	32	0·4	7	0·9	16	0·2	3	0·1	2	0·8	14	1·3	23	5·7	100
	Total	162·5	23	292·7	41	103·5	14	89·1	12	50·1	7	2·9	—	8·1	1	12·4	2	721·3	100
Wales	Coniferous	53·3	20	111·9	42	44·6	17	39·7	15	16·2	6	—	—	1·4	—	0·3	—	267·4	100
	Broadleaved	0·7	5	6·4	45	1·3	9	0·6	4	0·3	2	0·1	1	1·0	7	3·8	27	14·2	100
	Total	54·0	19	118·3	42	45·9	17	40·3	14	16·5	6	0·1	—	2·4	1	4·1	1	281·6	100
Great Britain	Coniferous	282·6	20	558·1	39	223·2	16	195·6	14	126·8	9	3·6	—	15·2	1	17·1	1	1,422·2	100
	Broadleaved	5·9	5	37·0	30	15·2	12	13·8	11	6·0	5	0·4	—	7·3	6	40·5	31	126·1	100
	Total	288·5	19	595·1	38	238·4	15	209·4	14	132·8	9	4·0	—	22·5	1	57·6	4	1,548·3	100

Notes. (1) P.61–65 = Planted in the years 1961–1965 (and so on).
(2) The first vertical column covers five planting years, the following columns ten years each, and the last column an indefinite period.

TABLE 25

HIGH FOREST UNDER MAJOR TREE SPECIES WITH DETAILS FOR COUNTRIES
FORESTRY COMMISSION WOODLANDS, 1965

Thousands of Acres

Species	England			Scotland			Wales			Great Britain		
	Area	Percentages		Area	Percentages		Area	Percentages		Area	Percentages	
		of Category	of all Species		of Category	of all Species		of Category	of all Species		of Category	of all Species
Scots Pine	102·4	24	19	150·9	21	21	11·0	4	4	264·3	19	17
Corsican Pine	61·2	14	11	6·6	1	1	7·9	3	3	75·7	5	5
Lodgepole Pine	23·0	5	4	85·8	12	12	14·0	5	5	122·8	9	8
Sitka Spruce	100·1	23	18	285·8	40	40	121·9	46	44	507·8	36	34
Norway Spruce	58·7	13	11	78·7	11	11	36·2	14	13	173·6	12	11
European Larch	13·2	3	2	17·6	3	2	2·6	1	1	33·4	2	2
Japanese and Hybrid Larch	27·4	6	5	61·7	9	9	39·9	15	14	129·0	9	8
Douglas Fir	31·5	7	6	15·5	2	2	18·0	7	6	65·0	5	4
Western Hemlock	8·3	2	1	2·4	—	—	6·5	2	2	17·2	1	1
Western Red cedar	4·6	1	1	0·4	—	—	1·2	—	—	6·2	—	—
Other Conifer	8·8	2	2	10·2	1	1	8·2	3	3	27·2	2	2
Total Conifer	439·2	100	80	715·6	100	99	267·4	100	95	1,422·2	100	92
Oak	40·3	38	7	1·5	27	—	4·3	30	2	46·1	36	3
Beech	45·7	43	9	1·1	19	—	6·4	45	2	53·2	42	3
Mixed and Other Broadleaved	20·2	19	4	3·1	54	—	3·5	25	1	26·8	22	2
Total Broadleaved	106·2	100	20	5·7	100	1	14·2	100	5	126·1	100	8
Total	545·4	—	100	721·3	—	100	281·6	—	100	1,548·3	—	100

The second point is that the acreage of plantations acquired by the Forestry Commission at or since its inception in 1919, which are currently aged 50 years or more, now accounts for only 5 per cent. of the total. This is equivalent to less than two years planting at the current rate.

The third point is the imbalance in the age structure created by the post-war planting programmes. By 1970 the area of the P.61–70 age class can be expected to be similar in size to that of the P.51–60 class. Each of these two classes is, however, almost double that of the P.41–50 and nearly three times that of the P.31–40 classes.

Composition by Species

Table 25 shows the present distribution of species for the High Forest area. It shows clearly the importance attached to spruces in the afforestation programmes as Sitka spruce and Norway spruce together account for 45 per cent. of the total area in Great Britain. Pines, particularly Scots pine, account for 30 per cent. but in recent years Lodgepole pine has increased markedly in importance as a pioneer species on the poorest soil types. The only other species group of importance is the larches with 10 per cent., Japanese larch being the most widely represented.

Within individual countries the spruces and larches are of greater importance in Scotland and Wales than in England, whilst the pines are of greater importance in England and Scotland than in Wales.

Of the hardwood species, beech is of slightly greater importance than oak in Great Britain, and only in Scotland does the oak area exceed that of beech. The undifferentiated broadleaved category consists not only of a fairly wide variety of species such as poplar, ash, birch, etc. but also comprises a number of mixed stands in which oak and beech are often constituents. Table 26 shows the relative importance of the three most important species, in terms of area, in age classes planted later than 1920, for Great Britain.

TABLE 26

PRINCIPAL SPECIES IN HIGH FOREST IN RELATION TO PLANTING YEAR CLASS FORESTRY COMMISSION WOODLANDS—GREAT BRITAIN, 1965

Planting(1) Year Class	Principal Species in Order of Area					
	First	%	Second	%	Third	%
P.61–70(2) . .	Sitka spruce .	42	Lodgepole pine	18	Scots pine .	11
P.51–60 . .	Sitka spruce .	31	Scots pine .	17	Japanese larch	13
P.41–50 . .	Sitka spruce .	42	Scots pine .	17	Norway spruce	16
P.31–40 . .	Sitka spruce .	31	Norway spruce	22	Scots pine .	17
P.21–30 . .	Scots pine .	35	Sitka spruce .	20	Norway spruce	11

Notes. (1) All the Planting year classes are of ten years duration.
(2) The percentage distribution is based on plantings made between 1961 and 1967.

Sitka spruce dominates all other species in the four youngest age classes, while Scots pine is the most important in the oldest age group. One point of interest is the increasing importance of Lodgepole pine which has taken over second position of recent years from Scots pine and Norway spruce, largely as a result of the present planting programmes being concentrated on the more difficult sites in the Western and Northern parts of the country. The larches, never of very high importance in relation to the other species, are now of diminishing importance.

CHAPTER 10

VOLUME CALCULATION

The data collected for the calculation of Yield Class and timber volume in private woodlands have already been discussed in Chapter 5 but briefly the aim was first to obtain an estimate of average Top Height within each stand provided this was 15 feet or more, and secondly, to produce volume estimates for the major crop types, species and planting year classes from all stands with measurable volume, i.e. those with a mean Breast Height Quarter Girth of $2\frac{1}{2}$ inches or more. Top Height was established for a stand by measuring heights of the trees of largest girth in each of four randomly selected 1/40th acre plots where the crop was pure, and the heights of trees of each species in three 1/40th acre plots in those cases where the crop was composed of more than one species. One of these plots, again chosen at random, was selected for the collection of data on numbers of trees and basal area, and the plot size adjusted where necessary so as to include between 10 and 20 trees. Information was also collected, where applicable, on the volume thinned or felled during the period 1963 to 1965.

It must be made clear, however, that a small number of samples measured in a stand cannot be expected to give reliable estimates of Top Height or volume for that stand. If, however, the data for individual stands are grouped into categories, e.g. Scots pine P.21–30, P.31–40 and so on, the sampling errors decrease and more reliable volume estimates can then be given. The precision of the volume estimate for a given category is, however, dependent on the number of stands in which measurements have been made, and because these vary from county to county and region to region it results in the volume estimates being more reliable in some cases than in others.

In the collection of the field data considerable stress was laid on the fact that the forms containing the height and volume information should be in the same numerical order as those relating to the stand description. This was to facilitate the next stage of the operation which was to combine the data so that the information on height, basal area and volume for a given plot could be related to the relevant form containing the information on forest type, species and planting year class. Merged tapes containing all the information necessary for the calculation and apportionment of volume were therefore produced for each county.

Calculation of Standing Volume

The calculation of volume was based on the linear relationship which exists between the average Tariff number of the standing crop and Top Height cf.) Finch, Forest Record No. 32). This may not give accurate information for an individual crop but does give a statistically reliable result for a large number of stands. The relationships found by Finch were re-examined using all, instead of a sample, of the data from the Forestry Commission permanent and temporary sample plots, and not only were his findings confirmed but it was also found that for all practical purposes the data for conifers could be grouped into two sets

depending on species. The first group comprised Sitka spruce, Norway spruce, Douglas fir, Scots pine and Western red cedar, and the second European larch, Japanese larch, Corsican pine and all other conifers.

In the case of broadleaved species the relationship between the average Tariff number of the standing crop and Top Height was found to be curvilinear and a quadratic regression gave the best fit for a rather heterogeneous collection of data. This average relationship will, however, underestimate volume in those stands where the crop is composed of stems with persistent main axes, and overestimate volume in the poorer crops where the timber lengths are relatively short.

The three relationships used for the volume computation were as follows:

(1) Sitka spruce, Norway spruce, Douglas fir, Scots pine, Western red cedar.
Standing Crop Tariff number = 7·567 + 0·343 Top Height.

(2) European larch, Japanese larch, Corsican pine and all other conifers.
Standing Crop Tariff number = 4·589 + 0·417 Top Height.

(3) All broadleaved species.
Standing Crop Tariff number =
4·867815 + 0·351053 Top Height − 0·000785 (Top Height)^2.

When the merged data tape for a county was fed into the computer the machine was programmed to calculate the volume of an individual plot as follows:

(*a*) Calculate the Top Height of each species in the plot by adding together individual tree heights and dividing by the number of entries, e.g. in a crop of pure Japanese larch the measured heights of the largest-girthed tree in each of the four 1/40th acre plots may have been 43, 36, 42 and 39 feet giving a mean Top Height of 40 feet.

(*b*) This value was then applied to the appropriate species/Top Height/Tariff number relationship giving a Tariff number in this instance of 21·269.

(*c*) The computer was programmed to convert individual girths to basal area in square feet Quarter Girth, and to sum these results by species. These values, together with the Tariff number already calculated, were then substituted in the following formula:

$$\text{Plot Volume} = Na + bX$$

where N = Number of trees in plot

X = Total plot basal area

$$b = \frac{\text{Tariff number}}{0{\cdot}97}$$

$$a = -b \times 0{\cdot}03$$

(*d*) The Plot Volumes were then brought to a per-acre basis by multiplying by the reciprocal of the plot size; to a stand basis by multiplying by the net area of the stand, i.e. the gross area less that which was blank, and to a county basis by applying the appropriate multiplying factor.

The procedure for a plot in which two or more species was present was similar in that the above calculations were carried out separately for each species. In the case of two-storeyd High Forest and Coppice-with-Standards the understorey was assumed to be unmeasurable and the calculated volume was credited to the species and planting year class of the overstorey.

On completion of each plot calculation the results were stored by forest type, species and planting year class and the totals printed at the end of each county. As a separate operation the volume of each species in each planting year group was divided by the corresponding area and the mean values examined. Where results were abnormally high or low the plot volumes for that group were individually examined for errors.

Although the volumes were calculated on the basis of net stand area, i.e. the gross area less an allowance, to the nearest 5 per cent. for gaps and unstocked areas, this is only one of a number of factors which affect the volume estimates. The plots were always measured in areas which were fully stocked or else represented the stocking shown on the Stand Assessment Form so that the net area did not take fully into account the deficiencies in stocking due to minor roads, rides and paths. To allow for all these factors the standing volumes were therefore reduced by 5 per cent. on the basis of experience in Forestry Commission stands.

Volume Removed in Thinning, 1963–65

Where a crop had been thinned in the period 1963 to 1965 measurements were made of any stumps of trees which had been removed during this period from within the plot area.

The field surveyor recorded the species of each stump where possible, but failing this, noted whether it was coniferous or broadleaved. He then recorded the mean diameter under-bark of each stump, in inches to the nearest inch. This was obtained by averaging two measurements at right angles to one another. To obtain the estimated volume of thinnings the stump diameters had first to be converted to Breast Height Quarter Girths and this was done by using data from Forestry Commission permanent sample plots which showed that not only did a linear relationship exist between under-bark stump diameter and over-bark girth, a fact which was borne out by data from Europe and elsewhere, but also that, up to about 15 inches stump diameter, a single relationship could be used for all species, whether coniferous or broadleaved. There was, however, little information on the relationship for trees larger than this and it appeared likely that beyond this point the estimates would be unreliable, the girth being either over or underestimated depending on how the degree of taper between stump height and breast height varied from that assumed in the formula. However, since the bulk of the thinnings were likely to have stump diameters of less than 15 inches (i.e. about 9 inches Breast Height Quarter Girth) the errors involved are likely to be small.

The relationship was:

Breast Height Quarter Girth (over bark)=

$$1{\cdot}937213 + 2{\cdot}220426 \text{ Stump diameter under bark in inches}$$

The computer programme first converted the under-bark stump diameters to over-bark Breast Height Quarter Girths and then, if the species had been recorded, used the Tariff numbers already calculated for the main crop to calculate volume. If the stump species had not been recorded then averageTariff numbers, namely Tariff 38 for coniferous species and Tariff 28 for broadleaved species, were used in their place. The volumes were then brought to a per-acre, stand and county basis as described above.

