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HEDGEROW AND PARK TIMBER
AND WOODS
UNDER FIVE ACRES
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P R E F A C E

This *Report* supplements Census Report No. 1, entitled: *Census of Woodlands 1947-1949, Woodlands of Five Acres and Over* (H.M.S.O. 1952. 12s. 6d.), and completes the survey of all the timber resources of Great Britain which was begun in 1947.

The survey of Hedgerow and Park Timber, and Woods under Five Acres, was organised by Mr. James Macdonald, Director of Research and Education, and Mr. M. V. Laurie, Chief Research Officer. Mr. F. C. Hummel, Mensuration Officer, was responsible for the methods employed, which were based, with appropriate modifications, on those used in certain previous surveys. The field work and computation of results were done by Mr. G. M. L. Locke, Census Officer, and this Report* has been prepared for press by Mr. H. L. Edlin, Publications Officer.

The map on Plate VI is reproduced by courtesy of the Director-General, Ordnance Survey, and the aerial photo on Plate VII by permission of the Air Ministry. The photograph reproduced on Plate I is by L. & M. Gayton, that on Plate IV by the *Scotsman*, and those on Plates V and X by Fox Photos; the remaining photographs are from the Forestry Commission's own collection.

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INTRODUCTORY OUTLINE

THIS Report gives the methods used, and the results obtained, in a Census survey of the timber content of standing trees in hedgerows, small woods, and the “unproductive” areas of larger woodlands. It was carried out during the autumn of 1950 and the spring of 1951, and covered the whole of Great Britain. It was designed to complete the survey of the area and timber content, of all the woodlands in the country, which had been begun with the main Census of Woodlands 1947-49. The results of that Census have been published in brief in the *Summary Report of the Census of Woodlands, 1947-49* (Forest Record No. 3, H.M.S.O. 9d.) and have also been published in full in Census Report No. 1, entitled *Census of Woodlands 1947-49, Woodlands of Five Acres and Over*. (H.M.S.O. 12s. 6d.). This main Census had been restricted, in the interests of speed, to woods of five acres and over in extent, and no attempt had been made to estimate the timber content of woods regarded as “unproductive”. Nevertheless, it was appreciated all along that there was a considerable volume of useful timber standing in trees along hedgerows, in woods of less than five acres, and even in those portions of the larger woodlands generally considered to be unproductive, and at the first opportunity this present survey was put in hand to complete our knowledge of the country’s resources of timber.

The problem was a four-fold one, involving:—

- (a) Hedgerow and Park trees.
- (b) Small patches and groups of trees less than one acre in extent, as well as strips and belts less than one chain wide which had been excluded from the main Census.
- (c) Small Woods of one to five acres in extent.
- (d) The woods, and “stands” or portions of woods, classified as Simple Coppice or as “unproductive” in the main census of 1947-49.

For convenience, groups (a) and (b) were combined because it was difficult to deal with those small patches on an area basis on account of their irregular and sometimes indefinite shape. The aggregate area of the small woods of one to five acres in extent had been estimated in the main Census, but nothing was known of their composition or volumes. The Simple Coppice and “unproductive” woods had been fully recorded, as regards their area, in the main Census, but no account was taken of what volume they contained. This was not important but it was felt that some attempt should be made to estimate what was standing in those woods in order to complete the picture.

In the main 1947-1949 Survey, the larger woods, i.e. those of five acres and over, were individually examined; but for the present survey a complete enumeration of all the scattered trees and small woods, throughout the country, would have required an altogether disproportionate expenditure of time, effort and money. This survey was therefore done by a sampling method, which is described in Chapter 1, page 7.

Chapter 2, page 18 entitled *Hedgerow and Park Timber*, gives the results of the volume survey of the trees mentioned under (a) and (b) above; that is, all trees of timber value standing alone or in groups, avenues, or woods of less than one acre in extent. Chapter 3, page 34, entitled *Small Woods*, presents

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the results of the survey of woods of from one to five acres, in terms of area classification, timber volume, and increment. Chapter 4, page 53, deals with the timber volume found in Simple Coppice and “unproductive” areas in woodlands of five acres and over in extent.

The results of the survey are summarised in Chapter 5, page 59, which presents, with the results of the main Census of the larger woodlands carried out from 1947 to 1949, a complete stocktaking of the timber standing in the country. Appendices I to VI, pages 67 to 84, give details of the methods used in this present survey, and Plate VI following page 44 shows a representative map as employed in the field. Appendix VII comprises two maps, illustrating the distribution of the samples taken, and the boundaries of the Forestry Commission Conservancies.

CHAPTER 1

METHODS USED IN THE SURVEY

THE methods adopted for the survey were based on experience gained in 1939 and 1942, when attempts (which remained incomplete owing to war-time difficulties) were made to estimate the volume of timber standing in the hedgerows. For that purpose a sampling method was evolved, and in the present work a similar procedure has been followed.

It was considered desirable that, for the hedgerow and park timber that comprised the largest volume, the method should provide information on the accuracy of the sampling procedure adopted. This was achieved by taking three independent sets of samples.

It was also necessary to provide most of the information, for administrative purposes, by Conservancies, which are the territorial units adopted by the Forestry Commission: Details of these Conservancies are given in Appendix VI, page 84, and in Map 2 of Appendix VII page 88.

A system had therefore to be devised, which would meet these requirements without adding unduly to the time spent on the field survey. The various computations could then be effected, fairly quickly, in the office. The work fell naturally into three stages—sampling of maps, field survey, and computation.

The first stage, sampling of the maps, applied to all the three investigations which the survey as a whole involved. Thereafter, the demarcation of areas to be surveyed on the maps, the field work and the subsequent computations, were carried out on different lines for the three objectives in view, namely:

- I. Volume survey of Hedgerow and Park Timber (see pages 9 to 13)
- II. Area and volume survey of Woods of One to Five acres (see pages 13 to 15)
- III. Survey of volume in Simple Coppice and “Unproductive” woodlands (see pages 15 to 17)

The procedures call for separate description, and the results are likewise presented separately.

SAMPLING OF MAPS

Although information was required eventually by Conservancies, it was decided to treat Great Britain as a single unit for sampling purposes, and to take three random sets of samples of the six-inch Ordnance Survey quarter sheets for further examination. These three sets were known as the A, B, and C series, respectively, and each covered one per cent of the country. Thus, in all, a three per cent sample of these maps was examined.

To select the maps on a random basis, a special grid was drawn on the Ordnance Survey ten-miles-to-one-inch map of Great Britain. This grid is similar in conception to, but not identical with, the National Grid. It was required because the six-inch Ordnance sheets, in the editions available for the whole country, are planned and numbered on a county basis: and, because of the inevitable overlap along county boundaries, they do not provide a satisfactory consecutive series for making a random choice. The rectangles of this special grid coincided in extent with the area represented by a six-inch sheet,

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after reduction to the ten-miles-to-one-inch scale; they seldom coincided with any actual published sheet, but in practice it was a simple matter to take the nearest sheet available. The squares of the map were numbered serially, row by row.

In practice, two such grids were used, one for England and Wales and another for Scotland. The former grid included Anglesey and the Isle of Wight, while the Scottish grid extended over the Inner Hebrides. The Outer Hebrides, the Orkneys, and the Shetlands, which carry little or no hedgerow timber, or indeed woods of any description, were omitted. This survey therefore covered virtually the same area as the 1947-49 Census of the Woodlands of Five Acres and Over, though a few small islands were omitted.

The "A" sample of maps was obtained by taking a random number between 1 and 100 as the first of the series (e.g. 49). Every 100th map thereafter (e.g. 149, 249, etc.) was then taken, to give a one per cent sample of the whole. The "B" and the "C" samples were taken in the same way, but were based on different original random numbers between 1 and 100. Thus three maps in all were selected in every hundred, giving three one-per-cent samples. The general distribution of these samples is shown in Map 1 of Appendix VII, page 87.

These samples were used for all three sections of the subsequent work—the hedgerow and park timber, the small woods and the timber in Simple Coppice and "Unproductive" woods.

The intention was that every part of the country should stand the same chance of being sampled. In practice, owing to the methods adopted, coastal areas within three miles of the sea stood a somewhat higher chance of selection than did inland areas; but it is not thought that this had any serious influence on the general results. Otherwise the density of selection was the same throughout Great Britain. The comparatively treeless uplands of the Pennines, and the built-up areas of London and other large cities, stood just the same chance of being sampled as did the tree-clad Weald of Sussex. Inspection of the small-scale map after the samples had been determined did, in fact, suggest a certain grouping of plots in some districts, and an apparent scarcity in others. But such effects are inherent in random sampling of this nature, and the real test of the validity of the sampling lay in the comparison of the results for the A, B, and C series of samples; this was made for the hedgerow timber only.

The results obtained were as follows:

Series A	780.60 million cubic feet, 148 plots
„ B	730.08 „ „ „ , 146 „
„ C	896.63 „ „ „ , 147 „

In planning the survey, a maximum standard error due to sampling of 10% was considered admissible for Great Britain as a whole.

Appendix IV shows that the actual standard error due to sampling was within this limit at 8.5%.

The Standard Error for England alone was 9.1 %. In both Wales and Scotland the Standard Errors were over 20%, but owing to the smaller volumes of timber involved this was accepted, and no additional sampling was carried out in these two countries. The figures obtained from the three series of samples were kept separate to calculate the Standard Errors, but for all subsequent computations, the figures obtained from the three series of samples were combined.

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In all, 441 maps were selected for sampling, of which 252 were in England, 47 in Wales, and 142 in Scotland. Details are given in Appendix V, page 83.

To inspect the whole area of ground represented by each sample quarter-sheet would have required an undue expenditure of time and money. So, for each object in view, only a portion of each map was examined. The method of demarcation was the same on every map. It is illustrated in the map reproduced as Plate VI, following page 44. Different procedures were followed for the three objectives required, which, from this point on, require separate discussion.

I. VOLUME SURVEY OF HEDGEROW AND PARK TIMBER

(a) Demarcation of Areas for Field Inspection

The unit for inspection was a strip of ground 16 acres in extent, being one mile long, and 2 chains (44 yards) wide. Wherever possible this ran from south to north, beginning one inch above the bottom edge of the map (see Plate VI). The object of starting at a point above the map edge was to make the point of origin more easy to determine on the ground. Such a strip is, of course, sited without any regard to the arrangement of hedgerows, and normally cuts across a number of them at various angles, as shown by Plates VI to VIII.

The total area of ground shown on each six-inch to the mile Ordnance Survey quarter-sheet is six square miles, or 3,840 acres. The 16 acre strip thus includes one acre in every 240, or .417 per cent of the total area. Since only one map in every 100 was taken in a sample, the net sampling fraction was .00417 per cent, or one acre in every 24,000; the three samples, taken together, gave a .0125 per cent sampling fraction, or one acre in every 8,000.

In actual practice a slightly higher density of sampling was achieved. The total area of the 441 strips, of 16 acres each, actually measured, is 7,056 acres. When this is compared with the total land area of Great Britain, 55,519,153 acres, it gives a sampling fraction of .01271 per cent, which is equivalent to one acre in every 7,868. This slight increase in density arises mainly because some of the maps inevitably extend beyond the land area and include stretches of sea.

An important point of detail is that the total land area for the whole country includes inland waters, orchards, and the woodlands of one acre and upwards. Hence, if a strip fell across a lake, an orchard, or a wood one acre or more in extent, it had to be accepted. In the field survey, water surfaces, being treeless, were automatically omitted, while all orchard trees were ignored. The volumes of woods five acres and over had already been determined, while those of woods between one acre and 5 acres were obtained in another way (see II, page 13). Woodlands of one acre and upwards were therefore excluded. Examples of such omissions are shown in Plates VI, VII, and VIII.

If a strip happened to fall so as to include tidal water, it was not accepted, and was replaced by another strip on the same sheet (or on an adjoining sheet) where no tidal water occurred.

The main reason for adopting a long narrow strip, 80 chains long by 2 chains wide, as the unit for sampling the area represented by each map, was that it is much simpler to enumerate and inspect the trees on a long narrow strip than it is on a broader area, which has first to be divided into strips before accurate enumeration can proceed. In addition, for a given size of sampling unit, a long and narrow strip tends to give a more representative sample than a unit of more

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compact shape. The alignment of the strips in a north-south direction was a purely arbitrary arrangement; but as the hedgerows run in all sorts of directions, it was unlikely to bias the results.

(b) Field Survey

An appropriate number of six-inch quarter sheets, prepared as described above, was issued to each party of field surveyors, together with a supply of the Field Forms reproduced in Appendix I, page 67 and the Instructions to Surveyors reproduced as Appendices II and III, pages 74 and 78.

An exception arose where inspection of any particular map suggested that it represented an area that was treeless, or nearly so. To save time in the field, a recent aerial photograph, taken vertically on a scale of approximately six inches to the mile, was first examined. If this photograph showed that no trees were, in fact, present on the ground due to be inspected, no map was issued, and no field inspection was made. The samples had, nevertheless, to be included in certain of the computations, so as to give a representation of the treeless areas.

Each field party consisted of two men, both of whom had previous training in forestry and, in most cases, previous experience of census work. Motor vans were used for transport. On arrival at the location of the map to be sampled, the actual inspection was carried out in three stages, one for the Hedgerow and Park Timber, as here described, and others for the One-to-Five Acre Woods, and the "Unproductive" Woodlands which are dealt with later. (See Sections II, page 13, and III, page 15).

The detailed instructions for the field sampling of trees falling within this section of the survey are set out in Appendix II, para 2 (i), para. 3 (i), para. 4(i) and para. 6. (See page 74).

Briefly, the procedure was for the surveyors, first of all, to find on the ground the point of origin of the strip shown on the map. From this point they proceeded due north for one mile, enumerating and measuring every tree that stood within one chain of the central axis of the strip. Where necessary, a compass was used for securing alignment, but in many districts sufficient check points were available from the six-inch map itself, e.g. junctions of field boundaries, roads, etc. A measuring tape was used to check whether any "border line" trees actually stood within the designated strip.

Included within this enumeration were all hedgerow, park and garden trees apparently capable of producing timber either immediately or in the near future, all such trees forming part of a stand less than one acre in extent, and also all such trees forming part of a belt less than one chain in width, whatever the total area of the belt might be.

Excluded were all trees in woodlands of one acre or more in extent, (with the exception of trees in narrow belts as mentioned above), all orchard trees, and, in practice, nearly all trees under ten feet in height or of less than 3 inches breast-height quarter-girth. (See Plates VII and VIII.)

The field form used for enumeration (Strip Data Form) is reproduced as Figs. 1 and 2 in Appendix I, page 68. Each tree was inspected, and the appropriate details were entered on the reverse of the form. When the inspection of the strip was completed, the figures obtained were summarised on the front of the form.

All trees were recorded by species and by four main categories. All quarter-girths were measured over bark at breast-height, 4 feet 3 inches above ground.

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“*Timber*” trees comprised all trees having a quarter-girth of 6 inches or over, together with a minimum length of 10 feet of apparently sound timber. They were sub-divided into three girth-classes.

6 to $9\frac{3}{4}$ inches quarter-girth at breast height						
10 to $14\frac{3}{4}$	„	„	„	„	„	„
15	„	„	„	and upwards at breast height.		

“*Short timber*” trees comprised those trees of 6 inches quarter-girth and upwards, that had between 6 feet and 10 feet of sound timber.

“*Saplings*” were well-grown young trees between 3 and 6 inches quarter-girth, with at least 10 feet of straight stem. (See Plate IX.) These were regarded as obviously capable of producing timber trees in the future. No enumeration was made of trees smaller than this.

“*Firewood*” trees included all trees with a quarter-girth greater than 3 inches, but with less than 6 feet of *straight* stem or timber. This definition was framed to bring in crooked, short-boled, and defective trees, useless for timber but of possible value for fuel wood or charcoal. Straight trees with more than 6 feet of timber had also to be classed as “firewood” trees if their bole obviously contained decay or other serious defects.

Although the volumes of the “short timber” and the “firewood” trees were determined in the field these descriptions are not further discussed in this *Report*, owing to their low commercial value. No assessment was made of the branch-wood volume of trees of any description.

Young trees (saplings) with a quarter-girth of three to six inches were only enumerated. Firewood trees were enumerated but their volume was estimated visually without any other measurements being taken. All other trees enumerated were measured in terms of height, breast-height quarter-girth, and volume.

In the case of conifers, heights were measured by Abney level. For the broad-leaved trees, estimation was done by eye, with an occasional instrumental check. *Total* heights were recorded for conifers, but *timber* heights for broad-leaved trees; this difference in procedure is accounted for by the different bases on which the Volume Tables for these two groups of trees have been drawn up. “Timber height” in broadleaved trees was taken to a top diameter of six inches, or spring of the crown, whichever came first.

Volumes were computed by using the Forestry Commission series of Volume Tables published by H.M. Stationery Office as Forest Records Nos. 5 to 11. These are General Volume Tables for Great Britain, which implies that they are based on an average of measurements for the whole country; hence they could fairly be applied to a comprehensive survey of this kind. Only certain species are directly covered by the series, but it was known that their use could be extended to other species of tree (as detailed in Appendix II, para. 6, page 74) without serious inaccuracies arising.

The volume of each tree was determined individually, from its total height or timber length and breast-height quarter-girth measurement. Any volume of timber in the branches was ignored throughout.

The completed strip Data Forms were forwarded to the Forestry Commission Research Station at Alice Holt Lodge near Farnham, Surrey, for subsequent computation.

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(c) Computation

For the Hedgerow and Park Timber, results were calculated by Forestry Commission Conservancies, by individual countries, and for Great Britain as a whole. The basic unit of area for the computation of results was the Conservancy. Results for the individual countries, England, Scotland, and Wales, were built up by adding the results for their component Conservancies. Results for Great Britain were similarly obtained by adding the country figures.

Adjustments had to be made to the boundaries of certain Conservancies, which consequently do not always coincide with the boundaries shown in the Commission's *Annual Report* for 1951. (See Map 2, page 88.) The New Forest area was here treated as a Conservancy; besides the New Forest proper, it includes the Isle of Wight, part of the Hampshire mainland, and part of Dorset. The Forest of Dean and its associated woods lie mainly in England but also include some land in Monmouth, which county was, in this survey, treated as being part of the South Wales Conservancy. To get over this difficulty, the Forest of Dean was disregarded entirely as a territorial division, and the lands comprised in it were divided, along the eastern border of Monmouth, between South Wales and South-West England. Certain minor adjustments were also made to the boundaries of other Conservancies in England and Wales.

In general, the Conservancies thus delineated agreed with those used for administration purposes, but there was one exceptional adjustment that calls for explanation. Owing to an error in mapping, the extreme western portion of the North Riding of Yorkshire, comprising 51,831 acres in Swaledale and Wensleydale, were shown in the North-West England Conservancy instead of in the North-East England Conservancy. This point did not come to light until the subsequent calculations were too far advanced to permit of corrections being made. It was ascertained, however, that had the correct Conservancy boundary been adhered to, the volume of hedgerow timber in the four territorial units affected would have been computed as follows:

North-East England:	99.5	million cubic feet, instead of 98.5
North-West England:	104.5	„ „ „ „ „ 105.2
England:	680.8	„ „ „ „ „ 680.5
Great Britain:	807.0	„ „ „ „ „ 806.7

The differences are thus very small, but require mention here as a matter of statistical accuracy.

Conservancy totals were obtained as follows:

(1) All Strip Data Forms for the Conservancy concerned were examined, and the figures for the desired characteristic were added up, to give the *total for all strips*.

(2) This figure was then divided by the number of strips, to give the *mean value per strip*.

(3) Since every strip had a uniform area of 16 acres, this figure in turn was divided by 16, to give the *mean value per acre*.

(4) This *per acre* figure was next multiplied by the number of acres of land area, in the whole Conservancy, to give the *estimated total for that Conservancy*.

A point to be noted here is that these figures are computed on a basis of "per acre of total land area." Total land area includes inland water surfaces, woodlands of all kinds, built-up areas, mountain tops, and, in fact, the whole superficial area of the Conservancy, whether bearing trees or not.

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A second point of interest is that no figures were computed for six-inch quarter sheets of the Ordnance Survey, although such sheets formed the basis of the sampling method. Had the calculations been done on a map sheet basis, a great deal of adjustment would have been required, for many sheets overlap other sheets, or stretches of the sea, or portions of other Conservancies.

II. AREA AND VOLUME SURVEY OF WOODS OF ONE TO FIVE ACRES

(a) Demarcation of Areas for Field Inspection

For this purpose only the south-west quarter of each Ordnance Survey six-inch quarter sheet was considered. The map was examined and every stand of woodland of between one and five acres in extent was demarcated. (See Plate VI.) All such stands were later inspected in the field. On some maps, of course, no such woods appeared.

The sampling fraction for the total area of ground examined on the maps was 0.25 per cent for each of the A, B, and C samples, or 0.75 per cent for the three combined; hence, it was to be expected that about one acre of Small Wood woodland in every 133 would fall within the scope of the field survey. In practice the total area demarcated was 1,723 acres, which corresponds to a sampling fraction of 0.92 per cent, or one acre in every 109.

(b) Field Survey

This consisted of a classification, by area, type and age-class, of those small woods lying in the south-west quarter of each quarter-sheet. In addition, the surveyors were instructed to examine the territory for small woods which had either been newly formed, or which had altered in size, since the Ordnance map used was last revised. If these new or altered woods fell within the size range of one to five acres, then they had to be included in the survey.

No enumerations of trees, or volume measurements, were required for this section; because, as will be explained later (page 15), volume per acre in each Type and age-class in these small woods, was assumed to be the same as that in the larger woods of five acres and over.

The field classification of the small woods by Type, for example as High Forest, Coppice, Scrub, or Felled areas, followed exactly the same scheme as that laid down in the main Census of Woodlands of 1947-49. The detailed instructions are reproduced as Appendix III, on page 78.

The field forms used (Stand Data Forms) were the same as those for the main Census; an example is reproduced as Figs. 3 and 4 in Appendix I, page 70. These Stand Data Forms enable a very full description of each stand—i.e. area of woodland of a similar character—to be recorded with the minimum of writing in the field.

The present analysis of the Small Woods was carried out in much the same way as that for the larger woods, and the main data extracted were:

(i) *Classification by Type and Sub-type:*

High Forest: Coniferous
 Mixed and Mainly Coniferous
 Mixed and Mainly Broadleaved
 Broadleaved.

(Continued overleaf)

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Coppice: Coppice-with-Standards
 Simple Coppice

Scrub:

Devastated Woodlands

Felled Woodlands

Lost or Disafforested areas.

(A small point of detail here was the separation of Mixed High Forest into "Mainly Coniferous" and "Mainly Broadleaved". Another minor point is that Felled Woodlands were *not* divided into those Felled Before, and those Felled After, 1st September, 1939, which were distinguished in the main 1947-49 Census).

(ii) *Classification of the four sub-types of High Forest by age-classes:*

Details appear in Appendix III, page 78.

Although only these basic data were used in the subsequent calculations, the field surveyors were required to record other information on the Stand Data Forms, so that it could be analysed later if required. These Stand Data Forms, with their related map references, were the only reports on this section of the survey, required from the field parties.

(c) **Computation**

It was required to know both the area and the volume of the small woods by type and age-class for the three countries and for Great Britain as a whole. The sampling fraction was too small to provide reasonably accurate estimates for any individual conservancy.

(i) *Areas*

From two independent one-per-cent samples of the six-inch maps of Great Britain, taken during the course of the main 1947-49 Census of Woodlands, the total extent of the Small Woods had been estimated with adequate accuracy. The figures then obtained were:

England:	120,000	acres
Wales:	29,000	„
Scotland:	38,000	„
<hr/>		
Great Britain:	187,000	„
<hr/>		

These figures were derived solely from maps, as no field inspection of the Small Woods had hitherto been made. It could not be assumed that the proportions of Types and age-classes in the Small Woods would correspond to those ascertained in the enumeration of the larger woodlands, of five acres and over, since size is probably one of the factors that affect the character of a wood and also the way in which it is managed.