Volume removed in Clear Felling, 1963–65

A similar procedure was used for crops clear felled in the period 1963 to 1965 except that there were no height measurements which could be used to give an indication of Tariff number. In felled crops, therefore, the surveyor measured all stumps within the plot area, recording species where possible, or failing this, whether the stumps were coniferous or broadleaved. The computer programme converted the stump diameters to girths using the same formula as that used to calculate the girths of the thinnings. Tariff 38 was then used to calculate the volume of coniferous stumps and Tariff 28 for broadleaved or for mixtures of coniferous and broadleaved stumps. As the average tree size of fellings is likely to be appreciably greater than that for thinnings, the estimate of Breast Height Quarter Girth will be less reliable. Moreover, since no heights are available for clear-felled crops, the use of average Tariff numbers will further reduce the precision of the estimate of volume. (The assumed Tariff numbers represent Top Heights of about 80 feet for coniferous species and 60 feet for broadleaved species.)

Calculation for Forestry Commission Woodlands

No field survey was made in Forestry Commission woodlands and accordingly a different method of volume computation had to be applied. Use was made of information which was already in our possession and basically this consisted of area statements showing the Yield Class distribution of individual species by planting year classes. With this information it is possible to produce an estimate of standing volume by applying the per-acre felling volume appropriate to the mean Yield Class of a given planting year class and species, to the area in that class. In the case of crops which are just coming into the volume-bearing stage, the use of the mean Yield Class may underestimate the standing volume; but the refinement of using the actual Yield Class distribution in place of the mean was not considered to be justified in view of the fact that the volumes involved are small in relation to the total.

As mentioned previously the areas of the older crops had to be adjusted to allow for the fact that the base date of the information had been altered from September 1967 to September 1965 and the volumes were accordingly calculated using these revised acreages.

The volume in Forestry Commission Woods has been estimated on a basis which differs from that used for private woodlands, but since the Tariff numbers used to obtain the estimates in the latter ownership category are based on the same data as used to construct the yield tables used for the Forestry Commission calculations, the differences are more apparent than real and are likely to be of little consequence.

TABLE 27

ESTIMATED TIMBER VOLUME BY FOREST TYPE AND OWNERSHIP, 1965

Millions of Hoppus Feet

Type	Private Woodlands				Forestry Commission Woodlands				Total Woodlands			
	England	Scotland	Wales	Great Britain	England	Scotland	Wales	Great Britain	England	Scotland	Wales	Great Britain
HIGH FOREST												
Coniferous	409	521	43	973	315	315	127	757	724	836	170	1,730
Broadleaved	1,049	239	83	1,371	97	4	11	112	1,146	243	94	1,483
TOTAL HIGH FOREST	1,458	760	126	2,344	412	319	138	869	1,870	1,079	264	3,213
Standards over Coppice	19	—	—	19	—	—	—	—	19	—	—	19
Utilisable Scrub	135	11	28	174	—	—	—	—	135	11	28	174
TOTAL	1,612	771	154	2,537	412	319	138	869	2,024	1,090	292	3,406

Total Volume Results

The estimated standing volume in Great Britain at 30th September 1965 in High Forest, Standards in Coppice-with-Standards, and Utilisable Scrub, shown in Table 27, was 3,406 million hoppus feet. Of this total 2,537 million hoppus feet or 74 per cent. were in privately owned woodlands and 869 million hoppus feet or 26 per cent. in woodlands belonging to the Forestry Commission.

High Forest accounted for 3,213 million hoppus of which only about one quarter was in Forestry Commission woods while standards in Coppice-with-Standards at 19 million hoppus feet and Utilisable Scrub at 174 million hoppus feet occurred wholly in privately owned woods. It is only in Coniferous woodland that Forestry Commission woods hold a substantial share, amounting to 44 per cent.

Analysis by countries shows that England holds 59 per cent. of the volume, Scotland 32 per cent. and Wales 9 per cent.

Volume in Private Woodlands

The break-down of the 2,537 million hoppus feet in privately owned woodlands is shown in Tables 28, 29, and 30. Table 28, shows first the analysis of the volume in High Forest and in standards over coppice for individual countries by type and planting year groups. It must be made clear that in all tables relating to private woodlands in this section volume has been first apportioned to species and then to forest type; so that for example conifer volume consists of the conifer element in predominantly coniferous stands together with the conifer element from predominantly broadleaved stands.

TABLE 28

ESTIMATED VOLUME IN HIGH FOREST AND STANDARD TREES OF COPPICE-WITH-STANDARDS BY PLANTING YEAR GROUPS AND COUNTRIES
PRIVATE WOODLANDS, 1965

Millions of Hoppus Feet

Country	Type	Planting Year Class				Total
		P.41–60	P.21–40	P.01–20	Pre-1901	
England	Coniferous	38	175	92	104	409
	Broadleaved	12	69	156	831	1,068
	Total	50	244	248	935	1,477
Scotland	Coniferous	16	173	114	218	521
	Broadleaved	—	9	16	214	239
	Total	16	182	130	432	760
Wales	Coniferous	3	21	11	8	43
	Broadleaved	—	6	13	64	83
	Total	3	27	24	72	126
Great Britain	Coniferous	57	369	217	330	973
	Broadleaved	12	84	185	1,109	1,390
	Total	69	453	402	1,439	2,363

The major points of interest are as follows:

(i) England and Scotland together hold 96 per cent. of the coniferous volume, with Scotland having the major share. Wales holds only 4 per cent. In England and Wales, however, the volume tends to be concentrated in the middle-aged planting year classes while in Scotland it tends to be concentrated in the oldest class. The youngest age class has, as yet, contributed only a small proportion of the total volume because the big increase in private planting tended to take place in the early years of the 1951 decade. The faster rates of growth in the southern part of the country and smaller dependence on pines as a major species in the planting programme has resulted in England showing a substantially higher volume in the youngest group than either Scotland or Wales. The next few years should, however, show a marked increase in these younger crops in the latter two countries.

(ii) The bulk of the broadleaved volume is in England which holds over three quarters of the volume. All three countries, however, show the same age distribution of volume in that most is concentrated in the oldest age class. This, of course, is simply a reflection of the area distribution, but the lack of potential recruitment to the mature size classes is nonetheless obvious.

An analysis of volume by species for the High Forest and Standards over Coppice categories is shown in Table 29.

TABLE 29

ESTIMATED VOLUME IN HIGH FOREST AND STANDARD TREES OF COPPICE-WITH-STANDARDS, BY SPECIES GROUPS AND COUNTRIES
PRIVATE WOODLANDS, 1965

Millions of Hoppus Feet

Species Group	England	Scotland	Wales	Great Britain
Pines	176	314	6	496
Spruces	45	79	13	137
Larches	130	84	15	229
Douglas Fir	36	16	6	58
Other Conifer	22	28	3	53
Total Conifer	409	521	43	973
Oak	496	56	43	595
Beech	201	62	10	273
Ash	109	6	10	125
Sycamore	94	28	9	131
Elm	53	13	2	68
Other Broadleaved	115	74	9	198
Total Broadleaved	1,068	239	83	1,390
Total	1,477	760	126	2,363

Of the coniferous species the pines, comprising Scots and Corsican pine, are the most important followed by the larches, spruces, Douglas fir and Other Conifer in that order. This pattern is generally reflected in both England and Scotland whilst in Wales the pines take third position behind the larches and the spruces. It should be remembered, however, that the current position reflects the pattern of the existing older crops and the new plantings in time will affect the volume distribution both in terms of quantity and in the importance of individual species.

Of the broadleaved species oak is by far the most important individual species in England followed by beech, ash, sycamore and elm. There are also substantial quantities of Sweet chestnut and birch. In Scotland, beech is the most important species followed by oak, sycamore, elm and birch whilst in Wales the order is oak, ash, beech, and sycamore. The small volume in standards over coppice in England is almost exclusively oak.

TABLE 30

ESTIMATED VOLUME OF UTILISABLE SCRUB BY SPECIES AND COUNTRIES
PRIVATE WOODLANDS, 1965

Millions of Hoppus Feet

Species Group	England	Scotland	Wales	Great Britain
Coniferous	2	—	—	2
Oak	24	6	12	42
Beech	10	1	—	11
Ash	17	—	4	21
Birch	43	3	5	51
Sycamore	11	—	2	13
Other Broadleaved	28	1	5	34
Total	135	11	28	174

Table 30 shows the distribution of volume in Utilisable Scrub which is largely composed of stands downgraded from High Forest and Coppice but also contains some crops which have previously been classed as Scrub but which have a reasonably high proportion of usable volume. The addition of this volume to the High Forest totals above therefore gives a figure which is closely but not exactly comparable with the categories sampled for volume in the 1947 Census of Woodlands.

From this table it will be seen that birch with 51 million hoppus feet is the most important species followed by oak, ash, sycamore and beech. The Other Broadleaved category contains a wide range of species of which alder is probably the most important. There is a small volume of coniferous timber representing stands at high elevation or on very exposed sites. When countries are considered England holds over three quarters of the volume, Wales 16 per cent. and Scotland 6 per cent. It is quite probable that the volume of Utilisable Scrub may be somewhat overestimated as a result of the method of volume computation used. As has been explained earlier it was primarily designed, in the case of broadleaved species, to cater for High Forest crops with timber heights of reasonable length; where stems lengths are shorter than average, as tend to be the case in

these poorer crops, the volume for a given girth and top height is exaggerated. The effect of this overestimate on this category is not, however, fully known.

Volume in Forestry Commission Woodlands

Tables 31 and 32 give information relating to Forestry Commission woodlands in a form similar to that for private woodlands, with the exception that there is no record of how much of the scrub woodland is classed as utilisable. The proportion is, however, small.

Table 31 shows the distribution of volume by planting year groups and countries.

TABLE 31

ESTIMATED VOLUME IN HIGH FOREST BY PLANTING YEAR GROUPS AND COUNTRIES FORESTRY COMMISSION WOODLANDS, 1965

Millions of Hoppus Feet

Country	Type	Planting Year Class				Total
		P.41–60	P.21–40	P.01–20	Pre-1901	
England	Coniferous	55	220	24	16	315
	Broadleaved	—	13	8	76	97
	Total	55	233	32	92	412
Scotland	Coniferous	61	206	25	23	315
	Broadleaved	—	1	1	2	4
	Total	61	207	26	25	319
Wales	Coniferous	30	92	4	1	127
	Broadleaved	—	1	1	9	11
	Total	30	93	5	10	138
Great Britain	Coniferous	146	518	53	40	757
	Broadleaved	—	15	10	87	112
	Total	146	533	63	127	869

From this table it will be seen that Scotland and England have equal proportions, i.e. just over 40% each, of the Coniferous volume, with Wales holding the balance of 17 per cent. In all three countries the P.21–40 age group holds the bulk of the volume; but the P.41–60 group, although holding less than 20 per cent. at present, will increase markedly in the next five years as approximately 50,000 acres are being recruited to the volume-bearing category each year.

The species distribution shown in Table 32 follows a fairly predictable pattern. In England the pines are at present the most important, followed by the spruces, larches and Douglas fir; in Scotland spruces, followed by pines and larches, and in Wales spruces, followed by larches and Douglas fir.

The broadleaved species are almost wholly confined to England, with oak and beech of almost equal importance. The "Other Broadleaved" category, comprising a wide range of species such as poplar, birch, alder, red oak, etc., occupies less than 15 per cent. of the broadleaved total.

TABLE 32

ESTIMATED VOLUME IN HIGH FOREST BY SPECIES GROUPS AND COUNTRIES
FORESTRY COMMISSION WOODLANDS, 1965

Millions of Hoppus Feet

Species Group	England	Scotland	Wales	Great Britain
Pines	165	79	10	254
Spruces	89	171	71	331
Larches	30	43	28	101
Douglas Fir	28	15	16	59
Other Conifer	3	7	2	12
Total Conifer	315	315	127	757
Oak	44	2	6	52
Beech	40	1	3	44
Other Broadleaved	13	1	2	16
Total Broadleaved	97	4	11	112
Total	412	319	138	869

Volume Thinned and Felled in Private Woodlands, 1963–65

Although no special survey was organised to provide information on the volume thinned and felled during the period 1963 to 1965, it was hoped that the collection of data from stands assessed on the Census would provide information on this point. The results of the investigation are not dealt with in this report as they proved unreliable in that they are well below the quantities known to have been removed during this period. The reason for the failure can partly be attributed to the inadequate size of the sample and partly to the practical difficulty of deciding what stands had been thinned or felled within the stated period. Where there was recent evidence on the ground there was, of course, no problem; but where the produce had been removed and the stumps possibly treated against fungal attack it can be extremely difficult to state with certainty when the thinning or felling took place. Added to this is the fact that stands are not necessarily wholly thinned or felled in the same forest year, so that the field assessment becomes even more difficult. Confining the investigation only to one year might have eased the surveyor's task; but it is doubtful even then if the sample would have been large enough to give precise data for operations which are confined to a relatively small proportion of the total area.

CHAPTER 11

HEDGEROW AND PARK TIMBER AND WOODS UNDER ONE ACRE

An assessment of the volume of timber standing in isolated hedgerow, park and garden trees, in woods under one acre in extent, and also in belts under one chain in width irrespective of acreage, was carried out concurrently with the main census. It differed in minor respects from the 1951 assessment although the basic survey method employed was the same.

In the 1951 survey 441 strips were selected at random and allocated to three independent samples, named the A, B and C schemes, with approximately equal numbers of samples in each. 252 of the strips were in England, 47 in Wales and 142 in Scotland, and each was 1 mile long and 2 chains wide with a standard area of 16 acres. All trees on these strips which were 6 inches Breast Height Quarter Girth or more and satisfied the definition given above, were measured for volume and allocated by species to one of three categories namely, timber, shorts or firewood, depending on whether the timber heights were 10 feet or more, 6 feet to 10 feet or less than 6 feet. Saplings, i.e. well-grown trees of between 3 and 6 inches Breast Height Quarter Girth were counted but not measured.

The results disclosed a total timber volume of 806·7 million hoppus feet of which 680·5 million hoppus feet were in England, 86·5 million in Wales and 39·7 million in Scotland. It was also clear from the results that the bulk of the volume was concentrated in central and southern England and that no less than 40 per cent. of the total lay South of a line from the Severn to the Thames.

Methods

Measurement of hedgerow strips is a very time-consuming task owing to the number of owners who have to be contacted, and in planning the 1965 survey use was made of the knowledge and experience gained in the 1951 assessment. It was therefore decided, in order to reduce the amount of field work involved, that the survey would be confined to central and southern England and that northern England, Wales and Scotland would be excluded from the sampling system. Under this arrangement over two-thirds of the volume of the category would be assessed, using only about 40 per cent. of the number of strips measured in 1951. The possible savings in time and effort were therefore substantial. All counties in England with the exception of Cumberland, Westmorland, Lancashire, Northumberland, Durham and the three Ridings of Yorkshire, were therefore included in the area to be assessed and, as is explained later, estimates were made for those parts of the country which had been excluded from the sample survey.

In order that we might have some indication of the change in volume on individual strips, all the A scheme samples which had been measured in 1951 and which fell within the designated area, were re-measured in the 1965 assessment. The balance of the sample was made up of two independent schemes, each consisting of a series of randomly selected strips with non-repeating 8-figure

co-ordinates. Thus the total number of strips within the region to be sampled was approximately the same as in 1951, and of this total one-third had the same co-ordinates as in the previous survey and two-thirds had different co-ordinates. The number measured within any one conservancy or part conservancy, also corresponded with the totals in 1951. The B and C samples selected in 1965 differed in two ways from their counterparts in 1951. First, the strips were aligned parallel to grid north and not to true north as was the case in the previous survey. This was done to make plotting simpler and, since hedgelines occur at all angles to whatever meridian is adopted, it is unlikely that this alteration can have biased the results in any way. The strips in the A scheme were, of course, aligned true North and South as in 1951 and to avoid confusion the original maps were issued to the field surveyors. The second divergence from the 1951 procedure was that in the earlier survey all the strips occurred on the centre line of the County Series map and the starting point was 1 inch above the southern margin. The position of the strip was therefore fixed in relation to the edges of the map. In 1965 the samples were plotted exclusively on 25 square kilometre maps and the strip could occur anywhere on the map, provided that it did not overlap on to an adjoining map. This constraint was adopted to avoid the complications which occur on map margins as a result of their having differing revision dates.

The field procedure was similar to previous assessments in that the surveyors established the starting point of the strip on the ground and then proceeded to measure every tree which was within 1 chain (66 feet) of the centre line, provided they satisfied the conditions of the category being measured. Trees which were dead, in an advanced stage of decay, or were so malformed as to contain no measurable timber were ignored. There was therefore no firewood category comparable with that of 1951. The remaining trees were measured for Breast Height Quarter Girth and, if conifers, measured for total height with a hypsometer. Broadleaved trees were measured for timber height, i.e. height to the first major break in the stem or to 6-inch top diameter whichever occurred first, and also for height to first stop which indicated the usable length of the butt section.

Before considering the results there are three points which should be borne in mind.

The first, is the very low sampling fraction which has been adopted for this category. In 1965, for example, 186 strips were selected within the region, representing a land area of 2,976 acres. When this is compared with the area of England included in the survey, namely 23,598,741 acres, the sampling fraction is only 0·01261 per cent. or 1 acre in every 7,930. An abnormally high or low volume on one strip can therefore exert a considerable influence on the mean volume in a region and also on the pattern of distribution of volume and number of trees.

The second point is that except where there is a lot of ground detail marked on the map, it is very easy to diverge from the centre line of the strip over part of its length and this can lead either to the inclusion of trees which should not be assessed, or alternatively the exclusion of trees which should be assessed. It is therefore difficult in some cases to compare two measurements of the same strip since they do not refer to the same land area. It is probable, however, that the gains and losses from this source will, to some extent, balance out if the

comparison is made on the combined results of a number of strips rather than on the individual strips themselves. The third point is that planting, felling, losses, and also recruitment of trees from the unmeasureable category to the sapling class, and particularly from the sapling class to the timber sizes, can radically alter the volume of a strip over a relatively short period of time. All these changes would need to be known in detail to make meaningful comparisons and, since information on fellings and losses are unobtainable for such small-scale units, any analysis must be in general rather than in specific terms.

Results

Table 33 shows the densities in hoppus feet per acre for the 61 sample strips which were measured in both 1951 and 1965. These are shown by conservancies or part-conservancies, and the New Forest, which was treated as a separate conservancy in 1951, has in this case been combined with South East England so as to provide a direct comparison with the 1965 results.

TABLE 33

ANALYSIS OF 'A' SCHEME HEDGEROW TIMBER SAMPLES MEASURED IN 1951 AND IN 1965

TIMBER VOLUME ONLY

Conservancy	Density in Hoppus Feet per Acre		
	1951	1965	Difference Using 1951 as Base
North-West England Part	17·8	19·2	+1·4
East England	12·0	10·4	−1·6
South-East England and New	24·5	91·8	+67·3
South-West England and Dean	25·9	26·0	+0·1
Total	19·3	30·8	+11·5

Table 33 shows that the differences in density per acre in all conservancies with the exception of South East England were small and can be largely attributed to the normal gains and losses which can be expected between surveys at differing points in time. In South East England, however, the difference was so large that it was obvious that there had been some radical changes in the character of the category in the intervening 14 years. All strips which showed substantial differences in volume were therefore re-visited or were examined on recent copies of aerial photographs. In two or three cases the difference could be attributed to a deviation from the centre line in 1951 which had resulted in rows or groups of trees being omitted, but the major discrepancies in the other cases could all be attributed to areas which had been classed as woodland in 1951, now being classed as isolated stems or as groups of trees, largely as a result of selective felling for house building or for garden extension. Trees are often retained on new housing estates, which have been built in former woodland areas, to act as a screen from public roads, or for amenity, and since they are often mature or over-mature, the increase of volume from this source on an

individual strip can be considerable. It is as well to remember, however, that although inclusion of trees from this source may be most apparent in South East England it is likely to be taking place to a lesser extent elsewhere, and for this reason any analysis of change based solely on the direct comparison of one survey with another is of doubtful validity since we are dealing with different situations.

Table 34 shows the estimated volumes by conservancies and part-conservancies for the assessed area based on the combined volumes of the three samples.

TABLE 34

ESTIMATED VOLUME AND MEAN VOLUME PER ACRE OF HEDGEROW TIMBER FOR CONSERVANCIES IN CENTRAL AND SOUTHERN ENGLAND, 1965

Conservancy	Millions of Hoppus Feet over Bark			Density in H.ft. Per Acre over Bark
	Coniferous	Broadleaved	Total	
North-West England Part	3·9	88·4	92·3±15·6	20·1±3·4
East England	11·3	140·1	151·4±35·3	18·8±4·4
South-East England and New.	55·8	215·2	271·0±49·8	64·7±11·9
South-West England and Dean	8·1	163·5	171·6±29·9	25·4±4·4
Total	79·1	607·2	686·3±75·5	29·1±3·2

This table shows that the volume in England, excluding the northern counties, is 686·3 million hoppus feet, of which 607·2 million, or 88 per cent., is broadleaved and 79·1 million, or 12 per cent., is coniferous. When compared with the results in 1951 East England and North West England conservancies have shown a small increase, while South West England has shown a slight drop, but the differences are generally within the standard errors of the 1951 estimates. South East England has shown a substantial increase but it will be obvious by comparing the average densities in Tables 33 and 34 that fewer samples were affected by conversion of woodland to single trees or groups in the B and C schemes than in the A scheme, and the average density of the three samples combined is only two-thirds that of the A sample alone. The choice of sample strips in this conservancy has therefore had a considerable effect on the results.

It would be unwise, therefore, to read too much into the absolute quantities found but the general inferences that can be drawn are that the volume of isolated trees and of woods under one acre has not appreciably altered in Central, East and South West England, but has increased markedly in South East England.

Table 35 compares the estimated distribution of trees in central and southern England which were classed as saplings, timber or as short timber trees, with the corresponding results in 1951.

This table shows quite clearly that there has been a significant drop in the proportion of saplings from 31 per cent. in 1951 to 23 per cent. in 1965. The proportion in the smallest timber class has increased from 18 per cent. to 28 per

TABLE 35

PERCENTAGE DISTRIBUTION OF HEDGEROW TREES BY SIZE CATEGORIES, 1965

Year	Category						Total
	Saplings	Timber, by Quarter Girth Classes				Short Timber	
		6–9[3] Inches	10–14[3] Inches	15+ Inches	Total Timber		
1951 .	31	18	22	22	62	7	100
1965 .	23	28	23	22	73	4	100

cent. while the percentages in the other classes correspond closely. It would therefore appear that there has been a substantial movement of trees from the sapling class to the timber class in the intervening period, without there having been a corresponding recruitment to the sapling class from well-grown trees classed as unmeasurable in 1951. The reduction in the sapling class is most marked in South West and North West England, East England has shown a slight drop and South East England a considerable increase.

It is clear, however, that with an overall ratio of saplings to timber sizes of one to three and every indication pointing to a further decline in the number of saplings, the volume of the hedgerow timber category in this region will decline unless something is done to rectify the imbalance between the classes.

Estimates of standing volume for areas excluded from the survey were dealt with in two ways. In the case of counties in northern England the general inference which can be drawn from the above results is that there is unlikely to have been an appreciable change in the past 14 years, and that the 1951 results could be accepted as being a reasonable estimate of the position. The data for the northern part of North West England Conservancy were therefore re-calculated on the basis of the 1951 figures and the data for North East England Conservancy taken directly from the 1951 report. In the case of Wales and Scotland the felling licence returns were used to indicate likely changes, but estimated allowances also had to be made for such items as unreported fellings and natural losses. These data, when combined and deducted from the increment, indicate the probable net gain or loss over the period, but such an analysis can only be made in very general terms and cannot be extended to give information by species or size-class representations. In Scotland, therefore, it is estimated that there has been a reduction in both the coniferous and broadleaved volumes while in Wales there has been a net gain in both. The estimated totals are given in Table 36.

This table shows that the estimated volume in isolated trees, in small woods, and in narrow belts, amounts to 946 million hoppus feet, of which 814 million or 86 per cent. is in England, 94 million or 10 per cent. in Wales and 38 million or 4 per cent. in Scotland. Compared with 1951 England and Wales have shown gains of 133 million and 8 million hoppus feet respectively, while Scotland has shown a net loss of 1 million hoppus feet. The net increase in Great Britain of 140 million hoppus feet is made up of 40 million of coniferous timber and 100 million of broadleaved timber.

TABLE 36

ESTIMATED VOLUME OF HEDGEROW AND PARK TIMBER BY COUNTRIES, 1965

Millions of Hoppus Feet

Country	Coniferous	Broadleaved	Total	Percentage of Total in Great Britain
England	83·6	730·2	813·8	86
Wales	12·3	82·2	94·5	10
England and Wales	95·9	812·4	908·3	96
Scotland	2·8	35·4	38·2	4
Great Britain	98·7	847·8	946·5	100

The general conclusions which can be drawn are as follows: First, in England, there has been a considerable increase in the volume of the Hedgerow and Park Timber category but it is largely confined to South East England Conservancy and can be primarily attributed to partial clearance of woodland for house-building and other purposes. Over the remainder of England and in Scotland and Wales there appears to have been little overall change although in purely local terms these changes may be very considerable. Secondly, when we consider the number of trees in Great Britain, it would appear that the proportion of saplings has been considerably reduced, probably due to an increase in the use of mechanical hedgecutters, but also, in some areas, as the result of the removal of hedges to enlarge fields. The ratio of saplings to timber trees in England is now approximately one to four and in Scotland probably one to twenty, and the numbers of trees represented by these ratios are incapable of maintaining an adequate and continuing promotion to the timber sizes. Only in Wales is the ratio still likely to be satisfactory but there is no current information available to confirm this point. Thus although the volume of Hedgerow timber has increased in South East England and remained fairly stable elsewhere there can be little doubt that this is a purely temporary phase and the volume will decline in time owing to lack of recruitment to the timber classes.

CHAPTER 12

COMPARISONS WITH EARLIER SURVEYS

Area

A direct comparison with previous surveys is difficult to make because definitions of forest types differ and the minimum size of wood included in the survey also changes. It is possible, however, to reconstruct the position in earlier years provided the comparison is confined to major forest types and all the survey results are brought to a common minimum acreage. This is shown for five successive returns for woods of one acre and over in Table 37.

TABLE 37

RELATIONSHIP BETWEEN PRIVATE WOODLANDS AND FORESTRY COMMISSION WOODLANDS AT FIVE SUCCESSIVE DATES—WOODS OF 1 ACRE AND OVER

Thousands of Acres

Year	Private Ownership		Forestry Commission Woodland		Total Area
	Area	%	Area	%	
1913–14	3,134	98	66*	2	3,200
1924	2,976	96	124	4	3,100
1938–39	2,958	87	442	13	3,400
1947–49	2,977	82	623	18	3,600
1965–67	2,682	62	1,618	38	4,300

Note. Estimated Areas only.
* Held by the Office of Woods, Forests and Land Revenues of the Crown.