The main Census had shown, moreover, that the proportions of Types and age-classes, in the larger woodlands, vary appreciably from one country to another. A similar variation was likely to be found in the Small Woods; but it could not be assumed that it would follow the same trends.

The calculations were therefore done separately for each country, and total figures were then obtained for Great Britain as a whole. They were worked

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out on the assumption that the Small Woods surveyed were a fair sample of all the Small Woods in the country concerned. The steps were:

(1) The total area of the "Surveyed Small Woods" was found by adding up all the areas recorded on the Stand Data Forms.

(2) The area of each description of "Surveyed Small Woods" was then ascertained, also from the Stand Data Forms, and expressed as a percentage of this total surveyed area.

(3) This set of percentages was applied to the total area of all Small Woods in each country, as mentioned above, that had been ascertained by the earlier map inspection. The calculation is, in effect, one of simple proportion.

The areas so obtained for the various Types of woodland are considered to be reasonably accurate. But no great reliance can be placed on the figures for the age-classes of High Forest, as the intensity of sampling was rather low.

(ii) *Volumes*

The volume of timber standing in the Small Woods was computed by a similar proportionate calculation. It was assumed that volumes per acre would not vary appreciably as between Small Woods and larger woodlands of any given Type.

The average volumes per acre in the High Forest and Coppice-with-Standards Types of the larger woodlands had already been computed in the course of the main 1947-49 Census. Average volumes per acre for the remaining Types—Simple Coppice, and the "Unproductive" types comprising Scrub, Devastated Woods, and Felled Woodlands—were obtained in the course of this present survey. (See page 53).

The calculations were done separately for each description of woodland (by Type and age-class) in each country, and the total figures were then obtained by addition. The steps were:

(1) The area for each description of woodland in each country was obtained from the area survey described under (i) above.

(2) For woodlands classed as High Forest or Coppice-with-Standards the volume per acre appropriate to that description was obtained from the previous main Census of Woodlands of Five Acres and Over carried out in 1947-49. (For details see Census Report No. 1, page 135).

(3) The total volume for each Type and age category in High Forest and Coppice-with-Standards occurring in the woods of one to five acres was obtained by multiplying (1) by (2).

(4) Similar processes were followed for the Simple Coppice and the "Unproductive" descriptions, except that the volumes per acre used were obtained from the present survey.

(5) The results obtained at (3) and (4) were added to give the required totals.

III. SURVEY OF VOLUME IN SIMPLE COPPICE AND "UNPRODUCTIVE" WOODLANDS

(a) *Demarcation of Areas for Field Inspection*

For this section of the work the whole of each selected six-inch quarter-sheet was used, and one sample was taken in each of the following Types or Sub-Types, namely Simple Coppice, Scrub, Devastated, and Felled Woodlands

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which happened to be represented on the sheet, (see Plate VI). As all these areas had previously been classified in the main Census of Woodlands, it was possible to mark them on the maps, from office records, before the field party visited the locality. Where two or more stands of the same Type occurred on any map, an arbitrary choice was made.

No precise sampling fraction is applicable to this section, nor was it required for subsequent computation.

(b) Field Survey

In the field survey, the surveyors had only to take into consideration those stands that were already demarcated on their maps. The area of the stand was immaterial for the purpose of this survey, provided it was not less than half an acre. The object was to obtain volume-per-acre figures based on one sample plot in each Type on every map that was sampled. The area of each plot was one acre, although exceptionally, a half-acre sample plot had to be accepted.

In order to eliminate any bias arising from personal choice, the sites of the sample plots were marked on the map before it was issued, the selection being made in the office by a person unfamiliar with the ground. This method was generally satisfactory, but there were occasions on which it led to an unrepresentative choice. In such cases, the surveyors were authorised to select another plot in the same wood.

Every plot had to be representative of the Type of Woodland which it was desired to sample. If, for example, a plot for Coppice happened to fall on a clear-felled area, the surveyors had to choose an alternative plot actually in coppice. Such adjustments were necessary because small areas of one Type, occurring in another, were not always differentiated in the earlier area Census, and a plot picked at random might fall in one of these. (This procedure is not the same as that used in the Volume Survey of the 1947 Census of the larger Woodlands; in that survey, no such adjustments were permitted).

The standard lay-out for the sample plot was a strip of one acre in extent, one chain wide and ten chains long, running east-west from the marked point of origin. But where conditions made it desirable, the surveyors were permitted to alter the direction, shape, or size of the plot. Instructions covering these points appear in Appendix II, para. 2 (iii), page 75.

The subsequent enumeration and measurement of the trees standing on the sample plots was done in the same way as has been described for the Hedgerow and Park Timber. Detailed instructions will be found in Appendix II, para. 3 (i) and (iii), and para. 4 (i) and (iii); minor variations in procedure are there noted. (See page 75.)

The same Strip Data Forms (See Appendix 1, Figs. 1 and 2) were used as for the Hedgerow and Park Timber. For a sheet whereon Simple Coppice and all three Types of "Unproductive" Woodlands were represented, four such Strip Data Forms were submitted by the field party to the Census Office, for subsequent computations to be made.

(c) Computation of Results

All these Simple Coppice and "Unproductive" woodlands had actually been enumerated during the main Census, and their areas were thus already accurately known. The findings of the present volume sampling survey, if expressed on a volume per acre basis, would therefore enable the total volume within these Types to be calculated. This was done separately for England, Scotland, and

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Wales, and the figures so obtained were then added to give totals for Great Britain as a whole. With the methods adopted, it would not have been possible to provide reasonably accurate information by counties or Conservancies.

As each sample plot measured in these Simple Coppice and "Unproductive" woods was one acre in extent (or was adjusted to that area), all the relative Strip Data Forms automatically gave "per acre" figures of volume. All that was required was to average the Strip Data Forms for each Type of woodland, and then to apply the mean volume per acre to the known area of that Type. In all the Types the average volume figures showed a considerable variation between Countries. Due to the smallness of the sample in Wales, however, it was deemed safer to take the average volume based on the combined totals of England and Wales, and to treat only Scotland as a separate entity. But in Simple Coppice the mean volume per acre which has been taken throughout is that of England and Wales, and this figure has been applied to all three countries; for only one Simple Coppice plot was measured in Scotland.

The distinction made between the volume of coniferous timber, and that of broadleaved timber, was based on the volume found in the present volume survey, and not on any classification made in the earlier area survey.

A further distinction was drawn between Private Woodlands and State Forests. This was based simply on the area figures found in the earlier main Census of 1947-49.

PROGRESS OF THE FIELD SURVEY

The field survey was begun in August 1950, and completed in April 1951. The mean date of the survey may be taken as 1st January, 1951. An advantage of sampling surveys, such as this, is that they can be completed in a short space of time, before gains through growth, or losses through felling, have materially affected the volume of timber to be measured.

Although the strength of the personnel of the survey parties varied from time to time, on the average two parties of two surveyors each were engaged throughout in England and Wales, while a third party worked in Scotland. In all, 441 sets of samples were investigated, 252 being in England, 47 in Wales, and 142 in Scotland.

The complete survey, including both field and office work, took nine months to carry out, and, on the average, nine people were employed. These comprised one technical officer, six field surveyors with a technical knowledge of forestry (who included two forestry graduates, two trained foresters, and a student of estate agency), and two office workers. The actual expenditure of time was about 300 man-weeks, and the cost, including transport and equipment, was approximately £4,000. The low cost is primarily due to the use of sampling techniques.

CHAPTER 2

HEDGEROW AND PARK TIMBER

Total Volume

THE survey of hedgerow and park timber, together with the woods under one acre in extent, and the belts less than one chain in width, disclosed a total volume of 806.7 million cubic feet of timber. Of this total, 748.1 million cubic feet, or 93 per cent, consisted of broadleaved timber, while 58.6 million cubic feet, or 7 per cent, consisted of coniferous timber. For this purpose, "timber" is defined as having a minimum quarter-girth at breast-height of six inches, and a minimum length of ten feet of sound timber. It is measured on the quarter-girth or Hoppus system, measurements being taken over bark. This timber volume is further classified below.

In addition to this main timber classification, the survey disclosed a quantity of smaller material, which could only be classed as "short timber", being over six inches in quarter-girth but having only from six to ten feet of sound timber, or as "firewood". The volume of this material, which is of minor importance, is not further considered or classified; but details are given later of the numbers of trees in these groups.

Plates I-V and IX to XII show representative Hedgerow and Park Timber, Small Woods, and shelterbelts. In Scotland, what is here described as "park" timber is generally known as "policy" timber.

Distribution by Countries

The distribution of the hedgerow and park timber over the three countries that make up Great Britain is set out in Table 1 below. Details of volumes per strip, and per acre, for the three countries, are given in Appendix IV, page 82.

DISTRIBUTION OF HEDGEROW AND PARK TIMBER BY COUNTRIES

Table 1. Millions of cubic feet, quarter-girth, over bark

Country	Coniferous	Broadleaved	Total, and Standard Error	Percentage of Total for Great Britain
England	44.2	636.3	680.5±60.9	84
Wales	10.8	75.7	86.5±18.9	11
England and Wales	55.0	712.0	767.0±63.5	95
Scotland	3.6	36.1	39.7±11.1	5
Great Britain	58.6	748.1	806.7±68.3	100

It will be seen that no less than 767 million cubic feet, or 95 per cent, is to be found in England and Wales. The density per acre is 20.8 cubic feet for England and 16.9 cubic feet for Wales. The density in Scotland is only 2.4 cubic feet per acre. (See Tables 2 to 4). The relationship of broadleaved timber to coniferous is much the same in all three countries; some nine-tenths of the whole being broadleaved.

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Distribution by Conservancies—England

The total volume of 680.5 million cubic feet of hedgerow and park timber standing in England is distributed over the six Conservancies, adapted for the purpose of the survey, as shown in Table 2 below. Details of volume per strip, and per acre, for English Conservancies, appear in Appendix IV, page 82, while the areas comprising the Conservancies are set out in Appendix VI, page 84, and in Map 2 reproduced on page 88.

DISTRIBUTION OF HEDGEROW AND PARK TIMBER
BY CONSERVANCIES—ENGLAND

Table 2.

Conservancy	Coniferous	Broadleaved	Total	Density in cubic feet per acre, quarter girth, over bark
	Millions of cubic feet, quarter girth, over bark			
North-West....	4.2	101.0	105.2	13.7
North-East	1.6	96.9	98.5	18.0
East	4.2	139.1	143.3	17.6
South-East	15.4	126.4	141.8	37.3
South-West	18.8	170.6	189.4	28.3
New Forest....	—	2.3	2.3	5.6
England: Total	44.2	636.3	680.5	20.8
Average				

This table shows that the density of hedgerow and park timber per acre of land surface is below the average in the more northerly Conservancies, and also in the New Forest, but above the average in the South-East and South-West Conservancies. In fact, these last two Conservancies—South-East and South-West—hold nearly half the total volume of hedgerow and park timber, although they cover only about one-third of the total area of England. Putting it another way, it may be said that half the hedgerow timber in England lies in the twelve southern counties of Kent, Surrey, Sussex, Hampshire, Berkshire, Wiltshire, Gloucestershire, Hereford, Dorset, Somerset, Devon, and Cornwall.

The exceptionally low density per acre recorded for the New Forest calls for some explanation. This Conservancy is a relatively small one, situated partly in the west of Hampshire and partly in the east of Dorset. It includes an exceptionally large area of woodland, and, in the New Forest proper and its adjacent commons, one of the largest stretches of unenclosed land in the south of England. Moreover, the enclosed fields in this district are commonly fenced with turf banks. Consequently hedges and hedgerow trees are infrequent.

The sampling fraction was too low to show in detail the composition by species of the hedgerow timber in each Conservancy, but observations and records made during the field work enable some broad generalisations to be made.

In the North-West Conservancy, oak and ash are the principal hedgerow trees. The more northerly counties, that is Cumberland, Westmorland, and parts of Lancashire, Yorkshire, Cheshire, and Derbyshire, include large areas of hill land that is either unenclosed or fenced with stone walls. The south of Lancashire is highly industrialised and carries little timber: but it was noted that although the oak there is poor, there is some sycamore and also some

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elm of fair quality. The more southerly counties of this Conservancy, which extends well into the Midlands, show a better stocking of hedgerow and park timber, of satisfactory tree form.

The North-East Conservancy likewise includes wide stretches of hill land along the Pennine range, in Northumberland, Durham, and Yorkshire, and also on the North York moors, which is either unfenced or has stone walls for field boundaries. Such trees as exist in these hill regions are generally windswept and stunted. The West Riding of Yorkshire includes a large industrial area, where smoke pollution is a serious factor; and there are similar industrial regions on Tyneside and in Durham. Nevertheless, in the lowland portions of the Conservancy there is much good oak, ash, sycamore, and beech, and hedgerow trees are fairly numerous.

The East Conservancy shows considerable regional variation both in species and density. Oak is the principal tree, being especially plentiful in Oxfordshire, the northern half of Norfolk, and the northern half of Suffolk. The elms are frequent, particularly in the counties of Huntingdon, Lincoln, and Bedford. Ash tends to be most common along the western borders of the Conservancy, which include a wide belt of Oolitic limestone. Norfolk is probably the county with the greatest density of hedgerow timber. Cambridgeshire, on the other hand, shows a low density, and there are wide areas of Fen country in Cambridgeshire, Huntingdonshire, the Soke of Peterborough (Northants), the Holland division of Lincolnshire, and the extreme west of Norfolk, which are virtually treeless.

A feature of the South-East Conservancy is the large volume of timber occurring in private gardens and public and private parks. Oak is the main tree along the hedgerows, but elm also occurs frequently. There is a good deal of Scots pine in Hampshire, and also in Kent.

Most of the counties included in the South-West Conservancy show a heavy density of hedgerow timber, but Cornwall is a notable exception. There are few hedgerow or park trees in Cornwall, except along the eastern border, where it adjoins Devon. Oak is the principal hedgerow tree, especially in Devon, Somerset, and Gloucestershire, while ash is also fairly frequent. There is a considerable volume of coniferous timber, much of which occurs in parks, gardens, small clumps and narrow belts, rather than along the hedgerows. Conifers that were commonly encountered are Scots pine, Corsican pine, maritime pine, European larch, and the Monterey cypress (*Cupressus macrocarpa*).

Distribution by Conservancies—Wales

The distribution of the 86.5 million cubic feet of hedgerow and park timber standing in Wales and Monmouth, between the two Conservancies, is set out in Table 3 below. Details of volume per strip, and per acre, for Welsh Conservancies, appear in Appendix IV, page 82. Areas for the Conservancies are given in Appendix VI, page 84.

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DISTRIBUTION OF HEDGEROW AND PARK TIMBER BY CONSERVANCIES—WALES

Table 3.

Conservancy	Coniferous	Broadleaved	Total	Density in cubic feet per acre, quarter girth, over bark
	Millions of cubic feet, quarter girth, over bark			
North	8.6	43.8	52.4	18.6
South	2.2	31.9	34.1	14.7
Wales:				
Total	10.8	75.7	86.5	
Average				16.9

A feature common to both the Welsh Conservancies is the large extent of moorland and mountain, which runs from north to south through the centre of Wales. Consequently the bulk of the hedgerow and park timber is found on the periphery of the country, that is along the northern, western and southern coastal strips, and along the valleys that run eastwards into England. Nevertheless there is a good deal of scattered timber in clumps and belts along the valley bottoms among the hills.

In North Wales oak is the principal tree, but there are considerable volumes of sycamore and elm. The relatively high proportion of coniferous timber, 16 per cent, should be noted. This consists mainly of Scots and Corsican pines, European larch, and Norway spruce.

In South Wales, many of the valleys are highly industrialised, but there is much hedgerow timber in the agricultural coastal belt of Carmarthen, Glamorgan and Monmouth. Oak is the principal tree, with ash, beech, and sycamore as important subsidiary species.

Distribution by Conservancies—Scotland

Table 4 below shows the distribution of the 39.7 million cubic feet of hedgerow and park timber in Scotland, between the four Conservancies. Details of volume per strip, and per acre, for Scottish Conservancies, appear in Appendix IV, page 82. Areas for the Conservancies are given in Appendix VI, page 84.

DISTRIBUTION OF HEDGEROW AND PARK TIMBER BY CONSERVANCIES—SCOTLAND

Table 4.

Conservancy	Coniferous	Broadleaved	Total	Density in cubic feet per acre, quarter girth, over bark
	Millions of cubic feet, quarter girth, over bark			
North	—	3.9	3.9	0.6
East	2.7	9.9	12.6	3.0
South	0.3	10.0	10.3	2.6
West	0.6	12.3	12.9	4.3
Scotland				
Total	3.6	36.1	39.7	
Average				2.4

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Taking Scotland as a whole, it may be said that hedgerow timber is almost non-existent north of the Great Glen. Between the Great Glen and the Highland line there lies the great mass of the Grampian mountains, which again is almost devoid of hedgerows. The Southern Uplands are largely devoted to sheep grazing, and carry little hedgerow timber. Consequently the greater part of the Scottish hedgerow and park timber is to be found in the narrow lowland belts. The principal tree species observed were beech, oak, ash, sycamore and Scots pine.

Classification of Hedgerow and Park Timber by Species and Quarter-girth Class—Great Britain

The classification of the volume of hedgerow and park timber by species and also by quarter-girth classes for Great Britain as a whole is set out in Table 5 below, and for the three individual countries in Tables 6 to 8 following.

CLASSIFICATION OF VOLUME OF HEDGEROW AND PARK TIMBER BY SPECIES AND QUARTER-GIRTH CLASS—GREAT BRITAIN

Table 5. Millions of cubic feet, quarter-girth over bark

Species	Quarter-girth Class			Total	Percentage in each species
	6-9 $\frac{3}{4}$ inches	10-14 $\frac{3}{4}$ inches	15 inches and above		
Scots pine	6.0	8.5	8.4	22.9	2.8
European larch	2.7	2.7	1.5	6.9	0.9
Norway spruce	2.4	1.5	0.6	4.5	0.6
Other Conifers	2.6	6.2	15.5	24.3	3.0
Total Conifer	13.7	18.9	26.0	58.6	7.3
Oak	9.4	38.0	202.8	250.2	31.0
Ash	8.7	22.5	73.3	104.5	13.0
Beech	3.3	16.6	49.9	69.8	8.7
Elm	8.6	36.5	112.1	157.2	19.5
Birch	1.4	1.1	0.3	2.8	0.3
Sycamore	7.8	17.1	33.6	58.5	7.2
Spanish chestnut	—	0.6	2.1	2.7	0.3
Other Broadleaves	9.0	19.1	74.3	102.4	12.7
Total Broadleaved	48.2	151.5	548.4	748.1	92.7
Grand Total	61.9	170.4	574.4	806.7	100
Percentage in each quarter-girth class....	7.7	21.1	71.2	100	—

Species

The first point to note is that the bulk of this hedgerow timber occurs in broadleaved trees or hardwoods, which have 748 million cubic feet, or 93 per cent. The coniferous trees, or softwoods, account for only 59 million cubic feet, or 7 per cent.

The oaks are the most important species, having 250 million cubic feet, or 31 per cent, and so accounting for nearly one-third of all the hedgerow timber in the country. The elms come next, with 157 million cubic feet, or 19 per cent. Thus these two groups comprise half the hedgerow timber in Britain.

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Ash takes third place with 105 million cubic feet, or 13 per cent, and beech comes fourth with 70 million cubic feet, or 9 per cent, while sycamore occupies the fifth place with 59 million cubic feet, or 7 per cent.

The five principal broadleaved hedgerow trees—oak, elm, ash, beech, and sycamore, account between them for 640 million cubic feet, or 79 per cent—nearly four-fifths—of all the hedgerow and park timber in Great Britain.

Birch and Spanish chestnut, the only other broadleaved trees shown separately in the table, are of minor significance. But “Other Broadleaves” comprise 102 million cubic feet, or 13 per cent of the total. These include a wide range of native and introduced species, and reflect the fact that a large proportion of the volume is made up of trees in ornamental grounds, parks, and gardens.

Scots pine is the only individual coniferous species with any appreciable volume in the form of hedgerow and park timber. This amounts to 23 million cubic feet or 3 per cent of the total. European larch and Norway spruce show very small quantities. “Other conifers”, however, show the substantial quantity of 24 million cubic feet, or 3 per cent, and, like the “Other Broadleaves”, bring out the fact that much of this volume is standing in gardens or parklands. Again a wide range of species is represented.

Quarter-girth Class

The classification of timber volume by quarter-girth classes shows that the bulk of it lies in the largest size category—that for trees above 15 inches quarter-girth at breast height, which holds 574 million cubic feet, or 71 per cent. The intermediate class, of 10 to $14\frac{3}{4}$ inches quarter-girth, follows, with 170 million cubic feet or 21 per cent. The smallest class, of 6 to $9\frac{3}{4}$ inches quarter-girth, has the smallest volume, only 62 million cubic feet or 8 per cent.

The relationship between the size classes, outlined above, is much the same for most species or species groups, but a few exceptions call for comment. In birch, Scots pine, Norway spruce and European larch, the general trend is reversed; with these species, the greater part of the volume is in the two smaller size classes. This result is understandable for birch, a broadleaved tree that is comparatively short-lived, and which seldom attains to large dimensions. Although the three common coniferous trees have most of their volume in the smaller size classes, the “Other Conifers” include a substantial quantity of larger timber, probably because they are mostly ornamental trees that are grown under favourable conditions and preserved to a considerable age: many are notable for their rapid growth on suitable sites.

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Classification of Hedgerow and Park Timber by Species and Quarter-girth Class—England

Details for England are set out, on the same pattern as those for Great Britain, in Table 6 below.

CLASSIFICATION OF VOLUME OF HEDGEROW AND PARK TIMBER BY SPECIES AND QUARTER-GIRTH CLASS—ENGLAND

Table 6. Millions of cubic feet, quarter-girth over bark

Species	Quarter-girth Class			Total	Percentage in each species
	6-9 $\frac{3}{4}$ inches	10-14 $\frac{3}{4}$ inches	15 inches and above		
Scots pine	3.2	7.6	7.2	18.0	2.7
European larch	1.0	1.5	1.1	3.6	0.5
Norway spruce	2.0	0.5	0.3	2.8	0.4
Other Conifers	2.4	5.2	12.2	19.8	2.9
Total Conifer	8.6	14.8	20.8	44.2	6.5
Oak	6.8	30.4	176.4	213.6	31.4
Ash	6.7	18.9	60.4	86.0	12.6
Beech	2.7	14.0	39.1	55.8	8.2
Elm	6.4	33.6	104.9	144.9	21.3
Birch	0.9	0.5	0.3	1.7	0.3
Sycamore	6.6	11.8	22.7	41.1	6.0
Spanish chestnut	—	0.6	2.1	2.7	0.4
Other Broadleaves	7.9	16.0	66.6	90.5	13.3
Total Broadleaved	38.0	125.8	472.5	636.3	93.5
Grand Total	46.6	140.6	493.3	680.5	100
Percentage in each quarter-girth class....	6.8	20.7	72.5	100	—

It will be seen that the English figures, accounting as they do for the bulk of the volume, accord closely with the general classification for Britain as a whole. The order of importance for individual species is: oak 31 per cent; elm, 21 per cent; ash, 13 per cent; beech, 8 per cent; sycamore, 6 per cent; Scots pine, 3 per cent.

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Classification of Hedgerow and Park Timber by Species and Quarter-Girth Class—Wales

Details for Wales, on the same plan, are given in Table 7 below.