The area under woodland is now one third greater than it was in 1913 and nearly one fifth greater than it was in 1947. The increase since the last survey has been far greater than in any period for which comparable returns are available and comment will therefore primarily be concerned with changes which have taken place since the 1947 census.

The most important change is the rise in acreage of Forestry Commission woodlands, which have increased by almost one million acres in the last eighteen years. Most of this increase is accounted for by afforestation but a proportion has resulted from the acquisition of standing woods, or of unproductive woodland for replanting, from private ownership. It is estimated that the acreage of woodland acquired by the Forestry Commission during this period is 362 thousand acres of which 38 thousand were standing woods and 324 thousand acres unproductive woodland. One would therefore expect the private woodland total to have fallen by a similar amount. In fact, the private area appears to have dropped by just under 300 thousand acres so that while there has been a large reduction as a result of acquisition by the Forestry Commission there has been some compensating gain through afforestation. The private woodland area,

therefore, although declining, is doing so at a slower rate than would at first appear. The net reduction, however, is about 16,000 acres per annum on average over the period although the amounts vary considerably from year to year.

We can next examine the proportion of productive and unproductive woodland occurring in private ownership. The Forestry Commission data, by reason of the emphasis on afforestation and the relatively small area of woodland kept in reserve for replanting, can be omitted from this aspect of the discussion.

Table 38 shows for private woodlands the percentages classed as productive and as unproductive at the four survey dates for which census data are available. Productive woodland in this context has been taken as being High Forest, Coppice with Standards and Simple Coppice, but the 1965 Census results also include Utilisable Scrub because a considerable proportion of this area has probably been classed as productive in previous surveys.

TABLE 38

CLASSIFICATION BY PRODUCTIVE AND UNPRODUCTIVE CATEGORIES AT FOUR SUCCESSIVE DATES FROM 1924–1965

PRIVATE WOODLANDS—GREAT BRITAIN, 1965

Year	Percentage Productive				Percentage Unproductive			
	England	Scotland	Wales	Great Britain	England	Scotland	Wales	Great Britain
1924 .	76	52	58	66	24	48	42	34
1938–39.	82	57	63	71	18	43	37	29
1947–49.	70	38	55	56	30	62	45	44
1965–67.	73	58	63	68	27	42	37	32

It will be seen that for Great Britain the percentage under productive crops, which was 66 per cent. in 1924, rose to 71 per cent. in 1939 and then declined sharply to 56 per cent. as a result of war-time fellings. In the past eighteen years the percentage has increased to 68 per cent. and this is not only a rise in percentage terms, which one might expect as a result of acquisition of unproductive woodland by the Forestry Commission, but also in real terms since the productive area has risen from 1,717 thousand acres in 1947 to 1,813 thousand acres in 1965. This represents an increase of 96 thousand acres, or approximately 5 thousand acres per annum, and reflects the efforts of private owners to increase the productive woodland area by means of restocking and new planting.

When individual countries are considered it will be seen that the percentage classed as productive in Scotland is now higher than any existing at the three previous survey dates, while Wales now has a similar percentage to the one just prior to the second world war. England, on the other hand, is now at a level which, although higher than that in 1947, is still well below the percentages present in the inter-war years. It must be remembered, however, that the bulk of the Felled and Scrub land purchased by the Forestry Commission has been in the upland areas and consequently the more dramatic rises in the productive percentages of Scotland and Wales can be attributed in part to the fact that they

are calculated on lower total acreages than in 1947. Nonetheless in all three countries the drop in the proportion of the woodland area classed as unproductive is encouraging.

It is not possible to analyse the High Forest area in the same detail for the four surveys for two reasons. The first is that in the past data were normally collected in terms of Coniferous, Mixed and Broadleaved High Forest while in the current survey only Mainly Coniferous and Mainly Broadleaved High Forest were recognised. Direct comparison can, however, be made between the 1947 and 1965 surveys because the data were summarised on both bases. The second reason is that the substantial decline in the area classed as Coppice in the last forty years is due to its re-allocation to other forest types and consequently makes valid comparisons difficult. This particular aspect, however, only affects the broadleaved area and this fact should be borne in mind when drawing conclusions from Table 39, which compares the areas of Mainly Coniferous and Mainly Broadleaved High Forest in 1947 and 1965. Utilisable Scrub has again been included in the 1965 totals.

TABLE 39

AREA OF CONIFEROUS AND BROADLEAVED HIGH FOREST IN 1947 AND 1965
PRIVATE WOODLANDS OF ONE ACRE AND OVER—GREAT BRITAIN, 1965

Thousands of Acres

Year	Coniferous				Broadleaved				Total			
	England	Scotland	Wales	Great Britain	England	Scotland	Wales	Great Britain	England	Scotland	Wales	Great Britain
1947–49 .	211	268	25	504	637	133	95	865	848	401	120	1,369
1965–67 .	383	405	56	844	722	101	75	898	1,105	506	131	1,742

This table shows very clearly the emphasis laid on the use of coniferous species in the last eighteen years. Since 1947 the area of conifers in Great Britain in woods of one acre and over has risen from about 504 thousand acres to about 844 thousand acres, a rise of 340 thousand acres or 67 per cent. on the 1947 total. The corresponsing increases by countries are England, 172 thousand acres or 81 per cent.; Scotland, 137 thousand acres or 51 per cent. and Wales 31 thousand acres or 124 per cent. On the other hand the broadleaved area has risen from 865 thousand acres in 1947 to 898 thousand acres in 1965, a rise of 33 thousand acres, with Scotland and Wales showing substantial reductions and England a substantial rise in area. This increase is, however, more apparent than real since it results primarily from the reclassification of between 200 and 250 thousand acres of coppice-with-standards and coppice categories as High Forest or Utilisable Scrub. Since the current broadleaved area has only risen by about 30 thousand acres it follows that about 200 thousand acres previously under broadleaved crops have now been felled and replanted with conifers. This trend of replacing hardwood crops with conifers appears likely to continue but a proportion of these new crops do contain a hardwood element and they may become predominantly, although not necessarily wholly, broadleaved at a later stage of the rotation.

Briefly, the general trends in private woodlands since 1947 are first, a big increase, in comparison with pre-war rates, in the area which is restocked or afforested annually; secondly, a swing towards coniferous species in new planting particularly of the faster growing species, and thirdly, a considerable reduction in the area of unproductive woodland, partly as a result of replanting, and partly by acquisition by the Forestry Commission. About one third of the private woodland area is still, however, classed as unproductive.

In Forestry Commission woodlands the greater part of the effort is still directed towards new planting, i.e. planting of bare land or former woodland acquired from private ownership and only about 10 per cent. is restocking of areas felled during the normal forest operations. The area of scrub or felled land held in reserve is normally small. Acquisition of former woodland for replanting is likely to continue and will have a considerable influence in reducing the area of unproductive woodland in Great Britain.

Volume

Private woodlands show an increase in volume on the 1947 figures from 2,498 million hoppus feet to 2,537 million hoppus feet. Coniferous volume has increased from 919 million hoppus feet to 973 million and broadleaved volume has decreased from 1,579 million to 1,564 million. When individual countries are considered both England and Wales show increases in coniferous volume whilst Scotland shows a decrease, and in broadleaved volume only England shows an increase. The decline in the volume in Scotland can partly be attributed to losses from windblow which have been severe in the older age groups and in particular in Scots pine.

It should be remembered, however, that the categories sampled in the 1965 Census are not exactly comparable with those sampled in the 1947 Census. Nevertheless the general conclusions that can be drawn are that there has been an increase in the volume of coniferous crops in the past eighteen years and that this increase is likely to become more marked as the younger crops reach the volume-bearing stage. The broadleaved volume has shown a slight decrease and, as it is probable that some crops have been included in the 1965 survey which were not measured in 1947, the reduction in volume may be even greater than shown.

Forestry Commission woods have shown a substantial increase in volume from 378 million hoppus feet to 869 million hoppus feet. Almost all this increase has been in conifers and with such a heavy preponderance of young crops, the standing volume can be expected to increase markedly in the near future.

CHAPTER 13

CONCLUSIONS

The main conclusions arising from the sample survey of private woodlands, carried out between the years 1965 and 1967, and from existing Forestry Commission data of the same base date, are as follows:

(i) **The total area of woodland in Great Britain** at 30th September 1965, occurring in woods of 1 acre in extent and over, is estimated to be 4,305·1 thousand acres (1 742·2 thousand hectares). This represents 7·6 per cent. of the land area of Great Britain.

(ii) **Private Woodlands,** including private estates, corporations, water boards etc., account for 2,686·7 thousand acres (1 087·3 thousand hectares) or 62 per cent and **Forestry Commission Woodlands** for 1,618·4 thousand acres (654·9 thousand hectares) or 38 per cent.

(iii) **Productive Woodland** i.e. High Forest, Coppice, Coppice with Standards and Utilisable Scrub amounts to 3,363·9 thousand acres (1 361·3 thousand hectares) or 78 per cent. of the total area. 1,813·5 thousand acres (733·9 thousand hectares) or 54 per cent. of the productive area are in private ownership and the balance of 1,550·4 thousand acres (627·4 thousand hectares) or 46 per cent. of the total area are owned by the Forestry Commission.

(iv) **High Forest** occupies an area of 3,130·9 thousand acres (1 267·0 thousand hectares). Coniferous High Forest accounts for 2,266·6 thousand acres (917·2 thousand hectares) of this total of which 844·4 thousand acres (341·7 thousand hectares) or 37 per cent. are privately owned and 1,422·2 thousand acres (575·5 thousand hectares) or 63 per cent. are owned by the Forestry Commission. Broadleaved High Forest occupies a total of 864·3 thousand acres (349·8 thousand hectares) of which 738·2 thousand acres (298·8 thousand hectares) or 85 per cent. are privately owned and 126·1 thousand acres (51·0 thousand hectares) or 15 per cent by the Forestry Commission.

(v) **The age class distribution of Coniferous High Forest** is still very unbalanced in the direction of the younger age classes. 58 per cent. of the area is under 15 years of age and 71 per cent. under 25 years of age. The corresponding proportions in private woodlands are 56 per cent. and 63 per cent. and in Forestry Commission woods, 59 per cent. and 75 per cent.

(vi) **The age class distribution of Broadleaved High Forest** on the other hand is unbalanced in the direction of the older age classes with only 10 per cent. aged 15 years or less and 15 per cent. aged 25 years or less. Two thirds of the area is 65 years of age or more and the bulk of this total is over 100 years of age.

(vii) **Coppice types** still worked under traditional systems or still classifiable as coppice and capable of being worked are estimated to be 73·1 thousand acres (29·6 thousand hectares) and are almost wholly in private ownership. One third of the total is classed as Coppice with Standards and two thirds as Simple Coppice. The acreage currently being worked on rotation is probably about 40 thousand acres (16·2 thousand hectares).

(viii) **Scrub and Felled woodland** amount to 1,101·1 thousand acres (445·6 thousand hectares). Utilisable scrub, which is essentially low grade High Forest accounts for 159·9 thousand acres (64·7 thousand hectares) or 15 per cent. of the category, so that the wholly unproductive area is 941·2 thousand acres (380·9 thousand hectares). Most of this land is in private ownership and if replanted is capable of growing High Forest crops.

(ix) **The total standing volume** in High Forest, Standards in Coppice with Standards and Utilisable Scrub is estimated to be 3,406 million hoppus feet (122·8 million cubic metres). 2,537 million hoppus feet (91·5 million cubic metres) or 74 per cent. is in privately owned woods and 869 million (31·3 million cubic metres) or 26 per cent. in Forestry Commission woods.

(x) **High Forest volume** accounts for 3,213 million hoppus feet (115·8 million cubic metres) of which 1,730 million hoppus feet (62·4 million cubic metres) or 54 per cent. are coniferous and 1,483 million hoppus feet (53·4 million cubic metres) or 46 per cent. are broadleaved. The respective holdings of coniferous and broadleaved timber in private woodlands are 973 million hoppus feet (35·1 million cubic metres) and 1,371 million hoppus feet (49·4 million cubic metres) and in Forestry Commission woods 757 million hoppus feet (27·3 million cubic metres) and 112 million hoppus feet (4·0 million cubic metres). Private woodlands hold 56 per cent. of the coniferous volume and 92 per cent. of the broadleaved volume.

(xi) **Standards in Coppice with Standards and Utilisable Scrub** hold 19 million hoppus feet (0·7 million cubic metres) and 174 million hoppus feet (6·3 million cubic metres) respectively, almost all of which is privately owned.

(xii) **The volume of Hedgerow and Park trees,** mostly broadleaved, is estimated to be 946 million hoppus feet (34·1 million cubic metres) of which 86 per cent. is in England, 10 per cent. in Wales and 4 per cent. in Scotland.

APPENDIX I

REGIONAL BOUNDARIES, CENSUS OF WOODLANDS, 1965–67

Region Number	Private Woodland Area (Thous. Acres)		
	From Sample	Estimated Unsurveyed	Total
I	61.4	—	61.4
II	130.4	3.8	134.2
III	88.2	—	88.2
IV	278.0	—	278.0
V	115.1	13.9	129.0
VI	177.9	—	177.9
VII	140.0	—	140.0
VIII	160.9	—	160.9
IX	170.0	—	170.0
X	48.2	—	48.2
XI	100.0	4.8	104.8
XII	101.3	—	101.3
XIII	101.5	—	101.5
XIV	179.0	—	179.0
XV	96.5	—	96.5
XVI	231.7	—	231.7
XVII	148.9	4.5	153.4
XVIII	330.7	—	330.7
Total	2659.7	27.0	2686.7

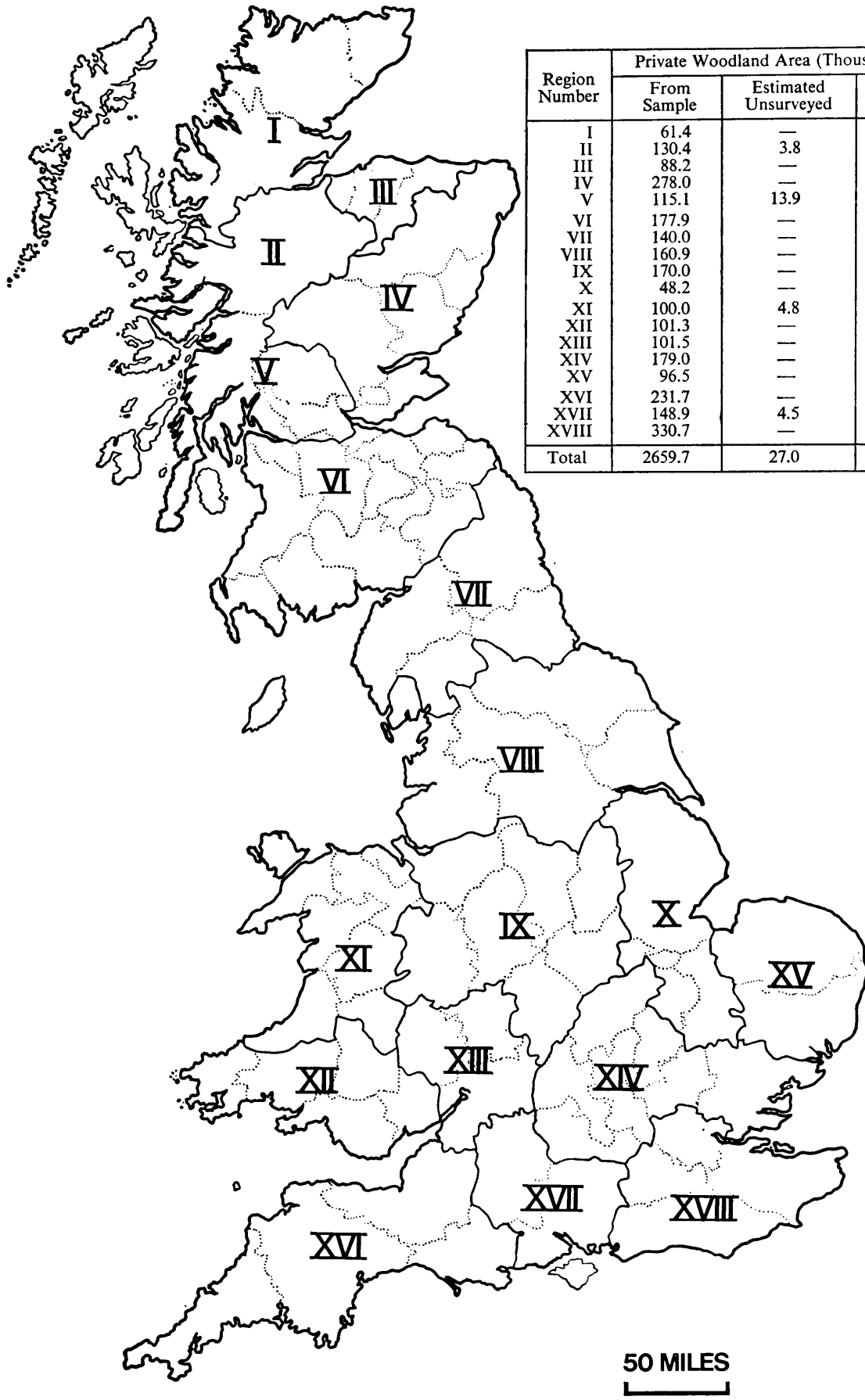


Fig. 5. Map of Regional Boundaries

This map shows the Regional boundaries adopted for the 1965–1967 Census and the estimated Private Woodland areas in each Region. These regions do not coincide with Forestry Commission Conservancies. See Figure 6, page 107, For Conservancy Boundaries.

APPENDIX II

COUNTY LAND AND INLAND WATER AREAS AS AT 1ST APRIL 1965

ENGLAND — Acres

County	Land	Inland Water	Total
Bedfordshire	304,016	1,113	305,129
Berkshire	460,730	3,100	463,830
Buckinghamshire	475,726	2,032	477,758
Cambridgeshire	529,866	1,689	531,555
Cheshire	642,721	6,793	649,514
Cornwall* (31/12/66)	878,532	1,758	880,290
Cumberland	961,605	11,542	973,147
Derbyshire	639,142	4,427	643,569
Devonshire* (31/12/66)	1,654,625	4,863	1,659,488
Dorset	622,137	1,608	623,745
Durham	645,781	3,672	649,453
Essex	904,499	3,350	907,849
Gloucestershire	802,317	2,611	804,928
Hampshire (excluding I.O.W.)	958,297	3,894	962,191
Herefordshire	536,071	2,853	538,924
Hertfordshire	401,933	1,789	403,722
Huntingdonshire	309,776	1,088	310,864
Kent	918,734	2,895	921,629
Lancashire	1,186,115	15,725	1,201,840
Leicestershire	530,025	2,352	532,377
Lincolnshire	1,699,936	4,449	1,704,385
London	390,072	4,415	394,487
Norfolk	1,307,425	6,908	1,314,333
Northamptonshire	582,849	2,276	585,125
Northumberland	1,284,567	7,473	1,292,040
Nottinghamshire	536,637	3,365	540,002
Oxfordshire	476,622	2,556	479,178
Rutland	97,087	186	97,273
Shropshire	856,651	5,151	861,802
Somerset	1,029,451	2,876	1,032,327
Staffordshire	736,084	7,108	743,192
Suffolk	945,406	2,866	948,272
Surrey	411,118	4,759	415,877
Sussex	928,813	3,737	932,550
Warwick	619,609	3,967	623,576
Westmorland	496,464	8,453	504,917
Wiltshire	857,796	2,814	860,610
Worcestershire	445,309	3,081	448,390
Yorks—East Riding	748,519	1,852	750,371
North Riding	1,356,589	5,206	1,361,795
West Riding	1,771,786	14,000	1,785,786
Total Area included in Sample	31,941,438	176,652	32,118,090
Hampshire (Isle of Wight)	93,926	214	94,140
Total England	32,035,364	176,866	32,212,230

Source: Director General, Ordnance Survey.

* The areas of Devon and Cornwall take account of the South Western Counties Order 1965 and the Cornwall and Devon (Broadwoodwidger) Order 1965 which had been implemented before the survey of these counties took place.

Appendix II, continued: County Areas, 1965

SCOTLAND

Acres

County	Land	Inland Water	Total
Aberdeen	1,261,333	6,970	1,268,303
Angus	559,090	3,353	562,443
Argyll (mainland only)	1,469,445	27,623	1,497,068
Ayr	724,234	6,594	730,828
Banff	403,054	1,977	405,031
Berwick	292,535	1,359	293,894
Caithness	438,943	7,177	446,120
Clackmannan	34,860	290	35,150
Dumfries	688,112	4,021	692,133
Dunbarton	154,462	13,531	167,993
East Lothian	171,044	421	171,465
Fife	322,856	2,289	325,145
Inverness (mainland only)	1,916,768	67,399	1,984,167
Kincardine	244,428	1,197	245,625
Kinross	52,392	3,457	55,849
Kirkcudbright	574,024	6,779	580,803
Lanark	574,473	4,750	579,223
Midlothian	234,385	2,267	236,652
Moray	304,931	3,198	308,129
Nairn	104,252	760	105,012
Peebles	222,240	1,048	223,288
Perth	1,595,804	37,036	1,632,840
Renfrew	143,829	2,941	146,770
Ross & Cromarty (mainland only)	1,572,835	48,101	1,620,936
Roxburgh	425,564	2,440	428,004
Selkirk	171,209	1,797	173,006
Stirling	288,345	8,786	297,131
Sutherland (mainland only)	1,295,062	47,721	1,342,783
West Lothian	76,855	549	77,404
Wigtown	311,984	2,892	314,876
Total Area included in Sample	16,629,348	318,723	16,948,071
Argyll (islands)	521,077	7,734	528,811
Bute	139,711	805	140,516
Inverness (islands)	778,326	23,998	802,324
Orkney	240,848	8,563	249,411
Ross and Cromarty (islands)	404,419	24,863	429,282
Sutherland (islands)	2,741	6	2,747
Zetland	352,337	9,631	361,968
Total Scotland	19,068,807	394,323	19,463,130

Appendix II, continued: County Areas, 1965

WALES — Areas

County	Land	Inland Water	Total
Anglesey	175,812	882	176,694
Breconshire	466,347	2,934	469,281
Caernarvonshire	360,307	3,801	364,108
Cardiganshire	441,237	1,952	443,189
Carmarthenshire	586,152	2,320	588,472
Denbighshire	426,186	1,791	427,977
Flintshire	163,041	666	163,707
Glamorganshire	518,982	4,262	523,244
Merionethshire	418,475	3,897	422,372
Monmouth	344,698	2,083	346,781
Montgomeryshire	505,738	4,372	510,110
Pembrokeshire	392,388	619	393,007
Radnorshire	299,521	1,644	301,165
	5,098,884	31,223	5,130,107

APPENDIX III

TOTAL WOODLAND AREA BY CONSERVANCY AND OWNERSHIP, 1965

Thousands of Acres

Conservancy	Ownership		Total Area
	Private	Forestry Commission	
North-West England	271·8	98·8	370·6
North-East England	199·2	176·3	375·5
East England	286·7	106·8	393·5
South-East England and New Forest	479·7	97·3	577·0
South-West England and Dean Forest	374·5	98·3	472·8
Total England	1611·9	577·5	2189·4
North Scotland	246·8	201·1	447·9
East Scotland	330·6	194·7	525·3
South Scotland	151·5	188·4	339·9
West Scotland	139·8	167·1	306·9
Total Scotland	868·7	751·3	1620·0
North Wales	102·2	148·8	251·0
South Wales	103·9	140·8	244·7
Total Wales	206·1	289·6	495·7
Total Great Britain	2686·7	1618·4	4305·1

APPENDIX IV

PRIVATE WOODLANDS: AREA BY CONSERVANCY AND FOREST TYPE, 1965

Thousand Acres

Conservancy	CHF	BHF	Coppice with Standards	Coppice		Scrub		Felled		Total
				Worked	Unworked	Utilisable	Unutilisable	1963–65	Pre-1963	
North West England	66·1	96·1	2·9	0·4	0·1	10·3	87·9	1·0	7·0	271·8
North East England	79·8	52·1	—	—	—	11·6	49·0	1·8	4·9	199·2
East England	56·1	122·5	1·4	1·4	1·9	24·5	74·8	1·4	2·7	286·7
South East England and New Forest	89·6	161·0	18·6	34·4	4·7	50·2	117·3	2·4	1·5	479·7
South West England and Dean Forest	91·6	166·7	2·5	2·2	0·3	27·3	78·3	1·6	4·0	374·5
Total England	383·2	598·4	25·4	38·4	7·0	123·9	407·3	8·2	20·1	1,611·9
North Scotland	103·4	4·6	—	—	—	2·7	99·4	0·8	35·9	246·8
East Scotland	167·4	32·3	—	—	—	2·2	64·8	0·9	63·0	330·6
South Scotland	88·2	25·3	—	—	—	1·0	27·1	1·3	8·6	151·5
West Scotland	46·4	29·2	—	—	—	4·0	45·0	0·3	14·9	139·8
Total Scotland	405·4	91·4	—	—	—	9·9	236·3	3·3	122·4	868·7
North Wales	35·3	28·7	—	—	—	6·9	27·2	0·2	3·9	102·2
South Wales	20·5	19·7	—	0·2	—	19·2	42·9	0·1	1·3	103·9
Total Wales	55·8	48·4	—	0·2	—	26·1	70·1	0·3	5·2	206·1

APPENDIX V

PRIVATE WOODLANDS: AREA OF CONIFEROUS HIGH FOREST BY CONSERVANCY AND PLANTING YEAR CLASS, 1965

Thousand Acres

Conservancy	P.61–65	P.51–60	P.41–50	P.31–40	P.21–30	P.11–20	P.01–10	P.1861–1900	Pre-1861	Total
North West England	14·1	19·7	6·2	7·8	8·0	3·8	2·3	3·5	0·7	66·1
North East England	14·6	22·6	9·8	11·4	9·3	5·0	4·1	2·9	0·1	79·8
East England	12·8	18·5	4·5	5·9	4·7	2·5	2·3	3·4	1·5	56·1
South East England and New Forest	25·0	28·7	7·1	7·4	7·1	3·2	3·4	7·3	0·4	89·6
South West England and Dean Forest	28·0	22·5	9·2	7·9	13·2	3·6	3·0	3·6	0·6	91·6
Total England	94·5	112·0	36·8	40·4	42·3	18·1	15·1	20·7	3·3	383·2
North Scotland	27·6	31·0	4·2	3·1	4·1	4·9	3·0	16·7	8·8	103·4
East Scotland	33·0	61·8	9·3	13·2	14·3	8·1	6·2	12·0	9·5	167·4
South Scotland	16·9	31·1	8·8	8·8	11·7	3·3	3·4	4·1	0·1	88·2
West Scotland	9·0	11·5	3·3	6·6	7·6	2·0	2·5	2·2	1·7	46·4
Total Scotland	86·5	135·4	25·6	31·7	37·7	18·3	15·1	35·0	20·1	405·4
North Wales	11·0	11·7	1·4	3·1	3·9	1·8	1·0	1·4	—	35·3
South Wales	8·8	8·3	0·5	0·8	0·8	0·3	0·6	0·3	0·1	20·5
Total Wales	19·8	20·0	1·9	3·9	4·7	2·1	1·6	1·7	0·1	55·8