CLASSIFICATION OF VOLUME OF HEDGEROW AND PARK TIMBER BY SPECIES AND QUARTER-GIRTH CLASS—WALES

Table 7. Millions of cubic feet, quarter-girth over bark

Species	Quarter-girth Class			Total	Percentage in each species
	6-9 $\frac{3}{4}$ inches	10-14 $\frac{3}{4}$ inches	15 inches and above		
Scots pine	0.1	0.2	1.2	1.5	1.8
European larch	1.7	1.2	0.4	3.3	3.8
Norway spruce	0.2	1.0	0.3	1.5	1.7
Other Conifers	0.2	1.0	3.3	4.5	5.2
Total Conifer	2.2	3.4	5.2	10.8	12.5
Oak	2.2	5.1	19.7	27.0	31.2
Ash	1.8	2.7	5.4	9.9	11.4
Beech	0.2	0.9	2.7	3.8	4.4
Elm	2.1	2.5	6.9	11.5	13.3
Birch	0.4	0.5	—	0.9	1.0
Sycamore	1.1	3.0	8.7	12.8	14.8
Spanish chestnut	—	—	—	—	—
Other Broadleaves	1.1	1.6	7.1	9.8	11.4
Total Broadleaved	8.9	16.3	50.5	75.7	87.5
Grand Total	11.1	19.7	55.7	86.5	100
Percentage in each quarter-girth class...	12.8	22.8	64.4	100	—

Some interesting comparisons may be made with the corresponding data for England, which have been presented in Table 6.

Species

Coniferous trees are relatively more important in the Welsh hedgerows and parks, accounting for 12 per cent of the volume, as compared with 6 per cent in England. Larch is particularly frequent, having 4 per cent of the volume, as against only 0.5 per cent in England. Of the broadleaved trees, sycamore has a much greater representation in Wales, with 15 per cent of the volume, compared with only 6 per cent in England.

On the other hand, elm is less important in Wales, with only 13 per cent of the volume, whereas in England it has 21 per cent. Beech accounts for only 4 per cent of the Welsh volume, as compared with 8 per cent in England. Oak, with 31 per cent, is equally important in both countries.

The order of importance for Wales is: oak, 31 per cent; sycamore, 15 per cent; elm, 13 per cent; ash, 11 per cent; beech and European larch each 4 per cent; Scots pine and Norway spruce each 2 per cent; and birch, 1 per cent.

Quarter-Girth Class

Only 64 per cent falls in the largest quarter-girth class, with 23 per cent in the intermediate class and 13 per cent in the smallest class.

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Classification of Hedgerow and Park Timber by Species and Quarter-Girth Class—Scotland

Details for Scotland, which follow in Table 8, show a representation of tree species substantially different to that found in England and Wales.

CLASSIFICATION OF VOLUME OF HEDGEROW AND PARK TIMBER BY SPECIES AND QUARTER-GIRTH CLASS—SCOTLAND

Table 8. Millions of cubic feet, quarter-girth over bark

Species	Quarter-girth Class			Total	Percentage in each species
	6-9 $\frac{3}{4}$ inches	10-14 $\frac{3}{4}$ inches	15 inches and above		
Scots pine	2.7	0.7	—	3.4	8.6
European larch	—	—	—	—	—
Norway spruce	0.2	—	—	0.2	0.5
Other Conifers	—	—	—	—	—
Total Conifer....	2.9	0.7	—	3.6	9.1
Oak	0.4	2.5	6.7	9.6	24.2
Ash	0.2	0.9	7.5	8.6	21.6
Beech	0.4	1.7	8.1	10.2	25.7
Elm	0.1	0.4	0.3	0.8	2.0
Birch	0.1	0.1	—	0.2	0.5
Sycamore	0.1	2.3	2.2	4.6	11.6
Spanish chestnut	—	—	—	—	—
Other Broadleaves	—	1.5	0.6	2.1	5.3
Total Broadleaved	1.3	9.4	25.4	36.1	90.9
Grand Total	4.2	10.1	25.4	39.7	100
Percentage in each quarter-girth class....	10.6	25.4	64.0	100	—

Species

Conifers are seen to have only a minor share (9 per cent) of the volume of Scottish hedgerow and policy timber. But the absence of any volume in the largest quarter-girth class, and also in the "Other Conifers" group, may be due to the chances of sampling. The volumes generally being small, the relative precision is comparatively low.

Among the broadleaved trees beech, with 26 per cent, has the largest volume; whereas in England it takes fourth place, with only 8 per cent. Oak, which is easily the most important species in England and Wales, takes second place, with 24 per cent. Ash, with 22 per cent, is far more important in the Scottish hedgerows and policies than it is south of the Border. Elms, on the other hand, hold only 2 per cent of the Scottish volume, compared with 21 per cent in England, where they are major species.

The order of importance for Scotland is thus: beech, 26 per cent; oak, 24 per cent; ash, 22 per cent; sycamore, 12 per cent; Scots pine, 9 per cent; and elm, 2 per cent.

Quarter-girth Class

The proportions of timber in the larger quarter-girth classes tend to be smaller in Scotland than they are in England.

HEDGEROW AND PARK TIMBER

NUMBER OF HEDGEROW AND PARK TREES BY COUNTRIES, AND CATEGORIES—GREAT BRITAIN

Table 9. All Species Thousands

Country	Category						Grand Total
	Saplings at least 10 feet tall and 3-6 inches quarter-girth	Timber, by quarter girth classes				Short Timber Over 6 inches quarter-girth and 6-10 feet long	Firewood : Crooked Trees over 3 inches quarter-girth
		6-9½ inches	10-14½ inches	15 inches and above	Total Timber Trees		
England	17,084	8,366	9,151	9,585	27,102	2,891	8,699
Wales	6,049	1,881	1,322	1,092	4,295	411	88
Scotland	105	528	675	520	1,723	46	4,804
Total	23,238	10,775	11,148	11,197	33,120	3,348	13,591
Percentage in each category ...	31.7	14.7	15.2	15.3	45.2	4.6	18.5
Percentage of timber trees in each quarter-girth class ...	—	32.5	33.7	33.8	100	—	—

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NUMBER OF HEDGEROW AND PARK TREES BY CONSERVANCIES AND CATEGORIES—ENGLAND

All Species				Thousands			
Conservancy	Saplings at least 10 feet tall and 3-6 inches quarter-girth	Category				Grand Total	
		Timber, by quarter-girth classes			Short Timber over 6 inches quarter-girth and 6-10 feet long		Firewood : Crooked trees over 3 inches quarter-girth
		6-9¾ inches	10-14¾ inches	15 inches and above				Total Timber Trees
North-West	4,258	1,499	1,660	1,522	569	1,214	10,722
North-East	4,053	1,605	1,216	1,473	394	2,481	11,222
East	2,229	1,407	1,660	2,148	814	334	8,592
South-East	879	1,472	1,206	1,875	61	495	5,988
South-West	5,576	2,366	3,371	2,520	1,032	4,175	19,040
New Forest	89	17	38	47	21	—	212
Total	17,084	8,366	9,151	9,585	2,891	8,699	55,776
Percentage in each category	30.6	15.0	16.4	17.2	5.2	15.6	100
Percentage of timber trees in each quarter-girth class	—	30.9	33.7	35.4	—	—	—
<div>36%20265855776</div> <div>8699</div> <div>47077</div> <div>108</div> <div>29993</div>							

HEDGEROW AND PARK TIMBER

NUMBER OF HEDGEROW AND PARK TREES BY CONSERVANCIES AND CATEGORIES—WALES

Table 11.		All Species					Thousands
Conservancy		Category					
		Saplings at least 10 feet tall and 3-6 inches quarter-girth	Timber, by quarter-girth classes			Short Timber over 6 inches quarter-girth and 6-10 feet long	Firewood: Crooked trees over 3 inches quarter-girth
			6-9 $\frac{3}{4}$ inches	10-14 $\frac{3}{4}$ inches	15 inches and above		
North	....	1,829	952	784	635	135	19
South	....	4,220	929	538	457	276	69
Total	....	6,049	1,881	1,322	1,092	411	88
Percentage in each category	....	55.8	17.4	12.2	10.0	3.8	0.8
Percentage of timber trees in each quarter-girth class	....	—	43.9	30.8	25.3	—	—
							Grand Total
							4,354
							6,489
							10,843
							100
							—

NUMBER OF HEDGEROW AND PARK TREES BY CONSERVANCIES AND CATEGORIES—SCOTLAND

Table 12. All Species Thousands

Conservancy	Category						Grand Total	
	Saplings at least 10 feet tall and 3-6 inches quarter-girth	Timber, by quarter-girth classes				Short Timber over 6 inches quarter-girth and 6-10 feet long		Firewood: Crooked trees over 3 inches quarter-girth
		6-9½ inches	10-14½ inches	15 inches and above	Total Timber Trees			
North	45	18	27	46	91	—	2,326	
East	—	229	351	152	732	8	1,404	
South	60	52	183	132	367	32	1,482	
West	—	229	114	190	533	6	1,466	
Total	105	528	675	520	1,723	46	6,678	
Percentage in each category	1.6	7.9	10.1	7.8	25.8	0.7	100	
Percentage of timber trees in each quarter-girth class	—	30.6	39.2	30.2	100	—	—	

HEDGEROW AND PARK TIMBER

Number of Hedgerow and Park Trees—Great Britain

The actual number of measurable trees standing along the hedgerows and in the parks and policies of Britain was computed from the data obtained during the field survey, and the overall figures are presented in Table 9 page 27. These trees are classified according to their description as saplings, timber, short timber, or firewood, while the timber trees are shown under their quarter-girth classes. Details are given by countries,* and also, in Tables 10 to 12, by Conservancies, pages 28-30.

The total number of hedgerow and park trees (as considered for purposes of this survey) was found to be 73 million, 55 million being in England, 11 million in Wales, and 7 million in Scotland. Only 33 million however, or 45 per cent, were classified as "timber", the balance consisting of 23 million saplings (32 per cent), 3 million "short timber" trees (5 per cent), and 14 million firewood trees (18 per cent). The timber trees were very evenly divided between the three quarter-girth classes, as shown by the lower percentage column of Table 9.

Inspection of the upper percentage column in Table 9 provides some information as to the degree in which the larger hedgerow trees are likely to be replaced, as they disappear, by smaller trees. If "short timber" and firewood trees are disregarded, it will be seen that the ratio between the saplings and the three quarter-girth classes of timber trees is approximately 2: 1: 1: 1. Thus there are twice as many saplings as small timber trees, which may be adequate for replacement. But unless no losses occur among the smallest class of timber trees, which is unlikely, the intermediate class is unlikely to be replaced in adequate numbers, as its present trees grow larger and pass into the largest class. In the same way, the largest size class is unlikely to get adequate recruitment from the intermediate class, and ultimately from the smallest class.

This must be regarded, however, as only a very general pointer to what is going on, as the survey provided no information regarding the ages of the trees concerned, nor does it show how rapidly they increase in girth and consequently pass from one class to another. Moreover, no data were obtained concerning recruitment to the sapling class, which is confined to trees at least three inches in quarter-girth, and having at least ten feet of straight stem. Nevertheless the figures do suggest that the volume of hedgerow timber is likely to diminish eventually, through insufficient recruitment of young trees, unless further planting is carried out.

Number of Hedgerow and Park Trees—England

The numbers of hedgerow and park trees growing in England are set out, by description and girth classes, in Table 10, page 28.

The distribution of the total number of trees between the various descriptions and quarter-girth classes resembles that for Great Britain, discussed above, and needs no further comment. Out of 55 million hedgerow trees, 27 million, or 49 per cent were classed as timber.

As the Conservancies differ considerably in area, close comparisons cannot be drawn between the figures for each, which are presented as a matter of record. It may be noted, however, that out of a total of 55 million hedgerow trees, 25 million lie in the three southern Conservancies, comprising Hereford, Gloucester, South-west England, and the counties south of the Thames.

In most Conservancies there is a reasonable balance between saplings and larger timber trees of the various quarter-girth classes, though South-east England shows a deficiency of saplings.

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Number of Hedgerow and Park Trees—Wales

Details for Wales and its two component Conservancies are given in Table 11, page 29. In all there are 11 million hedgerow trees, of which 4.3 million, or 40 per cent, rank as timber.

By comparison with England, Wales shows a high proportion of the smaller trees—saplings and timber in the smaller quarter-girth classes. The number of saplings is more than three times that of the smallest timber class, and may be adequate for its replacement. The proportion of “firewood trees” is only one per cent and therefore much less than the sixteen per cent recorded for England. The total number of hedgerow trees is 11 million, over 6 million being in the South Conservancy, though that has a smaller land area than the North Conservancy.

Number of Hedgerow and Park Trees—Scotland

Figures for Scotland and its four component Conservancies are presented in Table 12, page 30. There are 6.7 million hedgerow trees, but only 1.7 million (26 per cent) rank as timber, 4.8 million being “firewood” trees, 0.1 million “short timber” trees, and 0.1 million saplings.

Probable Annual Increment of Hedgerow and Park Timber

Only the volume of hedgerow and park timber was measured during the survey, and no general investigation of increment was carried out. However, as a result of other investigations, undertaken by the Mensuration Section of the Forestry Commission, it was found possible to make a very general estimate of the probable increment accruing to the hedgerow and park trees. Trees in the smallest quarter-girth class, of 6 to 9 $\frac{3}{4}$ inches, which are known to be growing fairly rapidly, were assumed to have an average annual increment of 4 per cent of their volume; larger trees, growing relatively slowly, were assumed to have an average annual increment of approximately 1.2 per cent. On this basis, the total annual increment for the 1951 growing season was computed to be as follows:—

ANNUAL INCREMENT OF HEDGEROW AND PARK TIMBER

Table 13 For 1951, Millions of Cubic Feet, quarter-girth, over bark

Country	Coniferous	Broadleaved	Total
England	0.8	8.8	9.6
Wales	0.2	1.2	1.4
Scotland	0.1	0.5	0.6
Total, Great Britain	1.1	10.5	11.6

Note: Only timber over 10ft. long and 6 in. girth, is considered.

These figures must be treated with reserve, since they are based on an estimate of volume from a sample and also on an assumed rate of increment. Nevertheless, it is fairly safe to say that, over Great Britain as a whole, hedgerow and park timber is growing at the rate of about 10 million cubic feet per annum. But owing to the high proportion of garden trees, ornamental trees, and trees planted for shelter, much of this increment is unavailable for harvesting.

HEDGEROW AND PARK TIMBER

Miscellaneous Observations

In the course of the survey of hedgerow timber a number of observations were made which, while not always contributing directly to the main results, throw some light on the character and distribution of hedgerow, park and garden trees generally.

Sampling Strips carrying no Hedgerow or Park Timber

The number of strips selected for measurement under the procedure described in Chapter 1, page 7, which proved on inspection to carry no measurable hedgerow or park trees, was 173, or 39 per cent of the total of 441 strips. Figures for individual countries were: England, 57, or 23 per cent of 252; Wales, 14, or 30 per cent of 47; and Scotland, 102 or 72 per cent of 142. See Appendix V., page 83.

It may be noted that the proportion of such strips is highest in Scotland. It was particularly high in the North and South Conservancies of that country. Otherwise the strips without hedgerow or park timber were spread fairly evenly over Great Britain, some occurring in every Conservancy. It should be borne in mind that such strips might include woodlands of one acre or more in extent.

Sampling Strips in Built-up Areas

From the nature of the sampling procedure, it was probable that a number of strips would fall on urban or suburban areas that were more or less built-up and hence included no rural hedgerows or parks. Actually ten such strips occurred, all of them in England, but all except three were found to include trees growing in public parks or private gardens.

The treeless urban strips were at Bootle, Lancs.; Tynemouth, Northumberland; and Bexhill, Sussex. A strip with only 7 cubic feet of timber was surveyed at Barking, Essex, on the eastern outskirts of London. Only one strip fell within the administrative county of London; this chanced to include a portion of Wandsworth Common, a public park, and consequently showed a considerable volume—171 cubic feet on the standard area of sixteen acres. The largest volume recorded on an urban strip was at Torquay, Devon; this happened to include numerous garden and street trees and showed a volume of 3,778 cubic feet, equivalent to 236 cubic feet per acre; it had, in fact, the highest volume of any strip measured, whether urban or rural.

The average volume for the ten urban strips was 435 cubic feet, equivalent to 28 cubic feet per acre. This is higher than the general average for any country, and also higher than the general average for any Conservancy except South-east England. Although it would be unwise to place great reliance on figures obtained from so small a number of samples, including one exceptional strip, it does appear possible that the density of hedgerow, park and garden timber may be at least as great in some built-up areas as it is in the rural ones.

The proportion of treeless strips in built-up areas, 30 per cent, is no higher than that for the country as a whole.

Trees of Exceptional Size

The largest tree measured in the course of the survey was an oak, growing in Kent, which had a volume of 457 cubic feet. This single tree had thus a much greater volume than was usually found on the whole of a sixteen-acre strip.

It was not, however, the tree with the greatest quarter-girth. Another oak, growing in Somerset, was found to have a quarter-girth, over bark, at breast height, of $56\frac{1}{4}$ inches.

CHAPTER 3

SMALL WOODS

THE Small Woods to which the survey relates are of very varied character and outline. They range from small patches of scrub on remote hillsides to well-tended plantations of High Forest growing on good lowland sites, and they include many amenity woods and shelterbelts. Shelterbelts less than one chain (66 feet) wide were excluded from this group, having been surveyed with hedgerow timber; nevertheless a high proportion of shelterbelts fall in the Small Wood class; belts one chain wide, and between ten and fifty chains long, are included, as are those two chains wide and between five and twenty-five chains long; and these dimensions are fairly representative of many of the belts planted to give protection from the wind. (See Plates IV and XII.) In contrast to these long narrow belts, a small compact wood measuring no more than three and one-third chains (74 yards) in each direction qualified for inclusion, while the largest wood of square outline that could be considered measured little more than seven chains each way.

I. AREA OF THE SMALL WOODS

In the course of the 1947-49 Census of the larger woodlands of five acres and over, a computation was made of the area covered by the smaller woods that have an individual size of one to five acres. This was based on two independent one per cent samples (2 per cent in all) of the six-inch Ordnance Survey maps of Great Britain. The total area, including any such woods that had been "lost" or disafforested since the maps were last revised, was found to be 187,000 acres. Of this, 120,000 acres were in England, 29,000 acres in Wales, and 38,000 acres in Scotland. (See Census Report No. 1, page 39.)

The classification of these areas into Types similar to those used in the 1947-49 Census of the larger woodlands, was made on the basis of three 0.25 per cent samples (0.75 per cent in all) of the Ordnance Maps, which actually included 0.92 per cent of the estimated total Small Wood area. Details of the methods used are given on pages 7 and 13, while the Types are defined in Appendix III page 78. Comparisons have been drawn, where appropriate, between the composition of the Small Woods and that of the Large Woods dealt with in the 1947-49 survey.

The first classification to be considered is that into four main Groups, which include the Types and Sub-types used in the 1947-49 Census of larger woodlands, on the following basis:

- Group 1. Mainly Coniferous*
 - Pure Coniferous High Forest
 - Mainly Coniferous Mixed High Forest
- Group 2. Mainly Broadleaved*
 - Pure Broadleaved High Forest
 - Mainly Broadleaved Mixed High Forest
 - Coppice-with-Standards
- Group 3. Simple Coppice and Unproductive*
 - Simple Coppice
 - Scrub
 - Devastated Woods
 - Felled Woodlands

SMALL WOODS

AREA OF SMALL WOODS CLASSIFIED BY COUNTRIES AND MAIN GROUPS

Thousand Acres								
Country		Group 1 Mainly Coniferous	Group 2 Mainly Broadleaved	Group 3 Simple Coppice and Unpro- ductive	Total of Groups 1-3 Remaining Woodland	Group 4 Lost Woodland	Grand Total All Small Woods	Percentage of total for Great Britain situated in each Country
England	...	17.2	56.9	39.2	113.3	6.7	120.0	64
Wales	...	3.5	17.1	6.9	27.5	1.5	29.0	16
Scotland	...	6.5	18.2	12.8	37.5	0.5	38.0	20
Great Britain	...	27.2	92.2	58.9	178.3	8.7	187.0	100
Percentage of all Small Woods in each group		14	49	32	95	5	100	—

HEDGEROW TIMBER AND SMALL WOODS, 1951

Group 4. *Lost or Disafforested Areas*

This classification is set out for Great Britain and the component countries in Table 14, page 35. Simple Coppice is grouped with the "Unproductive" descriptions of woodland because it carries so little timber; and—for that reason—it was sampled for timber volume along with them.

Lost Woods

Attention should first be directed to the woods of Group 4, that is the Lost or Disafforested Small Woods, which have been converted to non-forest uses since the last revision of the Ordnance Survey maps used in the field survey. This includes cleared woods which have been converted to agricultural uses, and those that have disappeared as the result of building or the construction of roads, aerodromes, or of other developments. The total lost in this way was found to be 8,720 acres, equivalent to 5 per cent of the total area of the Small Woods of Great Britain. This percentage is notably higher than that recorded for the larger woodlands, which was only 2 per cent, though it relates, so far as can be estimated, to the same period of years. It is evident that woodland comprised in Small Woods is more liable to be converted to other forms of land use, than is woodland in larger blocks.

The percentages of Small Woods Lost in England, 6 per cent, and also in Wales, 5 per cent, are close to the general average. But the Scottish percentage is much lower, being only 1 per cent. A similar state of affairs was noted with the larger woodlands. But even in Scotland the percentage of Small Woods lost is distinctly higher than the percentage of larger woodlands lost, which is only 0.5 per cent.

Comparison of Area of Small Woods with that of Large Woods

The area of Large Woods in Great Britain (excluding any "lost" areas) was determined by the 1947-49 Census to be 3,448,362 acres. When the Small Woods covering 178,300 acres (again excluding lost areas) are added to this the combined area is found to be 3,626,662 acres. Thus, 95 per cent of the woodland area is in the Large Woods, and 5 per cent in the Small Woods.

The corresponding figures for the two major timber-producing descriptions of woodland, i.e. High Forest and Coppice with Standards, are:

<i>Large Woods;</i>	....	....	2,018,587 acres	94 per cent
<i>Small Woods;</i>				
(Privately Owned)	....		119,400 acres	6 per cent
Total:	....	....	2,137,987 acres	100 per cent

Thus 6 per cent of such timber-producing woodland is in the Small Woods.

Distribution of Small Woods by Countries

Dealing again with those Small Woods that were actually in existence at the 1st January 1951, the total area is seen to be 178,300 acres. Of this, 113,300 acres or 63 per cent was in England, and 27,500 acres, or 16 per cent was in Wales. Scotland had 37,500 acres, or 21 per cent.

For comparison, it should be noted that where the larger, (over 5-acre) woods are concerned, England has 54 per cent, Wales 9 per cent, and Scotland 37 per cent. It thus appears that England and Wales both have larger shares

SMALL WOODS

in Britain's total area of Small Woods, than they do in the total area of larger woods. Scotland has a relatively small share of the Small Woods.

Classification of Small Woods by Main Groups

When the classification of the existing area of Small Woods, 178,300 acres, into its three main groups of Mainly Coniferous, Mainly Broadleaved and Unproductive, is considered, the following conclusions appear:

Taking Great Britain as a whole 3,900 acres, or 2%, are simple coppice and 55,000 acres or 31% are unproductive. This compares favourably with 3% and 38% respectively in the large woods. This suggests that, on the whole, the Small Woods have suffered less exploitation than the larger ones, but nevertheless it is disappointing to note that nearly one-third of their area is idle and growing nothing of value. This proportion of Unproductive Woodland is fairly constant for the three countries.