APPENDIX VI

PRIVATE WOODLANDS: AREA OF BROADLEAVED HIGH FOREST, 1965

Thousand Acres

Conservancy	P.61–65	P.51–60	P.41–50	P.31–40	P.21–30	P.11–20	P.01–10	P.1861–1900	Pre-1861	Total
North West England	1·7	3·2	2·4	3·1	2·8	4·3	8·8	43·8	26·0	96·1
North East England	1·2	1·8	1·7	2·8	3·1	4·6	8·1	22·3	6·5	52·1
East England	4·5	5·9	4·0	5·4	3·4	8·8	10·3	52·2	28·0	122·5
South East England and New Forest	2·7	7·6	5·1	4·2	5·1	7·1	9·2	75·0	45·0	161·0
South West England and Dean Forest	3·8	6·5	6·1	5·8	11·2	9·5	14·9	64·9	44·0	166·7
Total England	13·9	25·0	19·3	21·3	25·6	34·3	51·3	258·2	149·5	598·4
North Scotland	—	—	0·1	0·2	0·1	—	—	2·3	1·9	4·6
East Scotland	0·2	1·3	2·3	0·8	2·1	1·9	2·2	5·5	16·0	32·3
South Scotland	0·1	0·7	0·2	0·4	0·4	0·5	1·8	14·6	6·6	25·3
West Scotland	0·1	0·3	1·0	0·9	0·9	0·5	1·1	10·6	13·8	29·2
Total Scotland	0·4	2·3	3·6	2·3	3·5	2·9	5·1	33·0	38·3	91·4
North Wales	0·2	0·7	0·7	0·5	0·7	1·1	1·7	12·0	11·1	28·7
South Wales	0·4	0·5	0·1	0·8	1·3	0·8	3·5	6·4	5·9	19·7
Total Wales	0·6	1·2	0·8	1·3	2·0	1·9	5·2	18·4	17·0	48·4

APPENDIX VII

PRIVATE WOODLANDS: HIGH FOREST AREA BY CONSERVANCY, SPECIES GROUP AND PLANTING YEAR CLASS, 1965

ENGLAND — Thousand Acres

Conservancy	Species Group	P.61–65	P.41–60	P.21–40	P.01–20	Pre-1901	Total
North West England	Pines	6·5	11·2	6·6	1·5	2·1	27·9
	Spruces	3·3	4·3	1·6	0·2	0·1	9·5
	Larches	3·0	8·2	7·1	4·2	1·7	24·2
	Douglas Fir	0·6	1·0	0·4	—	—	2·0
	Other Conifer	0·7	1·2	0·1	0·2	0·3	2·5
	Total Conifer	14·1	25·9	15·8	6·1	4·2	66·1
	Oak	—	1·0	0·9	3·4	40·3	45·6
	Beech	0·6	0·1	0·6	0·8	5·5	7·6
	Sycamore	0·2	1·0	1·7	3·4	13·0	19·3
	Ash	0·1	0·9	1·1	2·9	3·9	8·9
	Other Broadleaved	0·8	2·6	1·6	2·6	7·1	14·7
	Total Broadleaved	1·7	5·6	5·9	13·1	69·8	96·1
	Total High Forest	15·8	31·5	21·7	19·2	74·0	162·2
North East England	Pines	5·6	12·3	8·9	5·3	1·7	33·8
	Spruces	3·5	7·5	4·6	1·0	0·1	16·7
	Larches	4·7	11·7	6·1	2·5	1·0	26·0
	Douglas Fir	0·4	0·6	0·8	0·1	—	1·9
	Other Conifer	0·4	0·3	0·3	0·2	0·2	1·4
	Total Conifer	14·6	32·4	20·7	9·1	3·0	79·8
	Oak	—	0·4	0·7	2·0	11·9	15·0
	Beech	0·2	0·9	0·6	1·1	4·4	7·2
	Sycamore	0·7	0·6	1·6	5·3	7·6	15·8
	Ash	—	0·9	1·2	3·3	2·2	7·6
	Other Broadleaved	0·3	0·7	1·8	1·0	2·7	6·5
	Total Broadleaved	1·2	3·5	5·9	12·7	28·8	52·1
	Total High Forest	15·8	35·9	26·6	21·8	31·8	131·9

Appendix VII, continued: Private Woodlands, High Forest, 1965

ENGLAND — Thousand Acres

Conservancy	Species Group	P.61–65	P.41–60	P.21–40	P.01–20	Pre-1901	Total
East England	Pines	6·3	11·7	4·7	1·8	3·7	28·2
	Spruces	3·1	2·6	0·8	0·9	0·3	7·7
	Larches	2·2	6·6	4·8	1·5	0·4	15·5
	Douglas Fir	0·5	1·3	0·3	0·5	0·1	2·7
	Other Conifer	0·7	0·8	—	0·1	0·4	2·0
	Total Conifer	12·8	23·0	10·6	4·8	4·9	56·1
	Oak	—	1·2	2·0	2·5	39·1	44·8
	Beech	1·0	1·0	0·7	2·8	21·3	26·8
	Ash	0·2	0·9	2·9	6·5	7·6	18·1
	Poplar	2·7	5·0	0·4	0·2	0·3	8·6
	Other Broadleaved	0·6	1·8	2·8	7·1	11·9	24·2
	Total Broadleaved	4·5	9·9	8·8	19·1	80·2	122·5
	Total High Forest	17·3	32·9	19·4	23·9	85·1	178·6
South East England and New Forest	Pines	10·0	19·1	8·6	4·7	4·6	47·0
	Spruces	5·6	3·6	0·6	0·3	0·5	10·6
	Larches	3·7	9·2	4·2	0·9	0·9	18·9
	Douglas Fir	2·7	2·7	0·7	0·6	0·4	7·1
	Other Conifer	3·0	1·2	0·4	0·1	1·3	6·0
	Total Conifer	25·0	35·8	14·5	6·6	7·7	89·6
	Oak	0·3	1·3	2·0	9·9	92·6	106·1
	Beech	1·1	1·4	0·9	1·6	15·6	20·6
	Birch	0·3	5·9	2·7	0·7	1·2	10·8
	Ash	—	1·1	1·5	2·1	3·2	7·9
	Other Broadleaved	1·0	3·0	2·2	2·0	7·4	15·6
	Total Broadleaved	2·7	12·7	9·3	16·3	120·0	161·0
	Total High Forest	27·7	48·5	23·8	22·9	127·7	250·6
South West England and Dean	Pines	2·9	7·2	5·9	1·4	2·4	19·8
	Spruces	9·1	5·3	2·5	0·6	0·2	17·7
	Larches	6·6	14·2	10·1	3·2	1·1	35·2
	Douglas Fir	6·4	3·6	2·5	1·1	0·1	13·7
	Other Conifer	3·0	1·4	0·1	0·3	0·4	5·2
	Total Conifer	28·0	31·7	21·1	6·6	4·2	91·6
	Oak	—	1·4	6·7	11·6	77·2	96·9
	Beech	1·4	2·0	1·7	1·9	16·9	23·9
	Ash	0·2	4·2	4·4	6·8	8·9	24·5
	Sycamore	0·2	0·9	1·3	1·6	1·6	5·6
	Other Broadleaved	2·0	4·1	2·9	2·5	4·3	15·8
	Total Broadleaved	3·8	12·6	17·0	24·4	108·9	166·7
	Total High Forest	31·8	44·3	38·1	31·0	113·1	258·3

Appendix VII, continued: Private Woodlands, High Forest, 1965

SCOTLAND — Thousand Acres

Conservancy	Species Group	P.61–65	P.41–60	P.21–40	P.01–20	Pre-1901	Total
North Scotland	Pines	16·9	29·6	5·6	5·9	23·6	81·6
	Spruces	7·9	3·1	0·6	0·2	0·2	12·0
	Larches	0·6	2·2	0·5	1·5	1·3	6·1
	Douglas Fir	1·8	0·2	0·5	0·3	0·2	3·0
	Other Conifer	0·4	0·1	—	—	0·2	0·7
	Total Conifer	27·6	35·2	7·2	7·9	25·5	103·4
	Oak	—	—	—	—	2·4	2·4
	Beech	—	—	—	—	1·2	1·2
	Birch	—	0·1	0·3	—	0·1	0·5
	Ash	—	—	—	—	0·2	0·2
	Other Broadleaved	—	—	—	—	0·3	0·3
	Total Broadleaved	—	0·1	0·3	—	4·2	4·6
	Total High Forest	27·6	35·3	7·5	7·9	29·7	108·0
East Scotland	Pines	17·0	42·6	16·9	9·4	18·1	104·0
	Spruces	11·8	15·5	4·5	0·9	0·4	33·1
	Larches	3·7	12·2	5·3	3·1	1·3	25·6
	Douglas Fir	0·4	0·6	0·3	0·3	0·4	2·0
	Other Conifer	0·1	0·2	0·5	0·6	1·3	2·7
	Total Conifer	33·0	71·1	27·5	14·3	21·5	167·4
	Oak	0·1	—	—	—	3·9	4·0
	Beech	—	0·1	0·3	0·6	7·1	8·1
	Birch	—	3·1	1·7	2·6	0·2	7·6
	Sycamore	—	0·1	0·5	0·3	1·1	2·0
	Other Broadleaved	0·1	0·3	0·4	0·6	9·2	10·6
	Total Broadleaved	0·2	3·6	2·9	4·1	21·5	32·3
	Total High Forest	33·2	74·7	30·4	18·4	43·0	199·7

Appendix VII, continued: Private Woodlands, High Forest, 1965

SCOTLAND — Thousand Acres

Conservancy	Species Group	P.61–65	P.41–60	P.21–40	P.01–20	Pre-1901	Total
South Scotland	Pines	2·4	8·6	7·8	3·8	3·3	25·9
	Spruces	10·6	19·6	6·4	1·1	0·5	38·2
	Larches	3·3	10·4	5·6	1·7	0·2	21·2
	Douglas Fir	0·2	0·5	0·6	0·1	0·1	1·5
	Other Conifer	0·4	0·8	0·1	—	0·1	1·4
	Total Conifer	16·9	39·9	20·5	6·7	4·2	88·2
	Oak	—	0·2	—	0·8	7·1	8·1
	Beech	0·1	—	—	—	5·4	5·5
	Sycamore	—	0·3	0·4	1·2	3·0	4·9
	Elm	—	—	—	0·1	1·5	1·6
	Other Broadleaved	—	0·4	0·4	0·2	4·2	5·2
	Total Broadleaved	0·1	0·9	0·8	2·3	21·2	25·3
	Total High Forest	17·0	40·8	21·3	9·0	25·4	113·5
West Scotland	Pines	0·8	2·7	3·4	2·9	2·1	11·9
	Spruces	5·5	7·6	6·6	0·4	0·4	20·5
	Larches	2·2	3·9	3·9	1·1	0·3	11·4
	Douglas Fir	0·1	0·3	0·3	0·1	0·1	0·9
	Other Conifer	0·4	0·3	—	—	1·0	1·7
	Total Conifer	9·0	14·8	14·2	4·5	3·9	46·4
	Oak	—	0·1	0·3	0·5	10·6	11·5
	Beech	0·1	—	—	0·2	4·7	5·0
	Sycamore	—	—	0·4	0·4	2·8	3·6
	Birch	—	1·1	1·1	0·3	—	2·5
	Other Broadleaved	—	0·1	—	0·2	6·3	6·6
	Total Broadleaved	0·1	1·3	1·8	1·6	24·4	29·2
	Total High Forest	9·1	16·1	16·0	6·1	28·3	75·6

Appendix VII, continued: Private Woodlands, High Forest, 1965

WALES — Thousand Acres

Conservancy	Species Group	P.61–65	P.41–60	P.21–40	P.01–20	Pre-1901	Total
North Wales	Pines	0·3	1·0	0·4	0·3	0·5	2·5
	Spruces	8·0	5·2	3·2	1·0	0·1	17·5
	Larches	0·6	5·2	2·3	1·0	0·6	9·7
	Douglas Fir	1·5	1·3	1·1	0·5	0·1	4·5
	Other Conifer	0·6	0·4	—	—	0·1	1·1
	Total Conifer	11·0	13·1	7·0	2·8	1·4	35·3
	Oak	0·1	0·4	0·2	0·9	18·4	20·0
	Beech	0·1	0·3	0·3	0·1	1·4	2·2
	Sycamore	—	0·3	0·3	0·8	1·3	2·7
	Ash	—	0·3	0·3	0·7	1·2	2·5
	Other Broadleaved	—	0·1	0·1	0·3	0·8	1·3
	Total Broadleaved	0·2	1·4	1·2	2·8	23·1	28·7
	Total High Forest	11·2	14·5	8·2	5·6	24·5	64·0
South Wales	Pines	0·2	0·4	0·3	0·1	0·1	1·1
	Spruces	7·1	2·8	0·4	0·1	—	10·4
	Larches	0·8	3·7	0·8	0·5	0·3	6·1
	Douglas Fir	0·5	1·6	—	0·2	—	2·3
	Other Conifer	0·2	0·3	0·1	—	—	0·6
	Total Conifer	8·8	8·8	1·6	0·9	0·4	20·5
	Oak	—	0·2	0·3	1·8	7·9	10·2
	Beech	0·1	0·1	—	0·1	1·3	1·6
	Ash	—	—	0·5	0·9	1·8	3·2
	Sycamore	0·1	0·1	0·4	0·3	0·7	1·6
	Other Broadleaved	0·2	0·2	0·9	1·2	0·6	3·1
	Total Broadleaved	0·4	0·6	2·1	4·3	12·3	19·7
	Total High Forest	9·2	9·4	3·7	5·2	12·7	40·2

APPENDIX VIII

FORESTRY COMMISSION WOODLANDS—HIGH FOREST AREA BY CONSERVANCY, SPECIES GROUP AND PLANTING YEAR CLASSES, 1965

ENGLAND — Thousand Acres

Conservancy	Species Group	P.61–65	P.41–60	P.21–40	P.01–20	Pre-1901	Total
North West England	Pines	5·5	15·1	11·0	1·2	0·5	33·3
	Spruces	3·8	20·0	8·4	0·3	—	32·5
	Larches	0·7	5·6	3·7	0·1	0·1	10·2
	Douglas Fir	0·7	2·1	1·7	—	—	4·5
	Other Conifer	1·1	2·8	0·3	0·1	—	4·3
	Total Conifer	11·8	45·6	25·1	1·7	0·6	84·8
	Oak	0·1	0·8	0·2	0·2	0·8	2·1
	Beech	0·3	1·6	0·5	—	0·1	2·5
	Other Broadleaved	0·4	2·0	1·2	0·5	0·2	4·3
	Total Broadleaved	0·8	4·4	1·9	0·7	1·1	8·9
	Total High Forest	12·6	50·0	27·0	2·4	1·7	93·7
North East England	Pines	10·0	29·4	8·6	0·6	0·6	49·2
	Spruces	8·1	59·0	21·4	0·1	0·1	88·7
	Larches	1·5	10·3	3·1	0·2	0·1	15·2
	Douglas Fir	0·4	1·6	0·9	—	—	2·9
	Other Conifer	0·8	1·2	0·1	—	—	2·1
	Total Conifer	20·8	101·5	34·1	0·9	0·8	158·1
	Oak	—	0·2	0·2	0·1	0·5	1·0
	Beech	0·3	2·3	0·2	0·2	—	3·0
	Other Broadleaved	0·5	2·0	1·4	0·7	0·4	5·0
	Total Broadleaved	0·8	4·5	1·8	1·0	0·9	9·0
	Total High Forest	21·6	106·0	35·9	1·9	1·7	167·1
East England	Pines	6·9	16·4	36·1	1·2	0·2	60·8
	Spruces	1·8	5·3	1·6	0·2	—	8·9
	Larches	0·3	1·3	1·2	0·3	0·1	3·2
	Douglas Fir	0·3	2·3	0·8	—	—	3·4
	Other Conifer	1·3	1·6	0·1	—	—	3·0
	Total Conifer	10·6	26·9	39·8	1·7	0·3	79·3
	Oak	0·1	4·4	3·6	0·5	0·8	9·4
	Beech	0·6	4·0	1·1	0·1	0·4	6·2
	Other Broadleaved	0·4	3·5	1·9	0·4	0·2	6·4
	Total Broadleaved	1·1	11·9	6·6	1·0	1·4	22·0
	Total High Forest	11·7	38·8	46·4	2·7	1·7	101·3

Appendix VIII, continued: Forestry Commission Woodlands, High Forest, 1965

ENGLAND

Conservancy	Species Group	P.61–65	P.4–60	P.21–40	P.01–20	Pre-1901	Total
South East England and New Forest	Pines	4·7	12·1	6·7	1·0	3·0	27·5
	Spruces	1·5	3·2	1·0	0·1	—	5·8
	Larches	0·6	1·5	0·5	0·2	0·3	3·1
	Douglas Fir	1·2	6·2	1·0	0·1	0·3	8·8
	Other Conifer	3·3	3·9	0·1	0·1	—	7·4
	Total Conifer	11·3	26·9	9·3	1·5	3·6	52·6
	Oak	0·1	1·1	0·7	1·0	9·5	12·4
	Beech	0·7	7·9	3·0	0·2	11·7	23·5
	Other Broadleaved	0·2	0·4	0·5	0·3	1·3	2·7
	Total Broadleaved	1·0	9·4	4·2	1·5	22·5	38·6
	Total High Forest	12·3	36·3	13·5	3·0	26·1	91·2
South West England and Dean Forest	Pines	2·0	8·1	5·3	0·2	0·2	15·8
	Spruces	4·6	10·0	7·8	0·5	—	22·9
	Larches	0·5	5·0	2·8	0·4	0·2	8·9
	Douglas Fir	4·0	3·8	3·8	0·3	—	11·9
	Other Conifer	1·4	3·0	0·4	0·1	—	4·9
	Total Conifer	12·5	29·9	20·1	1·5	0·4	64·4
	Oak	0·2	4·4	1·6	1·0	8·2	15·4
	Beech	0·9	7·0	1·3	0·2	1·1	10·5
	Other Broadleaved	0·2	0·7	0·4	0·3	0·2	1·8
	Total Broadleaved	1·3	12·1	3·3	1·5	9·5	27·7
	Total High Forest	13·8	42·0	23·4	3·0	9·9	92·1

Appendix VIII, continued: Forestry Commission Woodlands, High Forest, 1965

SCOTLAND — Thousand Acres

Conservancy	Species Group	P.61–65	P.41–60	P.21–40	P.01–20	Pre-1901	Total
North Scotland	Pines	24·9	53·5	10·2	1·8	7·3	97·7
	Spruces	16·9	28·5	23·2	0·7	0·1	69·4
	Larches	2·1	9·8	3·9	0·4	0·5	16·7
	Douglas Fir	1·2	2·5	3·0	0·1	—	6·8
	Other Conifer	0·4	0·7	1·0	0·2	—	2·3
	Total Conifer	45·5	95·0	41·3	3·2	7·9	192·9
	Oak	—	—	—	—	—	—
	Beech	—	—	—	—	—	—
	Other Broadleaved	—	0·1	0·1	—	—	0·2
	Total Broadleaved	—	0·1	0·1	—	—	0·2
	Total High Forest	45·5	95·1	41·4	3·2	7·9	193·1
East Scotland	Pines	19·8	49·0	20·5	2·1	1·8	93·2
	Spruces	12·9	33·7	13·9	0·2	0·1	60·8
	Larches	2·7	14·3	6·5	0·7	0·4	24·6
	Douglas Fir	1·0	2·3	0·4	0·1	—	3·8
	Other Conifer	0·5	1·3	0·4	0·2	—	2·4
	Total Conifer	36·9	100·6	41·7	3·3	2·3	184·8
	Oak	—	—	—	0·1	0·1	0·2
	Beech	—	0·1	0·1	0·1	0·1	0·4
	Other Broadleaved	0·1	0·5	0·4	0·1	0·4	1·5
	Total Broadleaved	0·1	0·6	0·5	0·3	0·6	2·1
	Total High Forest	37·0	101·2	42·2	3·6	2·9	186·9
South Scotland	Pines	9·2	18·6	2·9	0·1	0·2	31·0
	Spruces	30·4	75·2	12·0	0·1	0·1	117·8
	Larches	3·0	18·0	3·1	0·2	—	24·3
	Douglas Fir	0·8	2·2	0·3	—	—	3·3
	Other Conifer	1·2	1·4	0·2	—	—	2·8
	Total Conifer	44·6	115·4	18·5	0·4	0·3	179·2
	Oak	—	0·2	0·2	0·1	0·1	0·6
	Beech	—	0·3	—	—	—	0·3
	Other Broadleaved	—	0·4	0·2	0·1	0·1	0·8
	Total Broadleaved	—	0·9	0·4	0·2	0·2	1·7
	Total High Forest	44·6	116·3	18·9	0·6	0·5	180·9

Appendix VIII, continued: Forestry Commission Woodlands, High Forest, 1965

SCOTLAND — Thousand Acres

West Scotland	Pines	6·1	11·8	2·9	0·4	0·2	21·4
	Spruces	25·3	61·0	28·3	1·8	0·1	116·5
	Larches	2·2	6·9	3·7	0·7	0·2	13·7
	Douglas Fir	0·2	0·6	0·8	—	—	1·6
	Other Conifer	1·5	2·7	0·9	0·3	0·1	5·5
	Total Conifer	35·3	83·0	36·6	3·2	0·6	158·7
	Oak	—	0·1	—	0·4	0·2	0·7
	Beech	—	0·3	—	—	0·1	0·4
	Other Broadleaved	0·1	0·2	0·1	—	0·2	0·6
	Total Broadleaved	0·1	0·6	0·1	0·4	0·5	1·7
	Total High Forest	35·4	83·6	36·7	3·6	1·1	160·4

Appendix VIII, continued: Forestry Commission Woodlands, High Forest, 1965

WALES — Thousand Acres

Conservancy	Species Group	P.61–65	P.41–60	P.21–40	P.01–20	Pre-1901	Total
North Wales	Pines	2·1	10·0	1·7	—	—	13·8
	Spruces	15·2	54·3	21·4	0·3	—	91·2
	Larches	0·7	9·4	3·3	0·3	0·1	13·8
	Douglas Fir	1·8	4·1	4·1	—	—	10·0
	Other Conifer	3·2	6·3	0·4	—	—	9·9
	Total Conifer	23·0	84·1	30·9	0·6	0·1	138·7
	Oak	0·1	0·9	—	0·3	0·7	2·0
	Beech	0·1	1·9	0·1	—	0·2	2·3
	Other Broadleaved	0·1	1·0	0·1	0·3	0·2	1·7
	Total Broadleaved	0·3	3·8	0·2	0·6	1·1	6·0
	Total High Forest	23·3	87·9	31·1	1·2	1·2	144·7
South Wales	Pines	4·9	9·8	4·2	0·1	0·1	19·1
	Spruces	17·6	36·3	12·8	0·2	—	66·9
	Larches	4·0	18·3	5·9	0·4	0·1	28·7
	Douglas Fir	1·6	4·5	1·8	0·1	—	8·0
	Other Conifer	2·2	3·5	0·3	—	—	6·0
	Total Conifer	30·3	72·4	25·0	0·8	0·2	128·7
	Oak	—	0·6	0·2	0·3	1·2	2·3
	Beech	0·3	2·5	0·3	0·1	0·9	4·1
	Other Broadleaved	0·1	0·8	0·2	0·1	0·6	1·8
	Total Broadleaved	0·4	3·9	0·7	0·5	2·7	8·2
	Total High Forest	30·7	76·3	25·7	1·3	2·9	136·9

APPENDIX IX

STANDARD ERRORS OF AREA ESTIMATES BY FOREST TYPE, PLANTING YEAR CLASS AND SPECIES

APPENDIX IX (1)

AREAS OF WOODLAND, CLASSIFIED BY TYPES AND SUB-TYPES, IN EACH COUNTRY

PRIVATE WOODLANDS

Thousand Acres

Type	England	Scotland	Wales	Great Britain
	Area S.E.	Area S.E.	Area S.E.	Area S.E.
Coniferous High Forest	383·2±10·8	405·4±16·4	55·8± 4·9	844·4±20·0
Broadleaved High Forest	598·4±12·1	91·4± 4·4	48·4± 2·8	738·2±13·3
Total High Forest	981·6±19·6	496·8±19·8	104·2± 5·7	1,582·6±26·9
Coppice with Standards	25·4± 2·7	— —	— —	25·4± 2·7
Worked Coppice	38·4± 3·5	— —	0·2± 0·2	38·6± 3·5
Unworked Coppice	7·0± 1·0	— —	— —	7·0± 1·0
Total Coppice	70·8± 5·7	— —	0·2± 0·1	71·0± 5·7
Utilisable Scrub	123·9± 5·3	9·9± 1·7	26·1± 1·8	159·9± 5·8
Unutilisable Scrub	407·3± 8·6	236·3± 8·8	70·1± 2·8	713·7±12·2
Total Scrub	531·2±10·6	246·2± 8·6	96·2± 3·4	873·6±13·1
Felled 1963–65	8·2± 0·9	3·3± 0·7	0·3± 0·1	11·8± 1·1
Felled Pre-1963	20·1± 1·2	122·4± 8·0	5·2± 0·8	147·7± 8·1
Total Felled	28·3± 1·6	125·7± 7·5	5·5± 0·8	159·5± 8·0
Total	1,611·9±24·2	868·7±26·1	206·1± 6·2	2,686·7±32·2

APPENDIX IX (2)