The Productive area (excluding Simple Coppice) amounts to 119,400 acres, 27,200 acres being Mainly Coniferous and 92,200 acres Mainly Broadleaved. Conifers thus occupy 23 per cent of the Productive area, and broadleaved trees 77 per cent. The equivalent figures for large woods are 53 per cent coniferous and 47 per cent broadleaved. Hence the Small Woods show a substantially higher proportion of broadleaved trees. It may be said that, when all the High Forest Crops in both private woodlands and State forests are considered, conifers and broadleaved trees are fairly evenly balanced in the Large Woods, but in the Small Woods there is three times as much broadleaved woodland as there is coniferous. As will be shown later (see page 40), when only the private woodlands are considered the proportions of broadleaved and coniferous timber are similar for both Large and Small Woods.

It will be seen from Table 14 that the proportion of coniferous to broadleaved areas in the Small Woods is fairly constant for the three countries. In England conifers occupy 23 per cent of the area classed as High Forest and Coppice-with-Standards, in Wales 17 per cent, and in Scotland 26 per cent.

Classification of Small Woods by Type and Sub-Type—Great Britain

The classification presented in Table 14 is carried a stage further by Table 15 overleaf which subdivides the woodland area comprised in the Small Woods into its main Types and Sub-types. Further details of sub-types of Productive Small Woods are shown in Table 16, page 39. Since virtually all the Small Woods are in private ownership it has been thought advisable to make certain comparisons with the privately owned Large Woods.

CLASSIFICATION OF AREA OF SMALL WOODS BY TYPE—GREAT BRITAIN

Table 15. Thousand Acres												
Type	Productive						Unproductive				Grand Total Existing Woods	Lost Wood- land
	High Forest and Coppice-with-Standards			Simple Coppice	Scrub	Devastated	Felled	Total				
	Coniferous	Broadleaved	Total									
Area	27.2	92.2	119.4	3.9	25.6	12.1	17.3	55.0	178.3	8.7		
Percentage of all Existing Small Woods (Privately- Owned) 	15.3	51.7	67.0	2.2	14.3	6.8	9.7	30.8	100	—		
Corresponding percentage for Census of Large Woods (Privately- Owned) 	(16)	(36)	(52)	(4)	(17)	(5)	(22)	(44)	(100)	—		

Note: The area carrying Coniferous standards over coppice is negligible.

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CLASSIFICATION OF HIGH FOREST AND COPPICE-WITH-STANDARDS AREA OF SMALL WOODS BY TYPE AND AGE-CLASS—
GREAT BRITAIN
Table 16. Thousand Acres

Age Class Years	Coniferous			Broadleaved*			Total
	Pure Coniferous	Mixed, Mainly Coniferous	Total Coniferous	Pure Broadleaved	Mixed, Mainly Broadleaved	Total Broadleaved	
0—20 ...	2.0	—	2.0	0.6	0.4	1.0	3.0
21—40 ...	6.7	1.3	8.0	3.7	—	3.7	11.7
41—60 ...	3.0	1.1	4.1	5.8	1.7	7.5	11.6
61—80 ...	5.2	1.9	7.1	16.1	1.7	17.8	24.9
81—120 ...	0.3	0.6	0.9	23.6	0.8	24.4	25.3
Over 120 ...	—	0.1	0.1	7.6	1.6	9.2	9.3
Uneven-aged Coppice-with-Standards ...	0.7	4.3	5.0	18.8	5.3	24.1	29.1
Total ...	17.9	9.3	27.2	80.7	11.5	92.2	119.4
Percentage of All Existing Small Woods (Pri- vately Owned) ...	10.0	5.3	15.3	45.3	6.4	51.7	67.0
Corresponding Percentage for Census of Large Woods (Privately Owned) ...	(14)	(2)	(16)	(33)	(3)	(36)	(52)

* Includes Coppice-with-Standards

HEDGEROW TIMBER AND SMALL WOODS, 1951

Table 15 enables an analysis to be made of the various Unproductive Types that constitute 31 per cent of the Small Woods, and also permits comparisons to be drawn with similar areas in the Privately-Owned Large Woods.

It will be seen that the felled area amounts to 17,300 acres, or 10 per cent of the Small Woods, which is well below the 22 per cent found in the Large Woods.

The Small Woods are seen to contain 12,100 acres of Devastated Woodland, and 25,600 acres of Scrub. The proportions under these Types are generally similar to those for the Privately-Owned Large Woods.

High Forest and Coppice-with-Standards in the Small Woods extend to 119,400 acres, of which 92,200 acres or 77% is Broadleaved or Mainly Broadleaved High Forest or Coppice-with-Standards while 27,200 acres or 23% is Coniferous or Mainly Coniferous High Forest. The area of coniferous standards over coppice is negligible.

In the Privately owned Large Woods the respective percentages in these categories are 68% Broadleaved and 32% Coniferous.

The area of Simple Coppice, estimated at 3,900 acres, is comparatively small.

The second characteristic of the Small Woods that is analysed in Table 16 is their age-class composition. It will be seen that 4,500 acres are Coppice-with-Standards. Uneven-aged woods cover 29,100 acres, or about a quarter of all the Small Woods classed as High Forest and Coppice-with-Standards; 5,000 acres of these are coniferous and 24,100 acres are broadleaved.

The even-aged areas, which total 85,800 acres, require the further analysis that follows in Table 17 below:

CLASSIFICATION OF EVEN-AGED HIGH FOREST SMALL WOODS,
CONIFEROUS AND BROADLEAVED BY AGE CLASSES—GREAT BRITAIN

Table 17.

Age Class Years	Mainly Coniferous		Mainly Broadleaved	
	Thousand Acres	Percentage	Thousand Acres	Percentage
0-20	2.0	9	1.0	2
21-40	8.0	36	3.7	6
41-60	4.1	19	7.5	12
61-80	7.1	32	17.8	28
81-120	0.9	4	24.4	38
Over 120	0.1	—	9.2	14
All ages classes	22.2	100	63.6	100

A remarkable contrast appears between the age-class structure of the coniferous and the broadleaved even-aged High Forest Small Woods. The coniferous woods are mostly young: 45 per cent of them are under 40 years of age, and 64 per cent are under 60 years. The broadleaved woods on the other hand, are mostly old, 52 per cent being over 80 years of age, and 80 per cent over 60 years.

Classification of Small Woods by Type and Sub-Type—England

The analyses that have been presented for Great Britain in Tables 15 and 16 are repeated for the English Small Woods in Tables 18 and 19 following.

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CLASSIFICATION OF AREA OF SMALL WOODS BY TYPE—ENGLAND

Table 18. Thousand Acres

Type	Productive				Unproductive				Grand Total Existing Woods	Lost Wood- land
	High Forest and Coppice-with-Standards			Simple Coppice	Scrub	Devastated	Felled	Total		
	Coniferous	Broadleaved	Total							
Area 	17.2	56.9	74.1	3.9	21.4	6.4	7.5	35.3	113.3	6.7
Percentage of all Existing Small Woods (Privately- Owned) 	15	50	65	3	19	6	7	32	100	—
Corresponding percentage for Census of Large Woods (Privately Owned) 	(12)	(52)	(64)	(6)	(12)	(6)	(12)	(30)	(100)	—

Note: The area carrying Coniferous standards over coppice is negligible.

CLASSIFICATION OF HIGH FOREST AND COPPICE-WITH-STANDARDS AREA OF SMALL WOODS BY TYPE AND AGE-CLASS—
ENGLAND

Age Class Years		Coniferous				Broadleaved*			Total
		Pure Coniferous	Mixed, Mainly Coniferous	Total Coniferous	Pure Broadleaved	Mixed, Mainly Broadleaved	Total Broadleaved		
0—20	...	1.8	—	1.8	0.6	—	0.6	2.4	
21—40	...	3.8	0.7	4.5	2.4	—	2.4	6.9	
41—60	...	1.5	0.9	2.4	4.6	1.4	6.0	8.4	
61—80	...	3.9	1.3	5.2	9.9	1.2	11.1	16.3	
81—120	...	0.3	—	0.3	10.8	0.2	11.0	11.3	
Over 120	...	—	0.1	0.1	3.9	1.0	4.9	5.0	
Uneven-aged Coppice-with-Standards	...	0.2	2.7	2.9	13.9	2.9	16.8	19.7	
	...	—	—	—	4.1	—	4.1	4.1	
Total	...	11.5	5.7	17.2	50.2	6.7	56.9	74.1	
Percentage of all existing Small Woods (Pri- vately owned)	...	10	5	15	44	6	50	65	
Corresponding Percentage for Census of Large Woods (Privately owned)	...	(9)	(3)	(12)	(48)	(4)	(52)	(64)	

* Includes Coppice-with-Standards

SMALL WOODS

CLASSIFICATION OF AREA OF SMALL WOODS BY TYPE—WALES

Table 20. Thousand Acres										
Type	Productive				Simple Coppice	Unproductive			Grand Total Existing Woods	Lost Wood- land
	High Forest and Coppice-with-Standards			Scrub		Devastated	Felled	Total		
	Coniferous	Broadleaved	Total							
Area 	3.5	17.1	20.6	—	0.9	1.9	4.1	6.9	27.5	1.5
Percentage of all Existing Small Woods (Privately owned)	13	62	75	—	3	7	15	25	100	—
Corresponding percentage for Census of Large Woods (Privately owned)	(10)	(36)	(46)	(7)	(17)	(5)	(25)	(47)	(100)	—

Note: The area carrying Coniferous standards over coppice is negligible.

CLASSIFICATION OF HIGH FOREST AND COPPICE-WITH-STANDARDS AREA OF SMALL WOODS BY TYPE AND AGE-CLASS—
WALES

Table 21.

Age Class Years		Coniferous			Broadleaved*			Thousand Acres
		Pure Coniferous	Mixed, Mainly Coniferous	Total Coniferous	Pure Broadleaved	Mixed, Mainly Broadleaved	Total Broadleaved	
0—20	...	—	—	—	—	0.4	0.4	0.4
21—40	...	1.3	0.6	1.9	1.3	—	1.3	3.2
41—60	...	1.0	0.2	1.2	0.6	0.3	0.9	2.1
61—80	...	0.2	—	0.2	2.3	—	2.3	2.5
81—120	...	—	—	—	6.1	—	6.1	6.1
Over 120	...	—	—	—	1.9	0.6	2.5	2.5
Uneven-aged Coppice-with-Standards	...	—	0.2	0.2	2.9	0.3	3.2	3.4
	...	—	—	—	0.4	—	0.4	0.4
Total	...	2.5	1.0	3.5	15.5	1.6	17.1	20.6
Percentage of all Existing Small Woods (Pri- vately Owned)	...	9	4	13	56	6	62	75
Corresponding Percentage for Census of Large Woods (Privately Owned)	...	(8)	(2)	(10)	(34)	(2)	(36)	(46)

* Includes Coppice-with-Standards

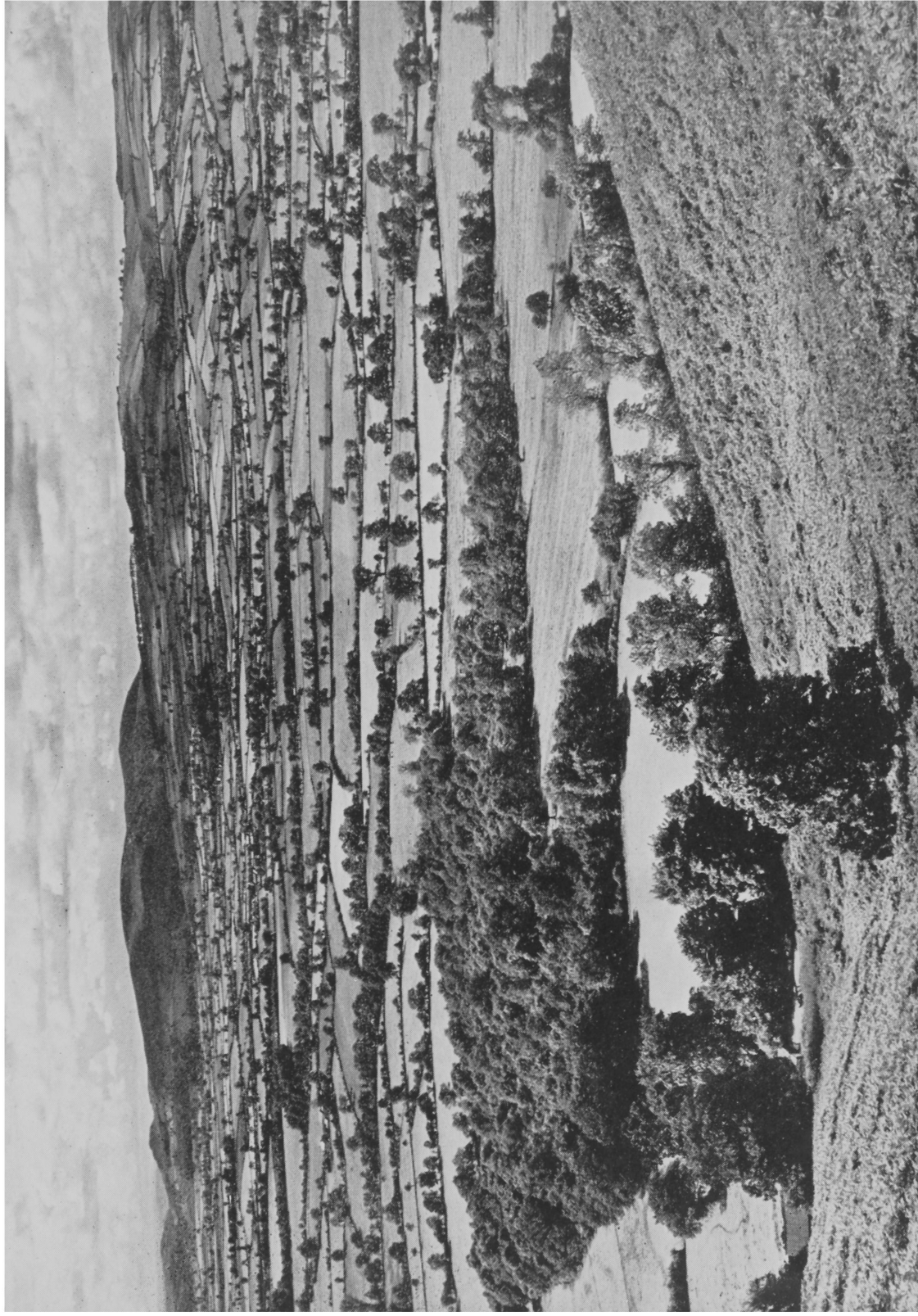


PLATE I. Typical pattern of enclosed fields, hedgerows, hedgerow trees, and small woods in the English landscape. View from the Long Mynd, Shropshire.



PLATE II. Park trees and ornamental clumps in the grounds of a mansion house. In the Surrey Weald.



PLATE III. Typical broadleaved hedgerow trees, including Lombardy poplar, oak, elm and ash. Near Basingstoke, Hampshire.

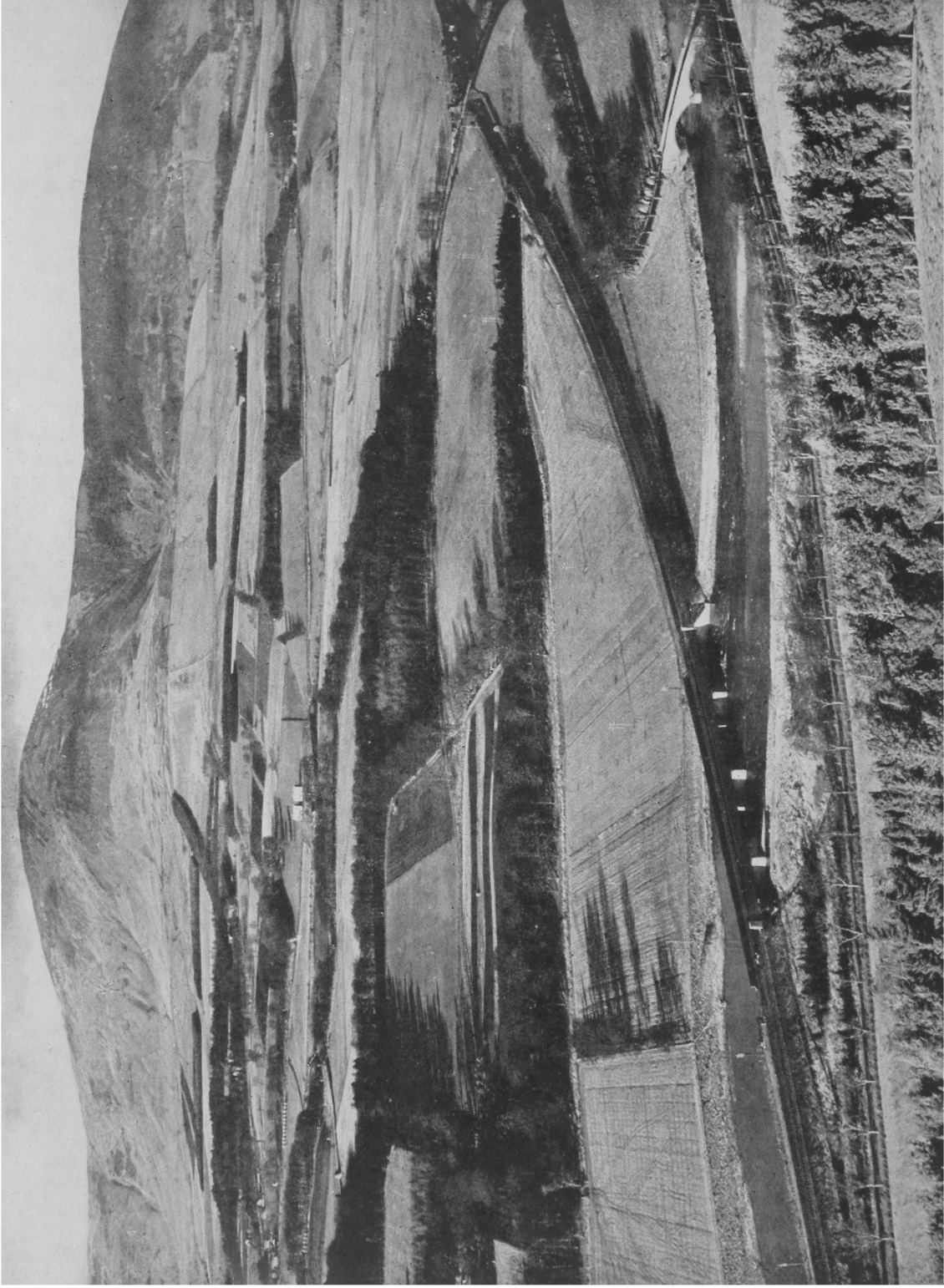


PLATE IV. Shelterbelts of broadleaved and coniferous trees; Tinto Hill and the valley of the Clyde, Lanarkshire.



PLATE V. An avenue of lime trees; such avenues were included under Hedgerow and Park Timber.

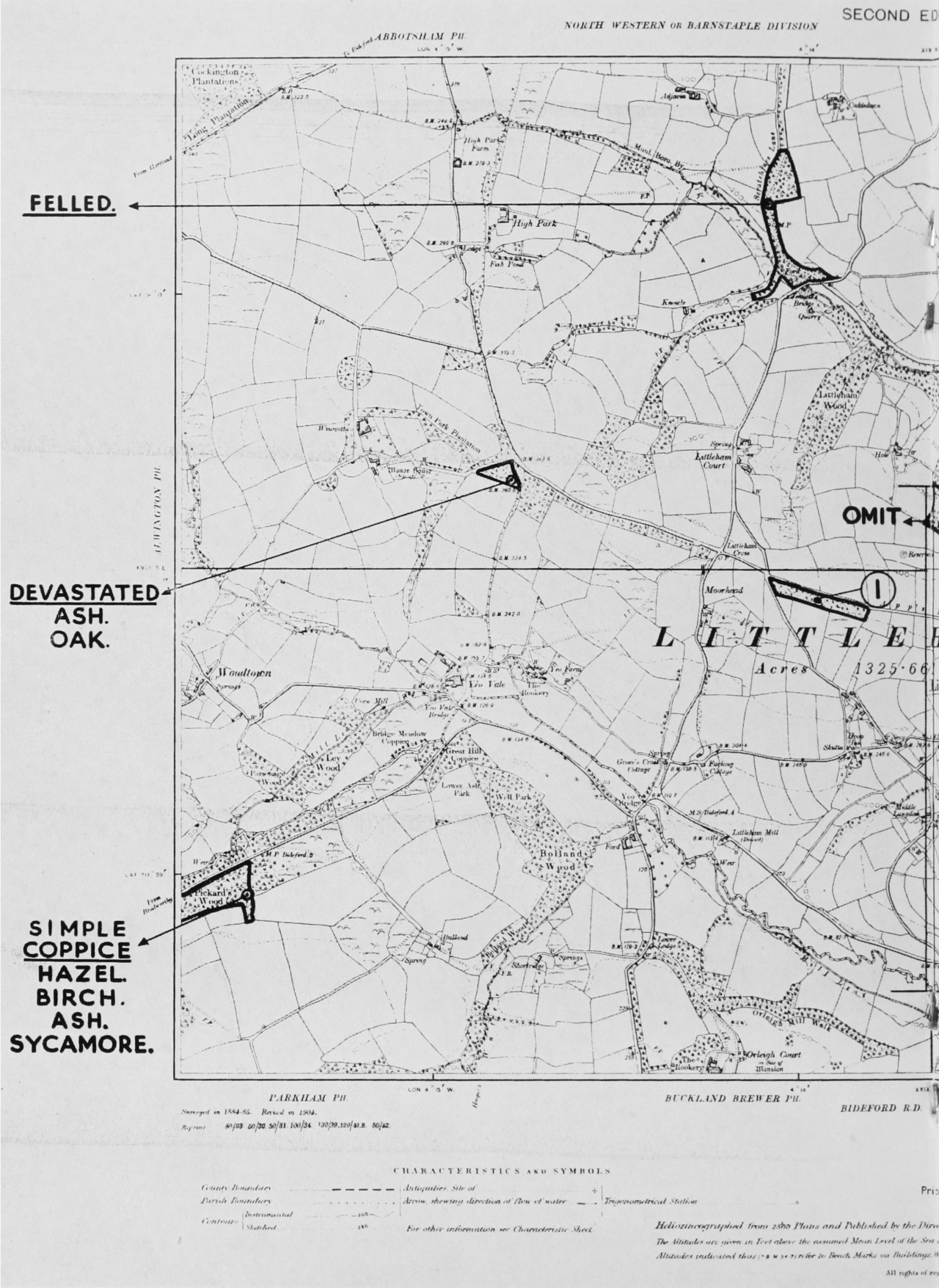


PLATE VI. Sample Ordnance Survey Six-Inch Quarter-Sheet of part of Devon, with areas south to north in the centre, a small area of larger woodland overlapping this strip being numbered "1". One stand of each description of "Unproductive" woodland has been

ITION, 1905.

DEVONSHIRE. SHEET 'XIX. S.W.

BIDEFORD MUNL. BORO.

BIDEFORD PH.

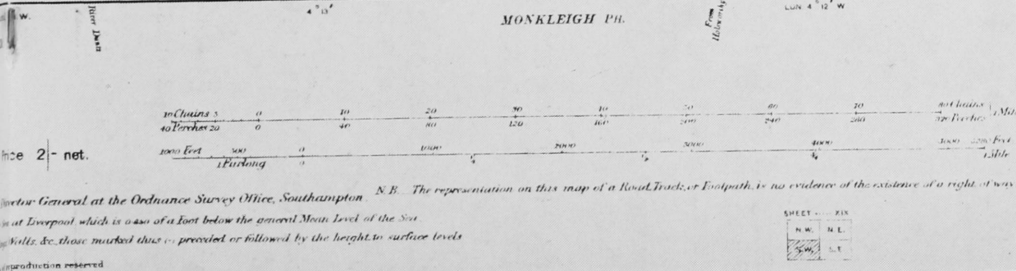
C.13.

1 WOOD OF
1 TO 5 ACRES.

①



→ **SCRUB
HAZEL.
ASH.
OAK.
ELDER.**



demarcated for survey. The strip examined for Hedgerow and Park Timber runs from
omitted. One wood of between one and five acres in extent in the south-west quarter, is
reen demarcated. Sheet 13 of the "C" scheme, reproduced about half actual size.

PLATES VII AND VIII. Aerial photograph and key drawing of part of Kent, taken on a scale of about 6 inches to one mile and here reproduced at about $4\frac{1}{2}$ inches to one mile. These pictures illustrate the various types of ground that might be met with in the field survey.

Strip A Shows only a few scattered hedgerow trees, giving a small volume of timber.

Strip B Falls on orchards and large woods, and so gives a very small volume of *hedgerow* timber.

Strip C Falls on park timber, and shows a large volume.

D Is a large wood, over five acres, partially included in area of strip, but omitted from field survey.



E Shows timber on an "unproductive" area in a large wood of over five acres.

F Is a belt less than one chain wide.

G Is a small wood, of one to five acres.

H Is an inland water surface, partially included in area of strip, though bearing no timber.

I Is an orchard, partially included in area of strip, though bearing no timber trees.

J, K, L. Are small Woods, partially included in areas of strips, but omitted from field survey.

(Note.—In practice three strips could not fall so close together as do A, B, and C here; they are presented as examples only.)

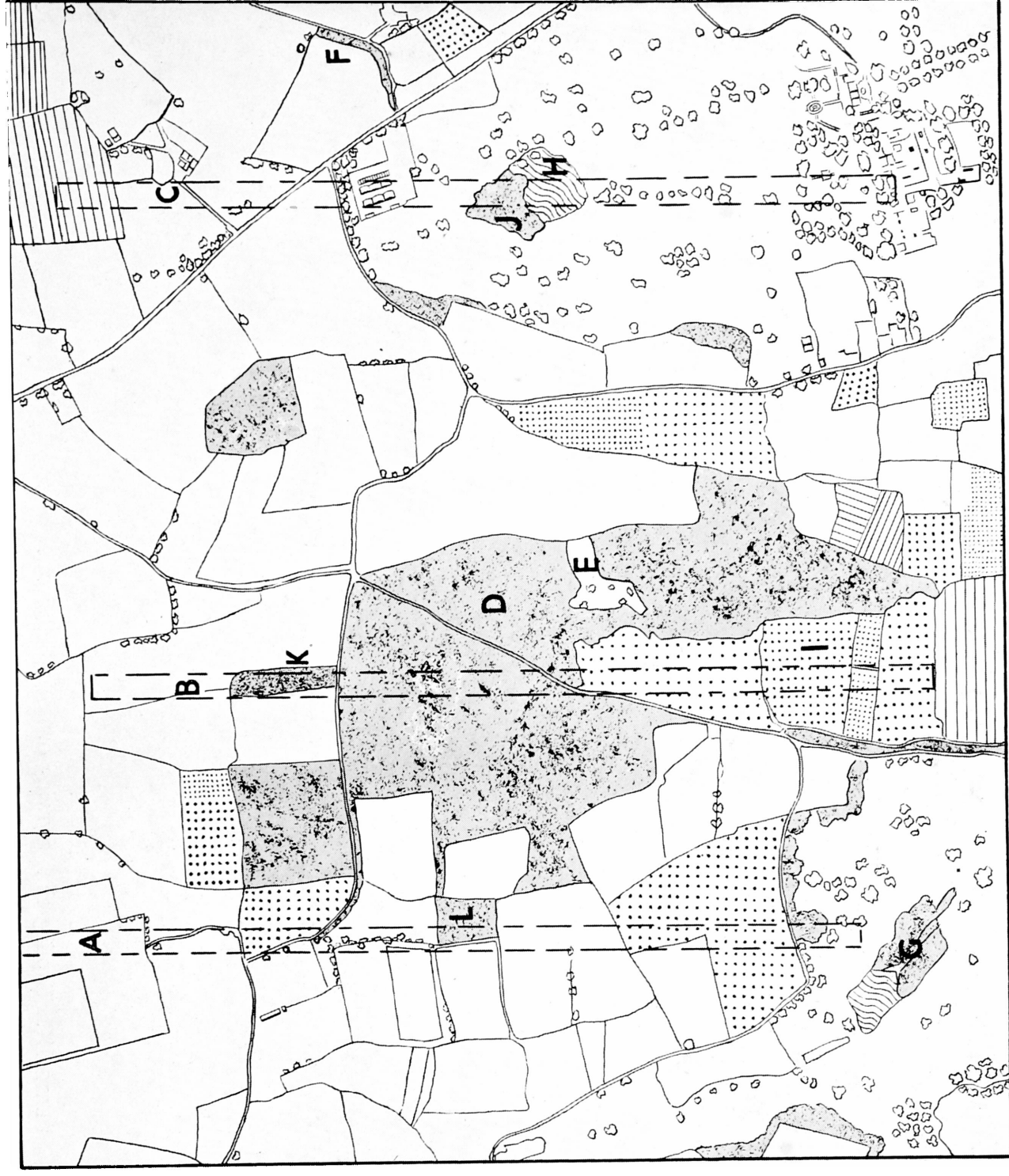




PLATE IX. Sapling elms growing out of a hedgerow.



PLATE X. Mature elm trees growing along a neglected hedge.



PLATE XI. Scots pines, originally planted as a low hedge but subsequently allowed to develop into timber trees. Near Mildenhall, Suffolk.



PLATE XII. A shelterbelt of broadleaved and coniferous trees. Such belts were classified under "Hedgerow and Park Timber" if less than one chain in width. Near Mildenhall, Suffolk.

SMALL WOODS

CLASSIFICATION OF AREA OF SMALL WOODS BY TYPE—SCOTLAND

Table 22. Thousand Acres

Type	Productive				Simple Coppice	Unproductive				Grand Total Existing Woods	Lost Wood- land
	High Forest and Coppice-with-Standards			Scrub		Devastated	Felled	Total			
	Coniferous	Broadleaved	Total								
Area	6.5	18.2	24.7	3.3	3.8	5.7	12.8	37.5	0.5		
Percentage of all Existing Small Woods (Privately Owned)	17	49	66	9	10	15	34	100	—		
Corresponding percentage for Census of Large Woods (Privately Owned)	(25)	(11)	(36)	(24)	(3)	(37)	(64)	(100)	—		

Note: In Scotland, the areas of Simple Coppice and Coppice-with-Standards in the Small Woods are negligible.

CLASSIFICATION OF HIGH FOREST AND COPPICE-WITH-STANDARDS AREA OF SMALL WOODS BY TYPE AND AGE-CLASS—
SCOTLAND

Table 23.										Thousand Acres						
Age Class Years										Coniferous			Broadleaved			Total
										Pure Coniferous	Mixed, Mainly Coniferous	Total Coniferous	Pure Broadleaved	Mixed, Mainly Broadleaved	Total Broadleaved	
0—20	...	...	...	...	0.2	—	0.2	—	—	—	0.2	
21—40	...	...	...	...	1.6	—	1.6	—	—	—	1.6	
41—60	...	...	...	...	0.5	—	0.5	0.6	—	0.6	1.1	
61—80	...	...	...	...	1.1	0.6	1.7	3.9	0.5	4.4	6.1	
81—120	...	...	...	...	—	0.6	0.6	6.7	0.6	7.3	7.9	
Over 120	...	...	...	...	—	—	—	1.8	—	1.8	1.8	
Uneven-Aged Coppice-with-Standards	...	...	...	...	0.5	1.4	1.9	2.0	2.1	4.1	6.0	
Total	...	...	...	...	3.9	2.6	6.5	15.0	3.2	18.2	24.7	
Percentage of all Existing Small Woods (Privately Owned)																
...	...	...	...	...	10	7	17	40	9	49	66	
Corresponding Percentage for Census of Large Woods (Privately Owned)																
...	...	...	...	...	(24)	(1)	(25)	(9)	(2)	(11)	(36)	

SMALL WOODS

Inasmuch as the greater part of the Small Woods are situated in England, the proportions of the various Types and age-classes are similar to those for Great Britain, and require little further comment. It should be noted, however, that all the Simple Coppice (3,900 acres) and nearly all the Coppice-with-Standards (4,100 out of 4,500 acres) is in England; this result may be due to the chances of sampling, but it is evident that any area under coppice in the Scottish and Welsh Small Woods must be very small. The proportion of High Forest and Coppice-with-Standards in the English Small Woods is 65 per cent, compared with an average for Great Britain of 67 per cent. The proportion of Scrub in the English Small Woods, 19 per cent, is rather high; it is believed to be mainly broadleaved and to include much regrowth on felled areas.

Classification of Small Woods by Type and Sub-Type—Wales

Classifications similar to those discussed for Great Britain are presented for Wales in Tables 20 and 21, pages 43 and 44.

One fact that emerges from an examination of these figures, is the rather high proportion of productive woodland in the Small Woods of Wales. At 75 per cent, it is higher than the general average of 67 per cent for Great Britain, and much higher than the figure of 53 per cent for the Large Woods of Wales. Most of it is broadleaved High Forest. The proportion of Scrub in the Welsh Small Woods, only 3 per cent, is remarkably low.

Classification of Small Woods by Type and Sub-Type—Scotland

The Scottish Small Woods are analysed, on the lines previously described for Great Britain, in Tables 22 and 23, pages 45 and 46.

The general composition of the Small Woods in Scotland is not markedly different from that of those in England and Wales, except that the Coppice Types are absent. But the Scottish Small Woods are seen to be in very much better shape than the Scottish Large Woods. Two-thirds of these Small Woods are Productive, whereas little more than one-third of the Large Woods could be so classed.

Another remarkable conclusion is that the Scottish Small Woods contain a very much higher proportion of broadleaved woodland than do the Scottish Large Woods; if only High Forest and Coppice-with-Standards are considered, 74 per cent of the Small Woods is broadleaved, but only 30 per cent of the Large Woods.

Species Composition of Small Woods, by Area

The principal tree species of each Small Wood was recorded on the field forms, but the data obtained are not sufficient to permit of very close analysis. They are based on a small (0.92 per cent) sample of the Small Woods, and as twenty-nine species or species groups were recorded, divided among seven types or sub-types of woodland, the area actually found for each description is too small to serve as a reliable basis for the estimation of its importance in the country as a whole. Nevertheless, certain broad conclusions may be drawn.

Taking, first of all, the Small Woods of Great Britain as a whole, oak is easily the most important species, accounting for about one-third of all woods surveyed; while the bulk of the oak occurs as Broadleaved High Forest, it was

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also found as a principal species in Mixed High Forest, Coppice-with-Standards, Scrub, and Devastated Woods. Three other hardwoods, beech, sycamore, and ash, when taken together, account for another third of the small woods; and again, all possible Types and sub-types of woodland are represented. Other broadleaved species of trees and shrubs recorded in the survey were hazel, birch, alder, horse chestnut, hornbeam, poplar, lime, spanish chestnut, willow, hawthorn, elder, elm, and privet.

Only three coniferous trees, Scots pine, European larch, and Norway spruce, occupied substantial areas of the sample. Also recorded were: Sitka spruce, Corsican pine, Austrian pine, Monterey pine (*Pinus radiata*), Japanese larch, hybrid larch, Douglas fir, redwood (*Sequoia sempervirens*) and a pinetum of mixed conifers.

This list of 27 species brings out the diversity of the British Small Woods. Taking the following woodland Types together, namely High Forest, Coppice, Scrub, and Devastated, the relative order of importance is probably that set out below:

Order	Species						Percentage of Sampled Area
1	Oak	....	....	....	....	....	32%
2	Beech	....	....	....	....	....	13%
3	Sycamore	....	....	....	....	....	8%
4	Ash	....	....	....	....	....	7%
5	Scots pine	....	....	....	....	....	7%
6	European larch	....	....	....	....	....	5%
7	Elm	....	....	....	....	....	4%
8	Birch	....	....	....	....	....	4%
9	Alder	....	....	....	....	....	2%
10	Norway spruce	....	....	....	....	....	2%
—	Hazel (Coppice and Scrub)	....	....	....	....	....	6%
—	All other broadleaved	....	....	....	....	....	7%
—	All other conifers	....	....	....	....	....	3%
Total							100%

Few valid comparisons can be drawn between this order of importance and that recorded for the High Forest component of the Large Woods. But one significant fact stands out. Oak accounts for 31 per cent of the High Forest area of the Privately-Owned Large Woods, 32 per cent of the total area of the Small Woods, and also for 31 per cent of the total volume of Hedgerow and Park timber. It thus appears that nearly one third of all woods and trees in private ownership in Great Britain consists of oak.

Six other trees are sufficiently well represented in all three groups to permit of a general and rather interesting comparison being made, as follows:

Species					Percentage of Private High Forest By Area	Percentage of Small Woods, By Area	Percentage of Hedgerow trees, By Volume
Scots pine	....	....	....	....	20%	7%	3%
Beech	....	....	....	....	12%	13%	9%
Ash	....	....	....	....	6%	7%	13%
Birch	....	....	....	....	5%	4%	—
Sycamore	....	....	....	....	4%	8%	7%
Elm	....	....	....	....	2%	4%	20%

SMALL WOODS

Scots pine plays a major part in Large Woods and has a moderate share in Small Woods, but does not figure to any great extent in Hedgerows. Beech is seen to play a large part in both Large and Small Woods, but a somewhat lesser one in Hedgerows. Ash with a considerable share in all woodlands, is even more important in the hedgerow class. Birch, however, though well represented in woods, is uncommon as a hedgerow tree. Sycamore is seen to be better represented in Small Woods than in either Large Woods or Hedgerows; this may be due to its value as a shelterbelt tree. The elms, though unimportant as woodland species, have a greater "Hedgerow" volume than any other tree of the six.

Putting it another way, Scots pine and birch are forest trees, but not hedgerow trees; the smaller the unit, the lower is their share therein. At the other extreme, the elms and ash are predominantly hedgerow trees, having greater importance among the open-grown solitary trees and small woods than they do amid the larger woods. Sycamore and beech are outstanding as "Small Wood" trees, though both are well represented in Large Woods and Hedgerows.

Species Composition of Small Woods—By Area, within Countries

Owing to the smallness of the samples taken, variations in species composition, as between the three countries, can only be discussed for the major species recorded, i.e. those listed in the main order of precedence on page 48.

In England, the general order of importance by area closely resembles that for Great Britain. In Wales, the only exceptional feature is the importance of alder, which occupies fourth place, following oak, beech, and ash. The bulk of the alder is good enough to be classed as High Forest.

Scotland, however, shows an order of precedence quite different from that for England and Wales, namely: sycamore, beech, Scots pine, oak, lime, and birch. It will be noted that the three principal trees are particularly valued for shelter, and also that three out of the first six—sycamore, beech, and lime, are not indigenous to Scotland. The small part played by oak—occupying 15 per cent of Scottish Small Woods as against 31 per cent in England and Wales, is rather surprising.

Other Characteristics of Small Woods

A number of factors that were assessed for the Large Woods in the 1947-49 Census could not be assessed accurately for the Small Woods owing to the small size of the sample taken. These include tree form, stocking, and "Suitability for Economic Management".

Size Classification and Number of Small Woods

An estimate of the area of Small Woods, falling in four size classifications, was made during the main 1947-49 Census. The object of this investigation was to show how much of the total "Small Wood" woodland is comprised in woods between one and two acres in extent, how much in somewhat larger woods, and so on. From these data it is possible to estimate the numbers of small woods that are likely to make up each size class. The results are set out in Table 24 overleaf, but it must be emphasised that they are arrived at by a process of sampling and calculation, and not from complete enumeration of the woods. Lost or Disafforested Woods are included in this table.

Table 24 shows that there were approximately 71,730 individual Small Woods throughout Great Britain. As might be expected, woods in the smaller size classes are more numerous than those in the larger: but the total area is fairly evenly divided among the four size classes. This applies to each individual

CLASSIFICATION OF SMALL WOODS BY SIZE

Table 24.

Size of Block	England		Wales		Scotland		Total Great Britain		Percentage of Total in each size class	
	No. of woods	Area, acres	No. of woods	Area, acres	No. of woods	Area, acres	No. of woods	Area, acres	By Number	By Area
1—2 Acres ...	16,350	24,500	3,600	5,500	5,650	8,500	25,600	38,500	36	21
2—3 Acres ...	14,800	37,000	3,200	8,000	4,200	10,500	22,200	55,500	31	29
3—4 Acres ...	9,000	31,500	2,710	9,500	3,000	10,500	14,710	51,500	21	28
4—5 Acres ...	6,000	27,000	1,330	6,000	1,890	8,500	9,220	41,500	12	22
Total: 1—5 Acres ...	46,150	120,000	10,840	29,000	14,740	38,000	71,730	187,000	100	100

SMALL WOODS

country as well as to Great Britain as a whole. It will be seen that in all, England has 46,150 Small Woods, Wales 10,840, and Scotland 14,740. In relation to land area, the density of Small Woods is above the average in Wales, and below the average in Scotland.

Small Woods on Forestry Commission Areas

The foregoing figures do not include a small area of woodland comprised in Small Woods on the Forestry Commission estates. This consists partly of amenity woods on farms or residential properties, and partly of outlying patches of scrub or similar woodland not yet linked, by afforestation, to larger woods. The total area is estimated at 750 acres comprised in about 290 blocks. This is too small to affect the general position, and it has not been further considered or classified.

II. TIMBER VOLUME OF SMALL WOODS

As explained in Chapter 1, page 7, the volume of timber standing in the Small Woods was estimated by applying, to the areas of each type ascertained in their area survey, the corresponding volumes per acre found for the Large Woods. This method has the drawback of assuming that, for any given description of woodland, the average stocking of timber is the same in the Small Woods as it is in the Large Woods. In point of fact, it may be greater or less; because the Small Woods, as a class, may be sited on better or on poorer ground than are the Large Woods. But an independent survey of timber volumes in Small Woods would have required an expenditure of effort out of all proportion to the total volume of timber involved. A large number of plots would have had to be measured to give a sufficiently large representation of each description of woodland. Hence it was more convenient to apply the data already obtained for the Large Woods, which are based on a large and representative survey. Many of the Small Woods in lowland areas are growing on very good sites and it is unlikely that the stocking of the class, as a whole, is poorer than that of the Large Woods. The results obtained are considered reasonably accurate for the three main groups of Small Woods, that is, the coniferous areas, the broadleaved areas, and the "unproductive" woods, and they are set out in this form in Table 25 below. The Small Woods are seen to have a total volume of 223 million cubic feet.

VOLUME OF TIMBER IN SMALL WOODS,
CLASSIFIED BY GROUPS AND COUNTRIES

Table 25. Millions of cubic feet, quarter-girth, over bark

Country	Group 1 Coniferous & and mainly Coniferous	Group 2* Broadleaved & Mainly Broadleaved	Total	Group 3† Simple Coppice and Unproductive Woods	Grand Total
England	31.1	92.4	123.5	3.2	126.7
Wales	6.6	29.8	36.4	0.5	36.9
England and Wales	37.7	122.2	159.9	3.7	163.6
Scotland	15.9	41.8	57.7	1.2	58.9
Total: Great Britain	53.6	164.0	217.6	4.9	222.5

* Includes Coppice-with-Standards.

† Includes Simple Coppice, Scrub, Devastated and Felled woodlands.

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It is interesting to note that the Small Woods have a larger share in the total *volume* of woods of one acre and above, than they do in the *area* of such woods. Small Woods hold 5 per cent of the total area, and 6 per cent of the area classed as High Forest and Coppice-with-Standards, but 8 per cent of the total volume.

This is believed to be due to the smaller proportion of unproductive areas in the Small Woods; and also to the small proportion in the 0–20 year age-class of High Forest.

Distribution of Timber Volume in Small Woods by Countries

It will be seen from Table 25 overleaf that the volume of timber in the High Forest and Coppice-with-Standards Small Woods is distributed fairly evenly over Great Britain, England having 123 million cubic feet, Wales 37 million, and Scotland 58 million. The proportions resemble those previously ascertained for the Large Woods, the details being:

				<i>Timber Volume in High Forest and Coppice-with-Standards</i>	
				<i>Large Woods</i>	<i>Small Woods</i>
England	....	....	....	57%	57%
Wales	....	....	....	7%	17%
Scotland	....	....	....	36%	26%
Great Britain				100%	100%

It will be noted, however, that the share of Wales in the timber volume of the Small Woods is relatively large, while Scotland has a comparatively smaller share of the total Small Wood timber volume.

III. PROBABLE ANNUAL INCREMENT OF SMALL WOODS

An estimate was made of the probable current annual increment of the timber volume of the Small Woods. The methods used were those adopted for the main 1947-49 Census of Large Woods, and as they have been described in Census Report No. 1, the details need not be repeated here. Briefly, the increment of coniferous woods is computed from yield tables, while that of broad-leaved woods (for which appropriate yield tables are not available) is calculated as a percentage of standing volume. The results obtained are set out below:

ANNUAL INCREMENT OF SMALL WOODS
Table 26. For 1951 Millions of cubic feet, quarter-girth, over bark

Country				Coniferous	Broadleaved	Total
England	....	....	....	1.0	1.9	2.9
Wales	....	....	....	0.2	0.5	0.7
Scotland	....	....	....	0.4	0.8	1.2
Total: Great Britain				1.6	3.2	4.8

These estimates are subject to sampling errors, being based, like all the figures for Small Woods, on a 0.92 per cent. sample. They also rest upon two assumptions—first, that the volume per acre is the same, type for type, in the Small Woods, as in the Large Woods; and second, that the rate of increment estimated for the Large Woods is applicable to the Small Woods. (The former assumption affects, in particular, the calculation of broadleaved increment, on a percentage basis. The latter assumption affects the calculation of coniferous increment, from yield tables, which makes it necessary to select a Quality Class).

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By comparison with the current annual increment of the Large Woods, which has been computed to be 97 million cubic feet in 1949, the 5 million cubic feet of increment in the Small Woods may appear unimportant. However, where broadleaved timber alone is concerned, the relative proportions are 29 million cubic feet in Large Woods and 3.2 million cubic feet in Small Woods. Thus, about 10 per cent of all the increment in broadleaved woods (excluding hedgerow timber) occurs in the Small Woods.

By no means all the increment in the Small Woods is available for harvesting, as many such woods are normally preserved as shelterbelts or for amenity reasons.

CHAPTER 4

TIMBER VOLUME IN “UNPRODUCTIVE” WOODLAND

WHEN the main Census of Woodlands of five acres and over was carried out in 1947-1949, the various Types of woodland recorded were classified as “Productive” and “Unproductive”. The former group comprised High Forest and Coppice, and a volume sampling survey was then undertaken to ascertain the timber volume in the High Forest Type, and in the standard trees of the Coppice-with-Standards sub-type. (See Census Report No. 1, Page 135). There remained to be considered the timber volume in the Simple Coppice and the “Unproductive” Types, that is Scrub, Devastated Woods and Felled Woodland. Simple Coppice was regarded as “Productive” because it yields substantial quantities of small poles and similar produce, but it was not sampled for volume in the main 1947-1949 Census because as a rule it only contains a scattered stocking of timber trees, and often none at all. It was appreciated that the volumes per acre in all these Simple Coppice and “Unproductive” woodlands would be low, but in view of their extensive area the total quantity was considered large enough to require assessment as a national asset.

The areas of the Simple Coppice and the “Unproductive” Types or sub-types of woodland were ascertained during the 1947-49 Census and have been fully discussed in Census Report No. 1 (Part II, page 29). Hence it was only necessary to obtain average “volume per acre” figures for each Type or sub-type and to apply these to the known acreages, as described in Chapter 1, page 7, of this Report.

The classification of the various Types and sub-types concerned is given in Appendix III on page 78. The results obtained are discussed below. It will be recalled that “timber” for this purpose consists of stems at least ten feet long, and six inches or over in quarter-girth at breast-height.