HIGH FOREST BY PLANTING YEAR CLASSES AND COMPOSITION—PRIVATE WOODLANDS

Thousand Acres

Country	Composition	Planting Year Class									Total
		P.61–65	P.51–60	P.41–50	P.31–40	P.21–30	P.11–20	P.01–10	P.1861–1900	Pre-1861	
		Area S.E.	Area S.E.	Area S.E.	Area S.E.	Area S.E.	Area S.E.	Area S.E.	Area S.E.	Area S.E.	Area S.E.
England	Coniferous .	94·5±4·0	112·0±4·7	36·8±2·5	40·4±2·6	42·3±2·6	18·1±1·4	15·1±1·4	20·7±1·7	3·3±0·5	383·2±10·8
	Broadleaved .	13·9±1·5	25·0±2·4	19·3±2·5	21·3±1·5	25·6±2·1	34·3±2·1	51·3±2·7	258·2±7·6	149·5±5·4	598·4±12·1
	Total . .	108·4±4·4	137·0±5·4	56·1±3·6	61·7±3·1	67·9±3·4	52·4±2·5	66·4±3·1	278·9±8·0	152·8±5·5	981·6±19·6
Scotland	Coniferous .	86·5±7·0	135·4±8·7	25·6±2·4	31·7±3·1	37·7±3·4	18·3±2·5	15·1±1·8	35·0±3·8	20·1±3·5	405·4±16·4
	Broadleaved .	0·4±0·1	2·3±0·5	3·6±1·3	2·3±0·6	3·5±0·7	2·9±0·9	5·1±0·9	33·0±2·5	38·3±2·8	91·4± 4·4
	Total . .	86·9±7·1	137·7±8·9	29·2±2·7	34·0±3·2	41·2±3·6	21·2±2·7	20·2±2·0	68·0±4·5	58·4±4·4	496·8±19·8
Wales	Coniferous .	19·8±3·2	20·0±2·4	1·9±0·4	3·9±0·9	4·7±0·7	2·1±0·5	1·6±0·3	1·7±0·4	0·1±—	55·8± 4·9
	Broadleaved .	0·6±0·2	1·2±0·3	0·8±0·2	1·3±0·3	2·0±0·3	1·9±0·4	5·2±1·0	18·4±1·3	17·0±1·7	48·4± 2·8
	Total . .	20·4±3·2	21·2±2·4	2·7±0·5	5·2±0·9	6·7±0·8	4·0±0·6	6·8±1·1	20·1±1·4	17·1±1·7	104·2± 5·7
Great Britain	Coniferous .	200·8±8·5	267·4±10·1	64·3±3·5	76·0±4·2	84·7±4·4	38·5±2·9	31·8±2·3	57·4±4·0	23·5±3·4	844·4±20·0
	Broadleaved .	14·9±1·5	28·5± 2·5	23·7±2·8	24·9±1·7	31·1±2·3	39·1±2·3	61·6±3·0	309·6±8·2	204·8±6·4	738·2±13·3
	Total . .	215·7±8·8	295·9±10·6	88·0±4·5	100·9±4·5	115·8±5·0	77·6±3·7	93·4±3·8	367·0±9·3	228·3±7·2	1582·6±26·9

APPENDIX IX (3)

HIGH FOREST UNDER MAJOR TREE SPECIES WITH DETAILS FOR COUNTRIES—PRIVATE WOODLANDS

Thousand Acres

Species	England		Scotland		Wales		Great Britain	
	Area	S.E.	Area	S.E.	Area	S.E.	Area	S.E.
Scots Pine	141·1	±6·4	215·3	±12·0	2·7	±0·4	359·1	±13·3
Corsican Pine	13·4	±1·3	0·9	±0·3	0·6	±0·2	14·9	±1·3
Sitka Spruce	20·4	±1·7	62·8	±5·7	21·4	±3·6	104·6	±6·9
Norway Spruce	41·8	±2·3	41·0	±3·2	6·5	±0·9	89·3	±4·0
European Larch	71·3	±3·0	19·8	±2·0	4·9	±0·6	96·0	±3·6
Japanese and Hybrid Larch	48·5	±2·9	44·5	±3·6	10·9	±1·2	103·9	±5·2
Douglas Fir	27·4	±1·8	7·4	±1·6	6·8	±0·9	41·6	±2·5
Mixed and Other Conifers	19·3	±1·5	13·7	±2·0	2·0	±0·4	35·0	±2·5
Total Conifer	383·2	±10·8	405·4	±16·4	55·8	±4·9	844·4	±20·0
Oak	308·4	±8·4	26·0	±2·6	30·2	±2·2	364·6	±9·1
Beech	86·1	±4·2	19·8	±1·6	3·8	±0·6	109·7	±4·6
Ash	67·0	±3·3	1·3	±0·3	5·7	±0·7	74·0	±3·4
Birch	18·2	±1·6	11·0	±1·9	1·4	±0·3	30·6	±2·4
Sweet Chestnut	11·3	±1·3	—	±—	0·1	± —	11·4	±1·3
Poplar	18·3	±2·5	0·4	±0·1	0·7	±0·2	19·4	±2·5
Sycamore	50·2	±2·4	10·5	±1·2	4·3	±0·6	65·0	±2·8
Elm	17·2	±1·4	3·0	±0·6	0·5	±0·1	20·7	±1·5
Mixed and Other Broadleaved	21·7	±1·7	19·4	±2·7	1·7	±0·3	42·8	±3·0
Total Broadleaved	598·4	±12·1	91·4	±4·4	48·4	±2·8	738·2	±13·3
Total	981·6	±19·6	496·8	±19·8	104·2	±5·7	1582·6	±26·9

APPENDIX X

FORESTRY COMMISSION CONSERVANCY BOUNDARIES, 1965

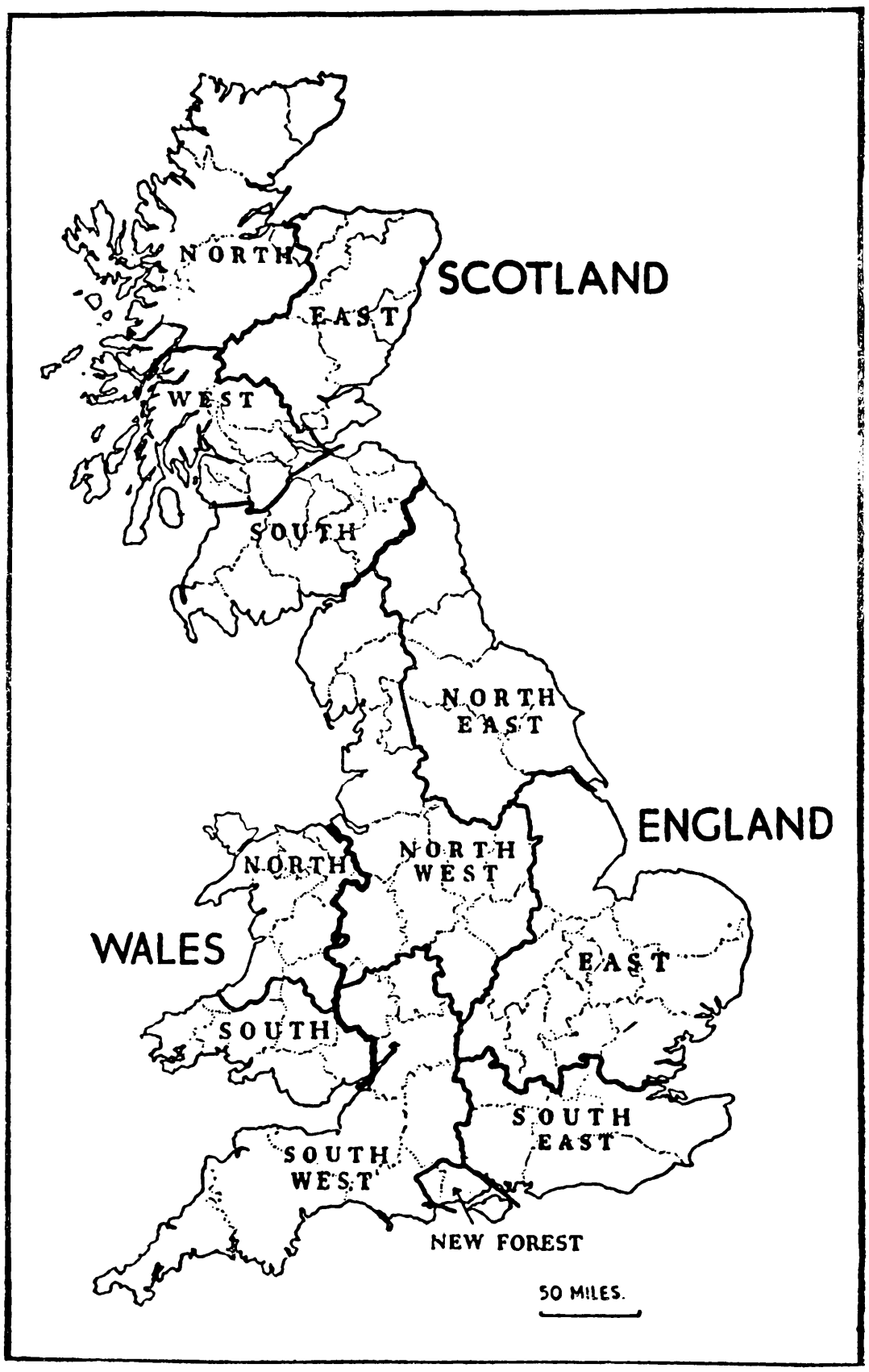


Fig. 6. Map of Forestry Commission Conservancies

CENSUS OF WOODLANDS, 1965–1967

COUNTIES COMPRISED IN FORESTRY COMMISSION CONSERVANCIES, 1965

Notes. (1) For Census purposes, the New Forest was included with South-East England. The Dean Forest was included with South-West England.

(2) Conservancies are used as territorial units in the *Appendices* to this *Report*, but not in the main text.

ENGLAND

NORTH WEST

Cumberland, Westmorland, Lancashire, part of West Riding of Yorkshire (Lune and Ribble Valleys), Cheshire, Shropshire, Staffordshire, Warwickshire, Leicestershire, Nottinghamshire and Derbyshire.

NORTH EAST

Northumberland, Durham, Yorkshire (except that part of West Riding in Lune and Ribble Valleys).

EAST

Lincoln, Rutland, Norfolk, Cambridge, Northamptonshire, Bedfordshire, Oxfordshire, Buckinghamshire, Hertfordshire, Essex, Suffolk and Huntingdonshire.

SOUTH EAST AND NEW FOREST

Berkshire, London, Kent, Sussex, Surrey and Hampshire, part Dorset (east of Salisbury–Blandford–Poole road).

SOUTH WEST AND DEAN FOREST

Herefordshire, Gloucestershire, Wiltshire, Dorset (west of Salisbury–Blandford–Poole road), Worcestershire, Somerset, Devon and Cornwall.

SCOTLAND

NORTH

Caithness, Sutherland, Ross and Cromarty, Inverness, part of Argyll (Mull and areas west of Loch Linnhe), Nairn (except north-east corner), Moray (southern areas only), Orkney, Shetland.

EAST

Nairn (north-east corner only), Moray (except southern areas), Banff, Aberdeen, Kincardine, Angus, Kinross, Fife (except south-west corner), part Perth (areas north and east of Crieff).

SOUTH

Midlothian, East Lothian, Berwick, Roxburgh, Selkirk, Peebles, Dumfries, Kirkcudbright, Wigtown, part Ayr (south of Kilmarnock), part Lanarkshire (south-east of Lanark).

WEST

Argyll (except Mull and areas west of Loch Linnhe), part Perth (areas west of Crieff), Stirling, Dunbarton, Renfrew, Clackmannan, part Fife (south-west corner only), part Ayr (north of Kilmarnock), part Lanarkshire (north-west of Lanark), West Lothian, Bute.

WALES

NORTH

Anglesey, Caernarvon, Denbigh, Flint, Merioneth, Montgomery, Radnor, Cardigan (except south-west and south-east).

SOUTH

Pembroke, Carmarthen, Brecknock, Glamorgan, Monmouth, south-western and south-eastern parts of Cardigan.

Dd. 153397 K28 5/70 Ed (6971)

FORESTRY COMMISSION PUBLICATIONS
RECENT ISSUES

Reports

Annual Report for the Year ended 30th September 1967	10s.	(10s. 6d.)
Report on Forest Research for the Year ended March 1968	20s.	(21s. 4d.)

Booklets

No. 20 Know Your Broadleaves	15s.	(16s. 8d.)
No. 21 Public Recreation in National Forests	9s.	(10s. 4d.)
No. 22 Forestry in the Weald	3s. 6d.	(4s. 0d.)
No. 23 Timber! Your Growing Investment	6s. 6d.	(7s. 4d.)
No. 24 Forestry in the British Scene	10s.	(11s. 0d.)
No. 25 Forests of Central and Southern Scotland	12s. 6d.	(13s. 10d.)
No. 27 Metric Guide for Forestry	3s.	(3s. 4d.)

Bulletin

No. 39 Use of Land Within the Proprietary Land Unit	17s. 6d.	(18s. 2d.)

Forest Records

No. 65 Butterflies in Woodlands	3s.	(3s. 4d.)
No. 66 Blackgame	3s.	(3s. 4d.)
No. 67 Effect of Fertilizer and Density Pretreatment on Spruce Seedling Survival and Growth	4s.	(4s. 4d.)
No. 68 Pulpwood Supply and the Paper Industry	5s.	(5s. 4d.)

Leaflets

No. 7 Adelgids Attacking Spruce and Other Conifers (Revised 1968)	1s. 6d.	(1s. 10d.)
No. 16 Larch Canker and Dieback (Revised 1969)	1s. 6d.	(1s. 10d.)
No. 51 Chemical Control of Weeds in the Forest	4s.	(4s. 4d.)

Guides

Short Guide to Bedgebury Pinetum and Forest Plots	9d.	(1s. 1d.)
Kilmun Arboretum and Forest Plots	2s.	(2s. 4d.)
Snowdonia Forest Park	6s. 6d.	(7s. 2d.)
Westonbirt in Colour	2s.	(2s. 4d.)

(Prices in brackets include postage)

Obtainable from Her Majesty's Stationery Office, 49 High Holborn, London, W.C.1 (post orders from P.O. Box 569, London, S.E.1) or through any bookseller.