Timber Volume per Acre in Simple Coppice

The main crop in Simple Coppice Woodland consists of poles too small to include any timber within the limits of measurement adopted for this survey. But individual stems of sufficient size do occur and may be fairly frequent in coppices of oak, ash or sweet chestnut that are cut over on a long rotation, or which have been allowed to stand uncut for longer than their due period of years. On the other hand recently cut hazel coppice may hold no timber whatsoever.

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A second class of timber tree in Simple Coppice consists of true standard trees, too sparsely distributed for the area to be classed as Coppice-with-Standards.

The volumes per acre ascertained in the field survey, and the numbers of plots measured, are set out in Table 27 below.

AVERAGE VOLUME PER ACRE OF MEASURED SAMPLE PLOTS
IN SIMPLE COPPICE

Table 27. One acre plots Cubic feet quarter-girth, over bark

Country						Number of Plots	Timber Volume
England	....	....	....	....	....	54	82.7
Wales	....	....	....	....	....	17	6.6
England and Wales						71	64.5
Scotland....						1	243.6
Great Britain						72	67.0

Taking the figures for Great Britain as a whole, it will be seen that the estimated total volume in Simple Coppice amounts to 67 cubic feet per acre. This may be compared with the 665 cubic feet per acre found in the Coppice-with-Standards areas of Private Woods.

Timber Volume per Acre in Scrub

Scrub consists of inferior growth unlikely to develop into a worth-while timber crop. It may be of any age, and may include a fair proportion of immature growth. The volumes per acre ascertained by the survey are given in Table 28 below.

AVERAGE VOLUME PER ACRE OF MEASURED SAMPLE
PLOTS IN SCRUB

Table 28. One acre plots Cubic feet quarter-girth, over bark

Country						Number of Plots	Timber Volume
England	....	....	....	....	....	155	95.1
Wales	....	....	....	....	....	32	62.4
England and Wales						187	89.5
Scotland....						68	51.2
Great Britain						255	79.3

Taking Great Britain as a whole, Scrub contains an average volume of 80 cubic feet of timber per acre.

Timber Volume per Acre in Devastated Woodland

Devastated woodland consists of areas from which the better timber trees have been removed, leaving a remnant of poorer specimens too sparse to form a proper crop. Details are given in Table 29 opposite.

UNPRODUCTIVE WOODLAND

AVERAGE VOLUME PER ACRE IN MEASURED SAMPLE PLOTS IN DEVASTATED WOODLAND

Table 29. One acre plots Cubic feet quarter-girth, over bark

Country	Number of Plots	Timber Volume
England 	97	145.5
Wales 	20	127.0
England and Wales 	117	142.3
Scotland.... 	17	219.5
Great Britain 	134	152.1

It will be seen that the average volume of timber which may be found in devastated woods is 152 cubic feet per acre. The volumes in Scotland are considerably higher than those in England and Wales.

Timber Volume per Acre in Felled Woodlands

There are many felled areas which carry some scattered trees, and so include measurable volume. It must be remembered that quite a high proportion—44 per cent—of the felled woodland, had been cleared before August 1939. Much of it had, in fact, been felled in the course of the 1914 to 1918 war. Small trees left standing in 1914 had, in many instances, grown to fair dimensions by 1951. But taking the felled areas as a whole the incidence of timber is very sparse. Details are given in Table 30 below.

AVERAGE VOLUME PER ACRE OF MEASURED SAMPLE PLOTS IN FELLED WOODLAND

Table 30. One acre plots Cubic feet, quarter-girth, over bark

Country	Number of Plots	Timber Volume
England 	133	20.2
Wales 	33	4.5
England and Wales 	166	17.0
Scotland.... 	69	36.4
Great Britain 	235	22.7

Timber Volume on Disafforested Areas

To complete the picture, reference must be made to the possibility of standing timber remaining on areas classified as “lost” or disafforested in the main 1947-49 Census. In many instances, the clearance of timber is complete; an example is the construction of an aerodrome on a woodland area. In other cases, however, some timber trees remain; this occurs, for example, where houses with large gardens are built in a wood. No account of such timber has been taken in the survey.

Total Timber Volume in Unproductive Woodland

Tables 31-33 summarise the information about the volume which remains standing in woodlands classified as Simple Coppice and “Unproductive” in the main census of 1947-49.

Table 31 gives details for the woodlands as a whole. Table 32 for Privately-owned woodland and Table 33 for State Forests.

ALL WOODLANDS, PRIVATE AND STATE
TIMBER VOLUME IN ALL SIMPLE COPPICE AND UNPRODUCTIVE WOODLAND, BY TYPES, COUNTRIES,
AND DESCRIPTIONS OF TIMBER
(EXCLUDING WOODS UNDER FIVE ACRES)

Table 31. At 1st January, 1951 Millions of cubic feet, quarter-girth over bark

Country	Simple Coppice			Scrub			Devastated			Felled			Total		
	Coni-ferous	Broad leaved	Total	Coni-ferous	Broad leaved	Total	Coni-ferous	Broad leaved	Total	Coni-ferous	Broad leaved	Total	Coni-ferous	Broad leaved	Total
England Wales	— —	6.6 1.1	6.6 1.1	1.4 0.3	16.5 3.3	17.9 3.6	2.6 0.3	12.4 1.4	15.0 1.7	0.3 0.1	3.2 0.9	3.5 1.0	4.3 0.7	38.7 6.7	43.0 7.4
England and Wales	—	7.7	7.7	1.7	19.8	21.5	2.9	13.8	16.7	0.4	4.1	4.5	5.0	45.4	50.4
Scotland	—	—	—	1.2	11.9	13.1	4.4	3.0	7.4	3.9	10.8	14.7	9.5	25.7	35.2
Great Britain	—	7.7	7.7	2.9	31.7	34.6	7.3	16.8	24.1	4.3	14.9	19.2	14.5	71.1	85.6

UNPRODUCTIVE WOODLAND

PRIVATE WOODLANDS
 TIMBER VOLUME IN SIMPLE COPPICE AND UNPRODUCTIVE WOODLAND BY TYPES, COUNTRIES,
 AND DESCRIPTION OF TIMBER
 (EXCLUDING WOODS UNDER FIVE ACRES)

Country	Simple Coppice			Scrub			Devastated			Felled			Total		
	Coni-ferous	Broad leaved	Total	Coni-ferous	Broad leaved	Total	Coni-ferous	Broad leaved	Total	Coni-ferous	Broad leaved	Total	Coni-ferous	Broad leaved	Total
England Wales	— —	6.2 1.0	6.2 1.0	1.3 0.3	15.7 3.1	17.0 3.4	2.5 0.3	11.8 1.4	14.3 1.7	0.3 0.1	2.9 0.9	3.2 1.0	4.1 0.7	36.6 6.4	40.7 7.1
England and Wales	— ...	7.2	7.2	1.6	18.8	20.4	2.8	13.2	16.0	0.4	3.8	4.2	4.8	43.0	47.8
Scotland ...	—	—	—	1.2	11.3	12.5	3.6	2.4	6.0	3.6	10.1	13.7	8.4	23.8	32.2
Great Britain	—	7.2	7.2	2.8	30.1	32.9	6.4	15.6	22.0	4.0	13.9	17.9	13.2	66.8	80.0

Table 32.

At 1st January, 1951 Millions of cubic feet, quarter-girth over bark

STATE FORESTS
TIMBER VOLUME IN SIMPLE COPPICE AND UNPRODUCTIVE WOODLAND BY TYPES, COUNTRIES,
AND DESCRIPTION OF TIMBER
(EXCLUDING WOODS UNDER FIVE ACRES)

Table 33. At 1st January, 1951 Millions of cubic feet, quarter-girth over bark

Country	Simple Coppice			Scrub			Devastated			Felled			Total		
	Coni-ferous	Broad leaved	Total	Coni-ferous	Broad leaved	Total	Coni-ferous	Broad leaved	Total	Coni-ferous	Broad leaved	Total	Coni-ferous	Broad leaved	Total
England Wales	— —	0.4 0.1	0.4 0.1	0.1 —	0.8 0.2	0.9 0.2	0.1 —	0.6 —	0.7 —	— —	0.3 —	0.3 —	0.2 —	2.1 0.3	2.3 0.3
England and Wales	—	0.5	0.5	0.1	1.0	1.1	0.1	0.6	0.7	—	0.3	0.3	0.2	2.4	2.6
Scotland	—	—	—	—	0.6	0.6	0.8	0.6	1.4	0.3	0.7	1.0	1.1	1.9	3.0
Great Britain	—	0.5	0.5	0.1	1.6	1.7	0.9	1.2	2.1	0.3	1.0	1.3	1.3	4.3	5.6

UNPRODUCTIVE WOODLAND

Tables 31 to 33 show that the total timber volume in the Simple Coppice and Unproductive woodland is 85.6 million cubic feet. Of this, 80 million is in Private Woodlands and 5.6 million in State Forests. The Simple Coppice and Unproductive Woodlands, taken together, hold only 2 per cent of the total volume of timber, in the country's trees and woodlands as a whole. (See Chapter 5, Table 35). But they account for 41 per cent of the country's total woodland area, (See Census Report No. 1, Table 9, page 41.)

Probable Annual Increment in Unproductive Woodland

Although it is almost a contradiction in terms to speak of an increment of timber volume in woods that are, by definition, "unproductive", the existence of a measurable volume of growing timber in such woods implies a certain amount of increment. An estimate of such increment, as occurring in 1951, was therefore made. It was found that about one-third of all recorded "timber" volume was under 10 inches quarter-girth and this volume was assumed to be increasing in size at the rate of 4 per cent per annum; the remaining two-thirds was found to be in trees over 10 inches quarter-girth and was assumed to be increasing at the rate of 1.2 per cent per annum. The following figures were obtained:

ANNUAL INCREMENT OF UNPRODUCTIVE WOODLAND							
Table 34.				For 1951 Millions of cubic feet, quarter-girth, over bark			
Country				Coniferous	Broadleaved	Total	
England	....	....	....	0.1	0.8	0.9	
Wales	....	....	....	Negligible	0.2	0.2	
Scotland	....	....	....	0.2	0.5	0.7	
Total: Great Britain	....	....	....	0.3	1.5	1.8	

CHAPTER 5

SUMMARY

Timber Volume of All Trees and Woods—Great Britain

THE total timber volume ascertained in the course of the two surveys (Main Census of 1947-49 and Hedgerows, etc. Census of 1951), is set out for Great Britain as a whole in Table 35 overleaf. It is classified according to its occurrence in Hedgerow or Park Trees, Productive and Unproductive Small Woods, and Productive and Unproductive Large Woods. Details are given for the coniferous and broadleaved components of each description of timber, and percentages show their relation to the total volume.

It will be seen that, out of a total volume of 3,773 million cubic feet, 2,744 million cubic feet, or 73 per cent, is in the Large Woods of five acres and over; 222 million cubic feet, or 6 per cent, is in the Small Woods of one to five acres; and no less than 807 million cubic feet, or 21 per cent, is in the Hedgerow and Park Trees. Thus, one-fifth of all the country's timber is in scattered hedgerow, park and policy trees; while when the Small Woods and the hedgerows are taken together, they hold 27 per cent, or over one-quarter, of Britain's timber reserves.

VOLUME OF TIMBER IN TREES AND WOODS OF ALL DESCRIPTIONS —GREAT BRITAIN

Table 35. Millions of cubic feet, quarter-girth, over bark

Description	Coniferous		Broadleaved		Total	
	Volume	Per cent	Volume	Per cent	Volume	Per cent
Hedgerow and Park Trees 	58.6	5	748.1	30	806.7	21
Small Woods of 1-5 acres High Forest and Coppice-with-Standards Simple Coppice and Unproductive areas	53.6 1.0	4 —	164.0 3.9	7 —	217.6 4.9	6 —
Total, Small Woods 	54.6	4	167.9	7	222.5	6
Large Woods, 5 acres and over... ... High Forest and Coppice-with-Standards Simple Coppice and Unproductive areas	1,143.9 14.5	90 1	1,514.5 71.1	60 3	2,658.4 85.6	71 2
Total, Large Woods 	1,158.4	91	1,585.6	63	2,744.0	73
Grand Total, All descriptions 	1,271.6	100	2,501.6	100	3,773.2	100

SUMMARY

VOLUME OF TIMBER IN TREES AND WOODS OF ALL DESCRIPTIONS—ENGLAND
Table 36. Millions of cubic feet, quarter-girth, over bark

Description	Coniferous		Broadleaved		Total	
	Volume	Per cent	Volume	Per cent	Volume	Per cent
Hedgerow and Park Trees.... 	44.2	9	636.3	33	680.5	29
Small Woods of 1-5 acres High Forest and Coppice-with-Standards Simple Coppice and Unproductive areas	31.1 0.3	7 —	92.4 2.9	5 —	123.5 3.2	5 —
Total, Small Woods 	31.4	7	95.3	5	126.7	5
Large Woods, 5 acres and over High Forest and Coppice-with-Standards Simple Coppice and Unproductive areas	400.4 4.3	83 1	1,134.8 38.7	60 2	1,535.2 43.0	64 2
Total, Large Woods 	404.7	84	1,173.5	62	1,578.2	66
Grand Total, All descriptions 	480.3	100	1,905.1	100	2,385.4	100

VOLUME OF TIMBER IN TREES AND WOODS OF ALL DESCRIPTIONS—WALES

Table 37. Millions of cubic feet, quarter-girth, over bark

Description	Coniferous		Broadleaved		Total	
	Volume	Per cent	Volume	Per cent	Volume	Per cent
Hedgerow and Park Trees....	10.8	12	75.7	33	86.5	27
Small Woods of 1-5 acres High Forest and Coppice-with-Standards Simple Coppice and Unproductive areas	6.6 0.1	8 —	29.8 0.4	13 —	36.4 0.5	12 —
Total, Small Woods	6.7	8	30.2	13	36.9	12
Large Woods, 5 acres and over High Forest and Coppice-with-Standards Simple Coppice and Unproductive areas	69.6 0.7	79 1	118.2 6.7	51 3	187.8 7.4	59 2
Total, Large Woods	70.3	80	124.9	54	195.2	61
Grand Total, All descriptions	87.8	100	230.8	100	318.6	100

SUMMARY

VOLUME OF TIMBER IN TREES AND WOODS OF ALL DESCRIPTIONS—SCOTLAND
Table 38. Millions of cubic feet, quarter-girth, over bark

Description	Coniferous		Broadleaved		Total	
	Volume	Per cent	Volume	Per cent	Volume	Per cent
Hedgerow and Park Trees....	3.6	1	36.1	10	39.7	4
Small Woods of 1-5 acres High Forest and Coppice-with-Standards Simple Coppice and Unproductive areas	15.9 0.6	2 —	41.8 0.6	11 —	57.7 1.2	5 —
Total, Small Woods	16.5	2	42.4	11	58.9	5
Large Woods, 5 acres and over High Forest and Coppice-with-Standards Simple Coppice and Unproductive areas	673.9 9.5	96 1	261.5 25.7	72 7	935.4 35.2	88 3
Total, Large Woods	683.4	97	287.2	79	970.6	91
Grand Total, All descriptions	703.5	100	365.7	100	1,069.2	100

ANNUAL INCREMENT OF TIMBER IN TREES AND WOODS OF ALL DESCRIPTIONS—GREAT BRITAIN
Table 39. For 1949 Millions of cubic feet, quarter-girth, over bark

Description	Coniferous		Broadleaved		Total	
	Increment	Per cent	Increment	Per cent	Increment	Per cent
Hedgerow and Park Trees	1.1	1	10.5	23	11.6	10
*Small Woods of 1-5 acres	1.6	2	3.2	7	4.8	4
Large Woods, 5 acres and over						
High Forest and Coppice-with-Standards	68.2	97	29.1	67	97.3	85
Simple Coppice and Unproductive areas	0.3	—	1.5	3	1.8	1
Total, Large Woods	68.5	97	30.6	70	99.1	86
Grand Total, All descriptions	71.2	100	44.3	100	115.5	100

* Productive areas only; the unproductive small woods have a negligible increment.

SUMMARY

When coniferous timber alone is considered, the share of the Large Woods is seen to be considerably greater. The Large Woods hold 91 per cent, the Small Woods 4 per cent, and the Hedgerows 5 per cent. Therefore nine-tenths of the coniferous timber is in the Large Woods.

With Broadleaved timber, on the other hand, the contribution of the Hedgerows, which hold 30 per cent, is substantial; the Small Woods account for 7 per cent, and the Large Woods for 63 per cent. Thus, over one-third of all the country's broadleaved timber is in hedgerow trees and Small Woods.

Timber Volume of All Trees and Woods—England

The data for England are presented in Table 36, page 61, in the same manner as those for Great Britain.

In comparison with the average figures for Great Britain as a whole, the English figures show an even greater proportion—29 per cent—of timber in the hedgerow and park trees. The proportion in Small Woods, 5 per cent, is slightly lower, and that in Large Woods, 66 per cent, considerably lower than the general average.

Taking coniferous timber alone, 9 per cent is in the hedgerows, 7 per cent in the Small Woods, and 84 per cent in the Large Woods. Where broadleaved timber is concerned, the remarkably high proportion of 33 per cent is found in the hedgerows; 5 per cent is in the Small Woods, and 62 per cent in the Large Woods.

Timber Volume of All Trees and Woods—Wales

The most remarkable feature of the Welsh figures, which are given in Table 37, page 62, is the relatively high proportion of the total volume found in the Small Woods. This is 12 per cent, which contrasts with the 5 per cent recorded for England and also for Scotland.

As in England, a high proportion of the Welsh volume—27 per cent—is in the hedgerows. The proportion in the Large Woods, 61 per cent, is the lowest for any country in Britain.

Where coniferous timber is concerned, a comparatively high proportion, 20 per cent, is in hedgerow trees and Small Woods. Only 51 per cent of the Welsh broadleaved timber is found in Productive Large Woods while the Unproductive Large Woods hold 3 per cent; the hedgerows hold 33 per cent, and the Small Woods 13 per cent.

Timber Volumes of All Trees and Woods—Scotland

The Scottish figures, in Table 38, page 63, show quite a different state of affairs to that described for England or Wales. The bulk of the Scottish timber—91 per cent—is in the Large Woods; only 5 per cent is in the Small Woods and only 4 per cent in the hedgerows and small clumps of less than an acre.

The coniferous timber, which makes up the bulk of the Scottish total, is almost confined to the Large Woods, which hold 97 per cent. Even the broadleaved timber has only a small proportion of its volume—10 per cent—in the hedgerows; but it is interesting to note that the Scottish Small Woods contain 11 per cent of the broadleaved volume, a proportion higher than that for the English Small Woods.

HEDGEROW TIMBER AND SMALL WOODS, 1951

Increment

The relative importance of the increment accruing to Productive Large Woods, "Unproductive" Large Woods, Small Woods, and Hedgerow and Park trees, is set out for Great Britain as a whole in Table 39, page 64. As the largest element in the totals i.e. the increment of the Productive Large Woods, was calculated for 1949, that year has been considered the basic date for this Table.

Table 39 shows that the total annual increment of timber in trees and woods of all kinds is 115.5 million cubic feet. Of this, 97.3 million cubic feet or 85 per cent, is estimated to accrue to the trees in the Productive Large Woods while 18.2 million cubic feet, or 15 per cent, accrues to trees in hedgerows and parks, Small Woods, and the "Unproductive" areas of Large Woods. In conifers the increment in these minor classes is of very small moment, amounting to only 3 per cent of the total. But with broadleaved timber, the "minor" descriptions of trees and woods have a substantial share, no less than 33 per cent of all the increment.

This analysis is not repeated for individual countries, as the small volumes of the minor descriptions found in Wales and Scotland would render the results both unreliable and of little practical value. The bulk of the increment of the minor descriptions of trees, 13.4 million out of 18.2 million cubic feet, is in England, where most of the broadleaved woods are situated. Details of the Increment in the Large Woods are given in Census Report No. 1, page 147.

APPENDIX I

FIELD RECORD FORMS

Strip Data Form

An example of the Strip Data Form, for volume measurements is shown in Figures 1 and 2. This form was used in the survey of Hedgerow and Park Timber, and also in the volume sampling survey of the Unproductive Woodland, but not in the survey of the Small Woods. The actual forms used were punched for use in loose-leaf folders.

On the front of the form, Figure 1, the top line gives the County, the surveyor's identity number and initials, the date of his visit, and the Ordnance Survey six-inch quarter-sheet map reference. The entry "C" in the box headed "Scheme No." shows whether the Strip concerned fell in the "A", the "B", or the "C" sample of the maps, as explained in Chapter 1, page 7. The Strip number in the last box on the top line is for reference purposes only. The area of each hedgerow Strip was 16 acres, but when this form was used for recording timber volumes in Simple Coppice or Unproductive Woodland, an area of one acre, or exceptionally half an acre, was adopted.

Having completed this top line of the Strip Data Form, the surveyors next turned to the reverse of the form (Figure 2), and enumerated the trees as they came to each in turn. It will be seen that the first tree encountered was a Scots pine of 12½ inches breast-height quarter-girth over-bark, with a height of 38 feet and a volume of 17.5 hoppus feet (or cubic feet quarter-girth measure) over-bark. The second tree that fell to be recorded was an elm, of 7 inches quarter-girth, a timber length of 8 feet, and a volume of 2.7 hoppus feet; being between 6 and 10 feet in timber length, it is described as "short" timber. Similarly, three oaks are described as "firewood" trees, and only a visual estimate of their volumes has been given. There are also a few classified as "saplings".

This information was next summarised and transferred to the front of the form (Figure 1). First the "Total Number of Trees", of all species, was entered, under appropriate classifications. Then the details of the volume recorded for each species, classified by quarter-girth class or other appropriate description, were filled in. Totals were then obtained for each species, and also for each quarter-girth class or description; these in turn give the grand total of 334.6 hoppus feet for measured trees of all species and descriptions.

Stand Data Form

An example of a completed Stand Data Form used for the area survey of Small Woods (but not in the survey of Hedgerow and Park trees) is shown in figs, 3 and 4. It is the same form as that used for the main survey of large woods in 1947-1949. (See Census Report No. 1, *Census of Woodlands* 1947-49. Appendix I, page 165.)

The actual forms used were punched for ease of handling in the loose-leaf folders used in the field. A list of abbreviations used follows on page 72.

In Figure 3, the first line gives in turn the County, the Ordnance Survey six-inch quarter sheet reference, the stand reference number used in the Small Woods survey, and the acreage of the stand concerned. The second line carries the surveyor's identity and the date on which he visited the stand, together with certain code numbers used for subsequent handling of the data. It also shows, by means of a cross at the extreme right-hand side, in the square marked 1, that the area is in private ownership. The third line, reserved for Forestry Commission areas, is not appropriate, and is left blank.

In the fourth line, a cross in the square numbered 3 shows that the stand consists of "B.H.F.", or Broadleaved High Forest.

In the fifth line, a cross in the square numbered 7 shows that the age-class of the stand is "81 to 120 years".

HEDGEROW TIMBER AND SMALL WOODS, 1951

COUNTY DEVON	SURVEYOR Number : 3 Initials : R.C Date : 9/3/51	MAP No. 19-SW	SCHEME No. C	STRIP No. 13 Area of Strip 16 aca.					
TOTAL NUMBER OF TREES — ALL SPECIES									
FIREWOOD	3	SHORTS	2	UNDER 6 ins.	12	TIMBER SIZES	16		
DETAILS OF STRIP BY SPECIES									
SPECIES	6"—9¾" Q.G.O.B.B.H.		10"—14¾" Q.G.O.B.B.H.		15" & UP Q.G.O.B.B.H.		Volume of Shorts	Volume of Firewood	TOTAL VOLUME (Hoppus Feet) 0-8
	No. of TREES	Volume	No. of TREES	Volume	No. of TREES	Volume			
Oak	—	—	—	—	—	—	—	3.5	3.5
Elm	3	18.1	7	121.6	5	166.7	7.2	—	313.6
Scots pine	—	—	1	17.5	—	—	—	—	17.5
Ash	—	—	—	—	—	—	—	—	} saplings only
Beech	—	—	—	—	—	—	—	—	
Total per Strip	3	18.1	8	139.1	5	166.7	7.2	3.5	334.6

Fig. 1. Strip Data Form for Survey of Hedgerow and Park Timber: Front

APPENDIX I—(contd.)

SPECIES	B.H.Q.G. O.B. inches	TIMBER LENGTH feet	VOLUME Hoppus feet 0.8	REMARKS
Scots pine	12 ²	Top Ht. 38	17.5	Short "
Elm	7	8	2.7	
	8 ²	9	4.5	
	14 ²	15	20.0	
	12 ²	23	19.8	
	11	10	8.2	
	13	19	19.1	
Oak (3 trees)			0.5 1.0 2.0	} Firewood
Ash	2 saplings			
Beech	1 sapling			
Elm	7 saplings			
Elm	16 ²	20	31.9	
	9	13	6.9	
	13'	23	22.2	
	13	12	13.3	
	15 ²	16	24.1	
Elm	2 saplings			
Elm	9	13	6.9	
	17 ²	15	29.4	
	15'	14	21.1	
	8	10	4.3	
	14 ²	14	19.0	
	20'	33	60.2	

Fig. 2. Strip Data Form for Survey of Hedgerow and Park Timber; Back

HEDGEROW TIMBER AND SMALL WOODS, 1951

COUNTY				MAP NO.		STAND NO.		AREA: Acres, gross	
LANARK				2 S.E.		5		3	
SURVEYOR. NO. ITLS. DATE		CODE NO.		CODE NO.		CODE NO.		PRIVATE <input checked="" type="checkbox"/>	
W.E.C. ² 2-12-50		26		2-4		5		FOR. COM. 2	
NAME OF F.C. FOREST				CODE NO.		COMPT. NO.		CODE NO.	

TYPE	C.H.F. 1	M.H.F. 2	B.H.F. 3	COPP. W.STD. 4	COPP. 5	SCRUB 6	DEVST. 7	FELLED 8	LOST 9
AGE CLASS	1/10 1	11/20 2	21/30 3	31/40 4	41/60 5	61/80 6	81/120 7	OVER 120 8	UNEVEN 9
SUB-TYPE	CHEST. COPP. 1	HAZEL COPP. 2	OAK COPP. 3	OTHER COPP. 4	UNEVEN UND. PL. 5	AGED NT. REG. 6	BEFORE 8/39 7	AFTER 8/39 8	

TREE FORM	ELITE FOR SEED 1	SATIS. 2	POOR 3	BAD 4	STOCK- ING	BADLY OVER-STOCKED 1	SATIS. 2	POOR 3	BAD 4
SUITABILITY for ECONOMIC MANAGEMENT	SUIT-ABLE 1	DOUBT-FUL 2	UNSUIT-ABLE 3						

PURE OR PRINCIPAL CONIFERS	S.P. 1	C.P. 2	P. CON. 3	E.L. 4	J.L. 5	H.L. 6	N.S. 7	S.S. 8	D.F. 9
	TSUGA 1	L. CYP. 2	AB. GR. 3	AB. PEC. 4	AB. NOB. 5	THUYA 6	OTHER CONIF. 7		

PURE OR PRINCIPAL BROAD-LEAVED	OAK 1	ASH 2	BEECH 3	BIRCH 4	SPAN. CHEST. 5	SYCA-MORE 6	COMM. ALDER 7	HAZEL 8	HORN-BEAM 9
	POPLAR 1	LIME 2	ELM 3	WILLOW 4	NORWAY MAPLE 5	CHERRY 6	OTHER B/L 7		

SUBSIDIARY (IN MIXT.) CONIFERS	S.P. 1	C.P. 2	P. CON. 3	E.L. 4	J.L. 5	H.L. 6	N.S. 7	S.S. 8	D.F. 9
	TSUGA 1	L. CYP. 2	AB. GR. 3	AB. PEC. 4	AB. NOB. 5	THUYA 6	OTHER CONIF. 7		

SUBSIDIARY (IN MIXT.) BROAD-LEAVED	OAK 1	ASH 2	BEECH 3	BIRCH 4	SPAN. CHEST. 5	SYCA-MORE 6	COMM. ALDER 7	HAZEL 8	HORN-BEAM 9
	POPLAR 1	LIME 2	ELM 3	WILLOW 4	NORWAY MAPLE 5	CHERRY 6	OTHER B/L 7		

Fig. 3. Stand Data Form for Survey of One-to-Five Acre Woods: Front

APPENDIX I—(contd.)

SUMMARY STATEMENT OF SPECIES

SPECIES	PER CENT (BY CANOPY)*	SPECIES	PER CENT (BY CANOPY)*
LIME	80		
SYCAMORE	20		

*Or by number of stems in young crops where the canopy has not closed.

REMARKS

FOR OFFICE USE

Fig. 4. Stand Data Form for Survey of One-to-Five Acre Woods: Back

HEDGEROW TIMBER AND SMALL WOODS, 1951

The sixth line only applies to Coppice, Uneven-aged High Forest, or Felled areas, so in this instance it is left blank.

In the seventh line, a cross in the first series of squares, square No. 3, indicates that Tree Form was considered "Poor". Further on in the same line, a cross in the second series of squares, square No. 2, shows that Stocking was considered "Satisfactory".

In the eighth line, a cross in the square numbered 3 shows that the surveyors considered this stand "Unsuitable for Economic Management". The observations recorded in lines seven and eight are not dealt with in this Report, the main reasons being that little reliable information could have been derived from a sampling survey. They were, however, effectively used in the main Census of the Large Woods, which was a complete enumeration of the stands concerned. The information was, nevertheless, collected at the time of the Small Woods survey, in case it should be required.

The next section of the form, lines nine to twelve inclusive, deals with the pure or principal tree species represented in the stand. In this case it was lime, which is therefore marked with a cross in line twelve, square No. 2.

The final section of this side of the form, lines thirteen to sixteen inclusive, shows any subsidiary tree species occurring in mixture. In this case sycamore was such a species, as is shown by the cross in line fifteen, square No. 6. Subsidiary species are not discussed in detail in this Report, but information was recorded.

Figure 4 shows the reverse of the same stand Data Form. In this instance, the only information recorded is that lime, the principal species, formed 80 per cent. of the canopy, while sycamore, the subsidiary species, comprised 20 per cent.

This Stand Data Form was designed in such a way that the information recorded could readily be transferred, if desired, to Hollerith cards for mechanical sorting and tabulation. In practice, however, the number of forms needed for this Small Woods survey was insufficient to call for mechanical handling. Information on the methods used for the survey of the Large Woods will be found in Census Report No. 1; *Census of Woodlands 1947-49*, Appendix I, page 165.

List of Abbreviations used

Strip Data Form

Q.G.O.B.B.H. = Quarter-girth over-bark at breast height.

O.B. = Over bark.

B.H.Q.G.O.B. = Breast-height quarter-girth over bark.

$12^2 = 12\frac{1}{2}$ inches, to nearest quarter inch. (Similarly 12^1 would equal $12\frac{1}{4}$ inches, and 12^3 would equal $12\frac{3}{4}$ inches).

Stand Data Form;

FOR. COM. (F.C.) = Forestry Commission. COMPT. = Compartment. C.H.F. = Coniferous High Forest. M.H.F. = Mixed High Forest. B.H.F. = Broadleaved High Forest. COPP. W. STD. = Coppice with Standards. COPP. = Coppice. DEVST. = Devastated. LOST = Disafforested. CHEST. = Chestnut. UND. PL. = Underplanting. NT. REG. = Natural Regeneration. SATIS. = Satisfactory. S.P. = Scots pine. C.P. = Corsican pine. P.CON. = *Pinus contorta*. E.L. = European larch. J.L. = Japanese larch. H.L. = Hybrid larch. N.S. = Norway spruce. S.S. = Sitka spruce. D.F. = Douglas fir. L. CYP. = Lawson cypress. AB.GR. = *Abies grandis*. AB.PEC. = *Abies pectinata*. AB.NO. = *Abies nobilis*. CONIF. = Conifers. SPAN. CHEST. = Sweet or Spanish Chestnut. COMM. = Common. B/L. = Broadleaves. MIXT. = Mixture.

Ordnance Survey six-inch Quarter-sheets were coded as follows: Sheet number in County series, followed by: 1 for North-west, 2 for North-east, 3 for South-west, 4 for South-east. Thus, "45—2" = Sheet No. 45, North-east.

APPENDIX I—(contd.)

Species Distinguished on the Stand Data Form

Conifers;

- (a) Scots pine (*Pinus sylvestris* L.)
- (b) Corsican pine (*P. laricio* Poir = *P. nigra* var. *calabrica* Schneid.)
- (c) Lodge-pole pine (*Pinus contorta* Doug.)
- (d) European larch (*Larix europaea* D.C. = *L. decidua* Mill.)
- (e) Japanese larch (*L. leptolepis* Gord.)
- (f) Hybrid larch (*L. eurolepis* Henry)
- (g) Norway spruce (*Picea excelsa* Link. = *P. abies* Karst.)
- (h) Sitka spruce (*P. sitchensis* Carr.)
- (i) Douglas fir (*Pseudotsuga douglasii* Carr. = *P. taxifolia* Brit.)
- (j) Tsuga (hemlock) (*Tsuga heterophylla* Sarg.)
- (k) Lawson cypress (*Chamaecyparis lawsoniana* Parl.)
- (l) Grand fir (*Abies grandis* Lindl.)
- (m) Common silver fir (*A. pectinata* D.C. = *A. alba* Mill.)
- (n) Noble fir (*A. nobilis* Lindl. = *A. procera* Rehd.)
- (o) Thuja (Western red cedar or arborvitae) (*Thuja plicata* D. Don.)
- (p) "Other conifers":

Broadleaved Trees;

- (a) Oak (*Quercus pedunculata* Ehrh. = *Q. robur* L. and *Q. sessiliflora* Salis. = *Q. petraea*. Liebl.)
- (b) Ash (*Fraxinus excelsior* L.)
- (c) Beech (*Fagus sylvatica* L.)
- (d) Birch (*Betula verrucosa* Ehrh. = *B. pendula* Roth, and *B. pubescens* Ehrh.)
- (e) Spanish or sweet chestnut (*Castanea sativa* Mill.)
- (f) Sycamore (*Acer pseudoplatanus* L.)
- (g) Common Alder (*Alnus glutinosa* Gaertn.)
- (h) Hazel (in Coppice, Scrub, or Devastated only) (*Corylus avellana* L.)
- (i) Hornbeam (*Carpinus betulus* L.)
- (j) Poplar (*Populus* spp.)
- (k) Lime (*Tilia* spp.)
- (l) Elm (*Ulmus* spp.)
- (m) Willow (*Salix* spp.)
- (n) Norway maple (*Acer platanoides* L.)
- (o) Cherry or gean (*Prunus avium* L.)
- (p) "Other broadleaved" species.

APPENDIX II

INSTRUCTIONS TO SURVEYORS

**SURVEY OF HEDGEROW AND PARK TIMBER,
SMALL WOODS, AND TIMBER VOLUME IN
UNPRODUCTIVE WOODLANDS, 1951**

1. General

The object of this survey is to gain an estimate of the timber volume standing in:—

- (i) *Hedgerows and Parks*
Isolated trees and woods with an area of under one acre.
- (ii) *Small Woods*
Woods between one and five acres.
- (iii) *Unproductive Woodlands*
Woods of five acres and over that were classified as “Unproductive” (i.e. Felled, Devastated or Scrub) or as Simple Coppice in the 1947-49 Census of Woodlands.

Categories (i) and (ii) were not included in the 1947-49 Census. Unproductive woodlands and Simple Coppice, in stands over five acres, were included in the area census but were excluded from the volume census.

Contact with Owners

Wherever possible contact should be made with owner or agent before woods are entered. Woods owned by the Forestry Commission are excluded from this survey.

2. Sampling Units

Sampling will be based on the Six-inch-to-one-mile Ordnance Survey maps. There will be three independent samples designated the A, B and C schemes respectively. Each sample will consist of one map in every hundred starting with a random number. The maps to be used will be issued to surveyors with the areas to be inspected already marked; each map is actually a “quarter-sheet”, and covers an area of six square miles.

(i) *Hedgerow and Park Timber*

The sampling units for hedgerows will be strips two chains (1 chain = 66 feet) wide and one mile (80 chains) long. Each strip has thus an area of 160 square chains, or 16 acres. There will be one such strip on each map. The sample strips will run from South to North from a point placed one inch above the centre point of the southern boundary of the map.

The line can be run by checking in on fixed points, or by using a compass. Where physical obstacles intervene, the line of survey must be carefully returned to after each detour.

All blocks of woodland of one acre and over will be *excluded* from the strip survey. (But the length of the strip will not, on that account, be increased). Where such a block lies completely across the strip the survey will cease at the southern boundary of the block and will recommence at the appropriate point on the strip on the northern boundary of the block. Where only a portion of the block falls in the strip the survey will skirt the boundary of the block and all trees falling within the boundary will be disregarded. Where the strip runs through a wood which is less than one chain wide, even though the wood be larger than one acre, the portion of the wood falling in the strip will be measured as hedgerow timber, because only stands of one chain width and over were considered in the general census of 1947.

It will usually be possible to judge by eye whether a tree is within the strip or not. In a doubtful case a tape should be run out at right angles from the centre line of the strip to the tree. A tree will be included if the point at which the central axis of the tree reaches the ground is within one chain of the strip centre. It is important that the strip is consistently two chains wide.

APPENDIX II—(contd.)

All hedgerow and park trees standing within the strip will be recorded on a Strip Data Form in accordance with the instructions given under heading (4).

(ii) *Small Woods*

Woods between one and five acres which are over one chain in width occurring on the South-west corner of the same six-inch Ordnance maps as used for the sample strips for hedgerows, will be classified according to the census classification as contained in the "Instructions to Surveyors, 1947". (See Appendix III, page 78)

(iii) *Simple Coppice and Unproductive Woodlands*

Temporary sample plots of one acre, or less if necessary, will be measured in areas classed as Simple Coppice, Scrub, Devastated and Felled on the maps to be sampled for the strip survey. One such sample plot will be laid out in each of these four types as far as they are represented.

The plots will be arranged as strips, one chain by ten chains, and will run east and west where possible, i.e. at right angles to the hedgerow sampling strips. The stands in which plots are to be measured will be marked on the maps in the office, and the starting point of the strip plot will also be marked. The plots should be measured starting from the fixed point whenever possible, but if for any reason surveyors consider it necessary to alter the above instructions, the direction of the strip, the shape of the plot, and in exceptional cases, the starting point may be altered and the reason for the alteration given on the form. Where more than forty trees occur in the acre plot, the size of the plot may be reduced to a $\frac{1}{2}$ or even a $\frac{1}{4}$ acre plot, depending on the density of stocking. Not more than one sample plot in each type per map will be measured, giving a maximum of four on each map to be sampled. Where any particular Type of woodland is not represented on the map, the number of plots will naturally be less than 4. Linked stands (i.e. stands in which two Types of woodland are intermixed), will not be used.

3. Definition and Classification

(i) *Hedgerow and Park Timber*

The survey will include all species capable of producing timber with the exception of fruit trees. Hedgerow trees growing on the edges of woods over one acre in extent will not be recorded, having been included with the wood in the previous census. Where merchantable trees have a special amenity value, forming part of an avenue or being ornamentals close to a residence, the fact should be noted.

Trees will be recorded in four main categories, all quarter-girths being measured over bark at breast-height (4 feet, 3 inches).

(A) *Timber trees*

Trees of 6 inches quarter-girth and up, having a minimum length of 10 feet of sound timber.

(a) 6 to $9\frac{3}{4}$ inches quarter-girth.

(b) 10 to $14\frac{3}{4}$ inches quarter-girth

(c) 15 inches and over quarter-girth.

(B) *Short timber trees*

Trees of 6 inches quarter-girth and up, having a length of 6 to 10 feet of sound timber.

(C) *Saplings*

Well grown trees 3 to 6 inches quarter-girth with a minimum length of straight stem of 10 feet. (Young trees capable of producing timber trees in the future).

(D) *Firewood trees*

Crooked, shortboled or defective trees of all girths above 3 inches quarter-girth having less than 6 feet length of timber, or, in the case of saplings, 6 feet length of straight stem. Trees with a timber length of more than 6 feet must be classed as firewood if the bole contains serious defects.

(ii) *Small Woods*

Woods of one to five acres will be classified according to the instructions given in Appendix III, page 78.

HEDGEROW TIMBER AND SMALL WOODS, 1951

(iii) *Simple Coppice and Unproductive Woodlands*

The same Definition and Classification as for 3, Section (i) above will be used in the temporary sample plots, with the following exception:

All trees under 6 inches quarter-girth will be recorded as firewood.

The volume entered in the "firewood" column will be the volume of the saplings together with the volume of any "firewood trees" over 6 inches quarter-girth. The *number* of firewood trees will similarly be the sum of the saplings and any "firewood trees".

4. Collection and Recording of Data for Volume Estimates

(i) *Hedgerow and Park Timber*

(a) In all cases the front page of the Strip Data Form is to be completed as regards county, map number, scheme number and strip number. Where several forms are used the word "cont." will be written on the back of the front form and the continuation sheets (printed in the same way as the back of the ordinary form) given additional numbers serially, e.g. 1, 2, 3, etc.

(b) Trees will be recorded on the second and succeeding pages of the sample strip form as encountered, but an effort should be made to keep the species and classes separate by judicious spacing.

(c) Breast-height quarter-girth over-bark, and timber height in the case of hardwoods, but total height in the case of conifers, will be measured and recorded. Heights will be ascertained by means of an ocular estimate, with an occasional check by Abney level. Conifers should always be measured by Abney level. Breast-height quarter-girth and mean crown diameter must always be measured by tape. These particulars will be recorded for every tree in the strip. The volume of each tree will be determined from the Volume Tables provided and the total volumes and numbers of trees entered by species in their respective girth classes on the front of the Strip Data Form. Young trees (saplings or firewood trees) 3 to 6 inches quarter-girth will be enumerated but no measurements will be taken.

Height; Timber height in hardwoods will be taken to a top diameter of 6 inches, or to the spring of the crown, whichever occurs first, while in the case of conifers total height to the tip will always be measured. Where trees have major defects the percentage of utilizable timber will be estimated, e.g. where the volume of a tree, according to the volume tables, is 80 cubic feet, of which it is estimated only 75 per cent is utilizable, a comment to this effect will be made in the Remarks column. Subsequently, in calculating the volume of the strip, 60 cubic feet (i.e. 75%) will be recorded as timber and placed in its appropriate girth class, while the remaining 20 cubic feet will be added to the firewood volume.

(d) Trees which fall into the "Firewood" or "Short" class will have the word "short" or "firewood" added in the Remarks column to assist in copying the data onto the front of the form.

(e) Trees with a quarter-girth of over 30 inches are not covered by the Volume Tables. These will be divided into log lengths, and the length of each of these logs will be estimated. The mid quarter-girth of each of these logs will be measured if it is accessible from the ground, otherwise it will be estimated by eye. The volumes of the logs will then be read from Hoppus Tables.

(ii) *Small Woods*

In the case of woods of one to five acres no volume data will be taken.

(iii) *Simple Coppice and Unproductive Woodlands*

In the Temporary Sample Plots girth and height measurements will be as in 4 Section (i). Where the majority of the trees would be classified as firewood according to the definition given above, trees of timber size in the plot will be measured and recorded individually; but instead of determining the volume of each firewood tree separately it will be sufficient to give a visual estimate of the number of firewood trees per acre and their combined volume.

APPENDIX II—(contd.)

The same Strip Data Forms as for the hedgerow and park timber strips will be used for recording the data. The category of the plot according to the census classification, (i.e. Scrub, Felled, Devastated or Coppice) will be entered on the front of the form in the space marked Scheme Number. The map number will be placed in the appropriate block.

5. Use of Aerial Photographs

The main use of aerial photography will be to determine whether there are any hedgerow trees on the strips selected for sampling. This is particularly important in Scotland where there are unlikely to be any trees on many of the strips.

6. Volume Tables

The following Volume Tables* will be used to compile the volume data:

<i>Table</i>			<i>Species covered</i>	
Oak.	Forest Record No. 5	....	Oak Ash	Horse chestnut Lime
Beech.	Forest Record No. 6	....	Beech Sycamore Elm Norway maple	Spanish chestnut Hornbeam Robinia Plane
Birch.	Forest Record No. 7	....	Birch Alder Willow	Field maple Holly
Scots pine.	Forest Record No. 8	....	Scots pine Yew and all pines except Corsican pine.	
European larch.	Forest Record No. 9	....	European larch	
Norway spruce.	Forest Record No. 10	....	Norway spruce. and Douglas fir.†	All other spruces
Corsican pine.	Forest Record No. 11	....	Corsican pine.	

Volumes for species other than those listed above should be obtained from estimates of mid quarter-girth and stem lengths.

* Published by H.M.S.O. at the following prices. No. 5, 4d.; No. 6, 4d.; No. 7, 3d; No. 8, 9d.; No. 9, 1s. 6d.; No. 10, 1s. 0d.; No. 11, 1s. 6d.

† A Volume Table for Douglas Fir has since been issued by H.M.S.O. (Forest Record No. 15, 1s. 6d.), but was not available at the time of the survey.

APPENDIX III

INSTRUCTIONS TO SURVEYORS

SURVEY OF SMALL (1 TO 5 ACRE) WOODS*

1. GENERAL

1. Contact with Owners

Wherever possible contact should be made with owner or agent before woods are entered. Woods owned by the Forestry Commission are excluded from this survey. No details of ownership are required in the case of the privately-owned woods.

2. Stands

(a) Each area of 1 to 5 acres, occurring wholly or partly on the south-west corner of the maps issued, which is now woodland, or which is shown on the map as such, must be visited, demarcated into stands (where necessary) and these stands entered upon separate field forms (Stand Data Forms).

(b) Strips of woodland less than 1 chain wide to be excluded.

(c) A minimum distance of $1\frac{1}{2}$ chains to constitute a division between blocks and between similar stands within a block.

(d) Stands to be numbered consecutively from (1) upwards. A fresh sequence of numbers must be begun for each 6 inch Ordnance Survey quarter-sheet.

(e) Stands must be stopped at edge of map. If a Small Wood overlaps a sheet edge, only that portion on the selected quarter of the quarter-sheet being sampled, is to be considered; if this portion is less than one acre, then the whole stand must be disregarded.

(f) Each stand is to comprise an area which is uniform for purposes of description, i.e. as regards Type, Age-class, Species, and Condition. All stands 1 to 5 acres in area (within each block inspected) must be differentiated. The minimum size of stand to be differentiated is 1 acre.

(g) Where two or more stand categories occur within one block, and these cannot easily be delimited on the ground, the approximate percentage by area of each stand category must be estimated and a separate form prepared for each. In "Stand No." space, write e.g. (5)+6 indicating that the form refers to the bracketed stand category. In space for area, write estimated percentage of area and under it the corresponding acreage, e.g. if the total area of Stand (5)+6 is 4 acres and 5 is 75 per cent of the whole, the space for area on the field form applying to stand (5)+6 should read

Area
75%
3

and for stand 5+(6) should read

Area
25%
1

(These are linked stands)

(h) In the case of blocks of scrub or natural regeneration which has invaded land not previously woodland, the outer limit of the scrub etc. should be roughly mapped so as to include that area which is at least 50 per cent stocked.

(j) If operations such as planting or felling are in progress when the area is inspected, the actual state of affairs as observed on that date to be recorded.

(k) Each stand form and map will on completion be initialled and dated by the Surveyor, and marked with his serial number in the space provided.

3. Maps

(a) Stand boundaries are to be delineated in pencil (H.B.) in the field, and the stand given the appropriate number.

* These are basically the same as those used for the main Census of Large Woods, 1947-49.

APPENDIX III—(contd.)

(b) Areas. The total area of each block must be measured by acre grid (to nearest acre). Individual stands comprising the block will be measured and their sum should agree with the total for the block, any necessary adjustments being made in the area of the larger stands.

4. Coding of maps

Field surveyors will code:

(a) the County according to the appropriate serial number on the list provided;
(b) six-inch Ordnance survey maps. The four quarters† of each six-inch Ordnance Survey Sheet will be coded numerically as follows:—

N.W. =1, N.E. =2, S.W. =3, S.E. =4. These numbers will follow the number of the six-inch sheet, i.e. quarter-sheet 23 N.E. will be coded as “23-2”.

(c) Ordnance sheets having a letter (e.g. A) prefixed to their numbers will be regarded for all purposes (numbers of stands, etc.) as part of the sheets whose numbers they bear, so the prefix will not be coded.

II. CLASSIFICATION OF STANDS

A. Types of Woodland

1. Coniferous High Forest (C.H.F.)

Include:—Coniferous forest with broadleaved mixture (or standards) if these form less than 20 per cent of the crop (as a rule in terms of canopy).

2. Mixed High Forest (M.H.F.)

Include all mixtures of conifers with broadleaved trees where either category forms 20 per cent or more of the crop.

3. Broadleaved High Forest (B.H.F.)

Include:—

(a) Broadleaved forest with conifer mixture (or standards) if these form less than 20 per cent of the crop (as a rule in terms of canopy).

(b) More or less widely spaced standards over coppice, if the coppice is too poor to class the stand as Coppice with Standards (Type 4.) Stands of this type but with fewer than six sizeable standards per acre are not to be classified as High Forest, but as Scrub.

(c) Poles of coppice origin (with or without standards) with an average of less than two stems per stool.

4. Coppice with Standards

Stands carrying standards of actual or potential timber value; the coppice to be capable of being worked or marketed, or suitable for conversion to High Forest.

5. Coppice

To include all coppice growth (except osiers, which are excluded entirely from the survey) if averaging more than two stems per stool; the coppice to be capable of being worked or marketed, or suitable for conversion to High Forest.

6. Scrub

Inferior growth unlikely to develop into a utilizable crop of coppice, poles, or timber.

7. Devastated

Stands from which the best timber has been removed leaving a scattered or patchy remnant of the original crop, not capable of satisfactory development. The removal of standards from coppice will not be included in this category so long as the coppice remains capable of being worked as coppice.

† This reference to “quarters” should not be confused with the quarter of the selected quarter-sheet, in which the sampling was done. This south-west quarter might fall on any quarter-sheet.

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8. Felled

To include all High Forest Stands which have been more or less completely clear-felled. Coppice which is being worked over on rotation will not be included in this category. Birch regeneration which has sprung up on recent fellings should be classed as Broadleaved High Forest 1-10 years, if over three feet in height, dense and uniform, provided that the locality conditions are suitable for the satisfactory development of birch (given proper tending). If the conditions are not suitable, such a stand should be classed as Scrub.

Note: Suitability for satisfactory development depends on local conditions and must be decided by the Census Officer.

If the regrowth is thin or very patchy, the stand should be classified as felled.

9. Lost (Disafforested)

Areas, irrespective of stocking, now converted or obviously under conversion to non-forestral uses such as agriculture, housing, gardens, sports grounds, aerodromes, etc.

B. Age Classes

Apply to High Forest Types, 1, 2, and 3 only.

Years 1/10, 11/20, 21/30, 31/40, 41/60, 61/80, 81/120, Over 120. Uneven-aged. Each stand in the High Forest Types must be put into its appropriate age class.

C. Sub-Types

Coppice with Standards—Type 4

- Sub-Type 1: Coppice mainly composed of Spanish Chestnut
- do. 2: Coppice mainly composed of Hazel
- do. 3: Coppice mainly composed of Oak
- do. 4: Coppice composed of other species, mixed coppice, etc.

Uneven-aged Class of High Forest Types 1, 2 and 3

- Sub-Type 5: Two-storied forest resulting from under-planting.
- do. 6: Natural regeneration under mother trees.

Felled—Type 8

- Sub-Type 7: Felled before 1st. September, 1939.†
- do. 8: Felled after 1st September, 1939.†

D. Condition as regards Form of Stem and Degree of Stocking†

Each Stand of Types 1 to 4 inclusive must be further classified according to the form (straightness) of the tree stems and the degree of stocking.

There are 4 classes for Stem Form:—

1. Elite trees for purposes of seed collection; i.e. trees of outstanding quality as regards straightness of bole and crown development.
2. Satisfactory. Majority of stems reasonably straight.
3. Poor. Many defective stems but capable of improvement.
4. Bad. Stems very defective. Improvement doubtful.

There are 4 Classes for Degree of Stocking:—

1. Badly overstocked. Comprises neglected stands long overdue for thinning.
2. Satisfactory—80 per cent to 100 per cent stocking, in terms of canopy.
3. Poor—From 50 per cent to 80 per cent stocking in terms of canopy.
4. Bad—Below 50 per cent stocking, in terms of canopy.

† Although full information was recorded in these sections, it was not further classified, and they are not discussed in this Report.

APPENDIX III—(contd.)

E. Suitability for Economic Management†

The object is to classify the stands, irrespective of ownership, according to their capability of being managed as part of the economically productive woodlands of the country.

There are 3 classes:—

1. Suitable for Economic Management

Stands forming part of a larger block of woodland; or in manageable proximity to other blocks. Isolated relatively small blocks of woodland must be of compact shape and have reasonable access for the extraction of forest produce.

2. Doubtful

Borderline cases.

3. Unsuitable for economic Management

Blocks of scrub on land incapable of growing timber. Blocks of woodland occurring on common land. Blocks of ornamental trees and similar areas planted purely for amenity.

Small isolated blocks in areas of a predominantly agricultural or rough grazing character. Small blocks with a long boundary in relation to their total area (e.g. shelterbelts). Isolated blocks with no reasonable access.

F. Species

All stands in Type 1 to 7 inclusive are to be classified according to species. Pure stands are stands in which at least 90 per cent of the crop is composed of the same species, and in such cases only one entry is made in the appropriate square on the front of the form against pure or principal species. In the case of mixed stands, the most abundant species in the mixture should be entered in the appropriate square in one of the rows headed "pure or principal species", and the next most abundant species in one of the rows headed "subsidiary species in mixture." In the case of coppice with standards, the standards only are to be recorded in the sections for species. (The coppice species will have already been roughly classified under "Sub-types 1 to 4").

"Other Conifers" and "Other Broadleaved" are to refer to species not listed on the Stand Data form; these headings are not to be applied to undifferentiated mixtures of codeable species.

In the case of felled areas, if there is a substantial regrowth from broadleaved stumps or coppice the species concerned should be entered in the appropriate squares in the species rows, and a note made under "remarks".

N.B.—Only one cross may be put in the four lines of "Pure or principal species", and only one cross in the four rows of "Subsidiary species in Mixture". All information regarding species other than the two most abundant ones, will be included in the statement on the back of the form.

G. Statement of Proportion of Species† (on reverse of form)

This information is to be given wherever more than one species occurs in the stand. Species which individually compose less than 10 per cent of the crop should be grouped together, e.g.:

Scots pine	40%
European larch	30%
Norway spruce	} 30%
Oak	
Spanish chestnut	

† Although full information was recorded in these sections, it was not further classified, and they are not discussed in this Report.

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In the case of Coppice-with-Standards (Type 4) and where both standards and coppice are mixed, the species and proportions should be given separately for the standards and coppice.

Remarks

Record whether felling or thinning is actually in progress at time of the visit of the census surveyor. Also note any points of outstanding silvicultural interest.

APPENDIX IV

MEAN VOLUMES PER STRIP, AND PER ACRE OF TOTAL LAND AREA, RECORDED DURING THE SURVEY OF HEDGEROW AND PARK TIMBER

Strips of 16 acres. Volume in cubic feet, quarter-girth, over bark

Country	Conservancy	Volume per Strip		Volume per Acre		Standard Error as percentage of actual Volume
		Volume	Standard Error	Volume	Standard Error	
England	Mean for whole country	333.23	±30.26	20.83	±1.89	9.1%
	North-West	219.01	±61.01	13.69	±3.81	27.8%
	North-East	287.97	±71.61	18.00	±4.48	24.9%
	East	281.89	±63.08	17.62	±3.94	22.4%
	South-East	596.42	±92.45	37.28	±5.78	15.5%
	South-West and New Forest	416.40	±62.02	26.03	±3.88	14.9%
Wales	Mean for whole country	269.86	±58.81	16.87	±3.68	21.8%
	North	298.14	±79.10	18.63	±4.94	26.5%
	South	234.84	±88.08	14.68	±5.51	37.5%
Scotland	Mean for whole country	38.32	± 9.78	2.40	±0.61	25.5%
	North	8.90	±16.80	0.56	±1.05	188.8%
	East	47.75	±20.95	2.98	±1.31	43.9%
	South	41.39	±21.25	2.59	±1.33	51.3%
	West	68.84	±20.29	4.30	±1.27	29.5%
Great Britain	Mean for whole Country	231.29	±19.71	14.46	±1.23	8.5%

See Chapter 1, page 7, for discussion of methods, and Chapter 2, page 18, for discussion of results.

APPENDIX V

NUMBER OF SAMPLING STRIPS AND NUMBER OF SAMPLING STRIPS DEVOID OF HEDGEROW TREES OR TIMBER, BY CONSERVANCY AND COUNTRY

Conservancy (1)	No. of strips in Conservancy (2)	No. of strips devoid of trees (3)	No. of strips with no volume. Only saplings present (4)	No. of strips with no "timber" volume i.e. those with "shorts" firewood trees, and saplings (5)	Total no. of strips with no "timber" volume. Cols. (3)+(4)+(5)	Strips carrying "timber" trees.	
						Number	Percentage
ENGLAND							
Total, England....	252	49	8	10	67	185	73
North West....	62	13	2	1	16	46	74
North East	45	11	2	2	15	30	67
East	58	14	2	—	16	42	72
South East	27	3	—	2	5	22	81
South West....	54	6	1	5	12	42	78
New Forest....	6	2	1	—	3	3	50
WALES							
Total, Wales	47	12	2	—	14	33	70
North	26	9	1	—	10	16	62
South....	21	3	1	—	4	17	81
SCOTLAND							
Total, Scotland	142	98	4	12	114	28	20
North	48	40	1	5	46	2	4
East	31	20	—	2	22	9	29
South	30	20	1	2	23	7	23
West....	33	18	2	3	23	10	30
Grand Total GREAT BRITAIN	441	159	14	22	195	246	56

APPENDIX VI

TOTAL LAND AREAS, IN ACRES, INCLUDING INLAND WATER, BY COUNTRIES, COUNTIES AND CONSERVANCIES

I. ENGLAND

A. BY COUNTIES, IN ALPHABETICAL ORDER

Bedfordshire	....	....	302,942	Norfolk	....	....	1,314,241
Berkshire	....	....	463,830	Northamptonshire	....	....	638,612
Buckinghamshire	....	....	479,410	Northumberland	....	....	1,291,978
Cambridgeshire	....	....	555,117	Nottinghamshire	....	....	540,015
Cheshire	....	....	645,725	Oxfordshire	....	....	479,173
Cornwall	....	....	868,167	Rutland	....	....	97,273
Cumberland	....	....	973,096	Shropshire	....	....	861,799
Derbyshire	....	....	643,571	Somerset	....	....	1,034,241
Devonshire	....	....	1,671,364	Staffordshire	....	....	738,513
Dorset	....	....	622,843	Suffolk	....	....	948,272
Durham	....	....	649,420	Surrey	....	....	461,834
Essex	....	....	977,760	Sussex	....	....	932,471
Gloucestershire	....	....	802,984	Warwickshire	....	....	628,994
Hampshire	....	....	1,055,811	Westmorland	....	....	504,917
Herefordshire	....	....	538,924	Wiltshire	....	....	860,610
Hertfordshire	....	....	404,526	Worcestershire	....	....	447,684
Huntingdonshire	....	....	233,985	Yorkshire, East Riding	....	....	750,115
Kent	....	....	975,965	Yorkshire, North Riding	....	....	1,361,522
Lancashire	....	....	1,205,575	Yorkshire, West Riding	....	....	1,785,763
Leicestershire	....	....	532,385				
Lincolnshire	....	....	1,704,240				
London	....	....	74,850				
Middlesex	....	....	148,688				
				TOTAL, ENGLAND	....	....	32,209,205 acres

B. BY CONSERVANCIES, AS ADAPTED FOR USE IN THE HEDGEROW SURVEY

NORTH-WEST				EAST			
Cumberland	....	....	973,096	Lincolnshire	....	....	1,704,240
Westmorland	....	....	504,917	Rutland	....	....	97,273
Yorks. W.Riding (Part)	....	....	309,977	Northamptonshire	....	....	638,612
Yorks. N.Riding (Part)	....	....	51,831*	Huntingdonshire	....	....	233,985
Lancashire	....	....	1,205,575	Cambridgeshire	....	....	555,117
Cheshire	....	....	645,725	Norfolk	....	....	1,314,241
Derbyshire	....	....	643,571	Suffolk	....	....	948,272
Nottinghamshire	....	....	540,015	Essex	....	....	977,760
Leicestershire	....	....	532,385	Bedfordshire	....	....	302,942
Staffordshire	....	....	738,513	Hertfordshire	....	....	404,526
Shropshire	....	....	861,799	Buckinghamshire	....	....	479,410
Herefordshire (Part)	....	....	49,261	Oxfordshire	....	....	479,173
Warwickshire	....	....	628,994				
Total	....	....	7,685,659*	Total	....	....	8,135,551
NORTH-EAST				SOUTH-EAST			
Northumberland	....	....	1,291,978	Berkshire	....	....	463,830
Durham	....	....	649,420	Middlesex	....	....	148,688
Yorks. N.Riding	....	....	1,309,691*	London	....	....	74,850
Yorks. E.Riding	....	....	750,115	Kent	....	....	975,965
Yorks. W.Riding (Part)	....	....	1,475,786	Surrey	....	....	461,834
				Sussex	....	....	932,471
				Hampshire (Part)	....	....	746,427
Total	....	....	5,476,990*	Total	....	....	3,804,065

APPENDIX VI—(contd.)

SOUTH-WEST			NEW FOREST		
Herefordshire (Part)	489,663		Hampshire (Part, including Isle		
Worcestershire	447,684		of Wight)	309,384	
Gloucestershire	802,984		Dorset (Part)	95,810	
Somerset	1,034,241				
Wiltshire	860,610		Total	405,194	
Dorset (Part)	527,033				
Devonshire	1,671,364		Total, ENGLAND	32,209,205	
Cornwall	868,167			acres	
Total	6,701,746				

Areas quoted for whole counties, etc., were supplied by the Director General, Ordnance Survey. Where a county is split by a Conservancy boundary, the area of each portion was calculated by using a planimeter.

For the arrangement of Conservancy boundaries, see Map 2 on page 88.

* The inclusion of a portion of the North Riding of Yorkshire in the North-West England Conservancy, arose through an error in mapping, as explained on page 12. The figures shown here are those used in the subsequent calculations. If this error is adjusted by including the whole of the North Riding in the North-East England Conservancy, the figures become: North Riding: 1,361,522 acres; North-East England: 5,528,821; acres; North-West England: 7,633,828 acres.

II. WALES

A. BY COUNTIES, IN ALPHABETICAL ORDER

Anglesey	176,693	Monmouthshire	349,569
Brecknock	469,281	Montgomeryshire	510,110
Cardiganshire	443,189	Pembrokeshire	393,003
Caernarvonshire	364,108	Radnorshire	301,165
Carmarthenshire	588,472		
Denbighshire	427,977	Total, WALES AND MONMOUTH	5,130,102
Flintshire	163,707		acres
Glamorgan	520,456		
Merionethshire	422,372		

B. BY CONSERVANCIES, AS ADAPTED FOR USE IN THE HEDGEROW SURVEY

NORTH			SOUTH		
Flintshire	163,707		Monmouthshire	349,569	
Denbighshire	427,977		Brecknock	469,281	
Caernarvonshire	364,108		Carmarthenshire	588,472	
Anglesey	176,693		Pembrokeshire	393,003	
Merionethshire	422,372		Glamorgan	520,456	
Montgomeryshire	510,110				
Cardiganshire	443,189		Total	2,320,781	
Radnorshire	301,165				
Total	2,809,321		Total, WALES AND MONMOUTH	5,130,102	
				acres	

For the arrangement of Conservancy boundaries, see Map 2 on page 88.

HEDGEROW TIMBER AND SMALL WOODS, 1951

III. SCOTLAND

A. BY COUNTIES, IN ALPHABETICAL ORDER

Aberdeen	....	....	1,270,273	Midlothian	....	....	236,617
Angus	....	....	562,443	Moray	....	....	308,129
Argyll*	....	....	1,724,852	Nairn	....	....	105,011
Ayr	....	....	730,828	Peebles	....	....	223,288
Banff	....	....	405,031	Perth	....	....	1,632,839
Berwick	....	....	293,894	Renfrew	....	....	146,770
Buteshire	....	....	140,515	Ross & Cromarty	....	....	2,050,212
Caithness	....	....	446,009	Roxburgh	....	....	428,005
Clackmannan	....	....	35,222	Selkirk	....	....	173,006
Dumfries	....	....	692,133	Stirling	....	....	297,133
Dunbarton	....	....	167,890	Sutherland	....	....	1,345,640
East Lothian	....	....	171,390	West Lothian	....	....	77,407
Fife	....	....	325,065	Wigtown	....	....	314,876
Inverness†	....	....	2,415,729				
Kincardine	....	....	243,654	Total, SCOTLAND, EXCLUDING			
Kinross	....	....	55,848	ISLANDS NOT SURVEYED	....	18,179,846	acres
Kirkcudbright	....	....	580,803				
Lanark	....	....	579,334				

B. BY CONSERVANCIES AS ADAPTED FOR USE IN THE HEDGEROW SURVEY

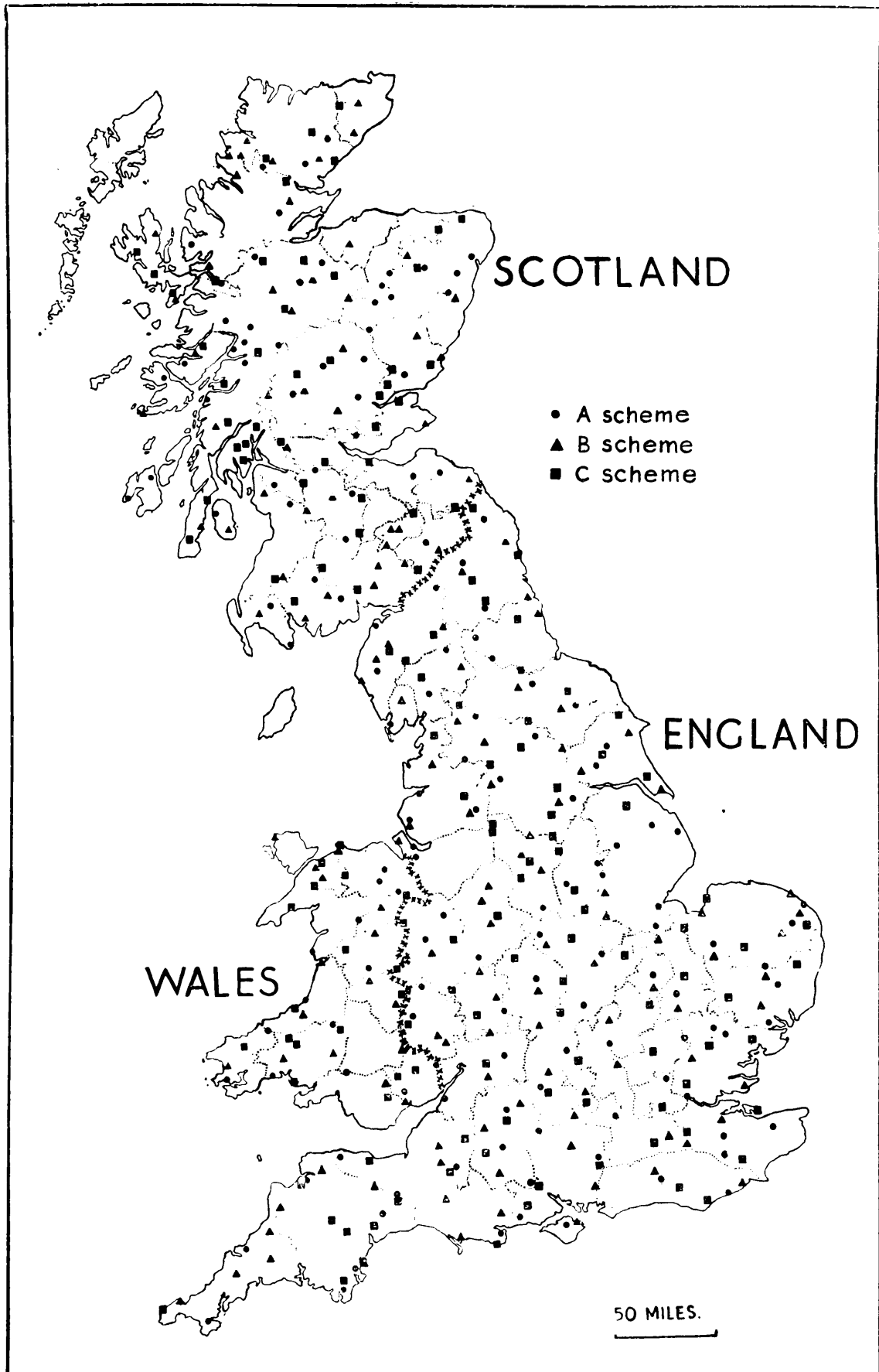
NORTH				SOUTH			
Caithness	....	....	446,009	Lanark (Part)	....	....	324,629 8
Sutherland	....	....	1,345,640	Midlothian	....	....	236,617 6
Ross & Cromarty	....	....	2,050,212 30	East Lothian	....	....	171,390 4
Inverness† (including Skye)	....	....	2,415,729 35	Berwick	....	....	293,894 7
Nairn (Part)	....	....	98,964 7	Peebles	....	....	223,288 6
Moray (Part)	....	....	78,651 1	Selkirk	....	....	173,006 4
Argyll (Part)* (including Mull)	....	....	540,966 8	Roxburgh	....	....	428,005 11
				Dumfries	....	....	692,133 17
Total	....	....	6,976,171	Ayr (Part)	....	....	555,179 14
				Kirkcudbright	....	....	580,803 15
				Wigtown	....	....	314,876 8
				Total	....	....	3,993,820
				WEST			
				Perth (Part)	....	....	473,820 2
				Fife (Part)	....	....	27,643 1
				Clackmannan	....	....	35,222 1
				Stirling	....	....	297,133 10
				Dunbarton	....	....	167,890 6
				Argyll (Part)*	....	....	1,183,886 110
				Bute (including Inchmarnock, the Cumbraes and Arran)	....	....	140,515 5
				Renfrew	....	....	146,770 5
				Lanark (Part)	....	....	254,705 9
				West Lothian	....	....	77,407 3
				Ayr (Part)	....	....	175,649 6
				Total	....	....	2,980,640
				Total, SCOTLAND, EXCLUDING			
				ISLANDS NOT SURVEYED	....	18,179,846	acres

For the arrangement of Conservancy boundaries, see Map 2 on page 88.

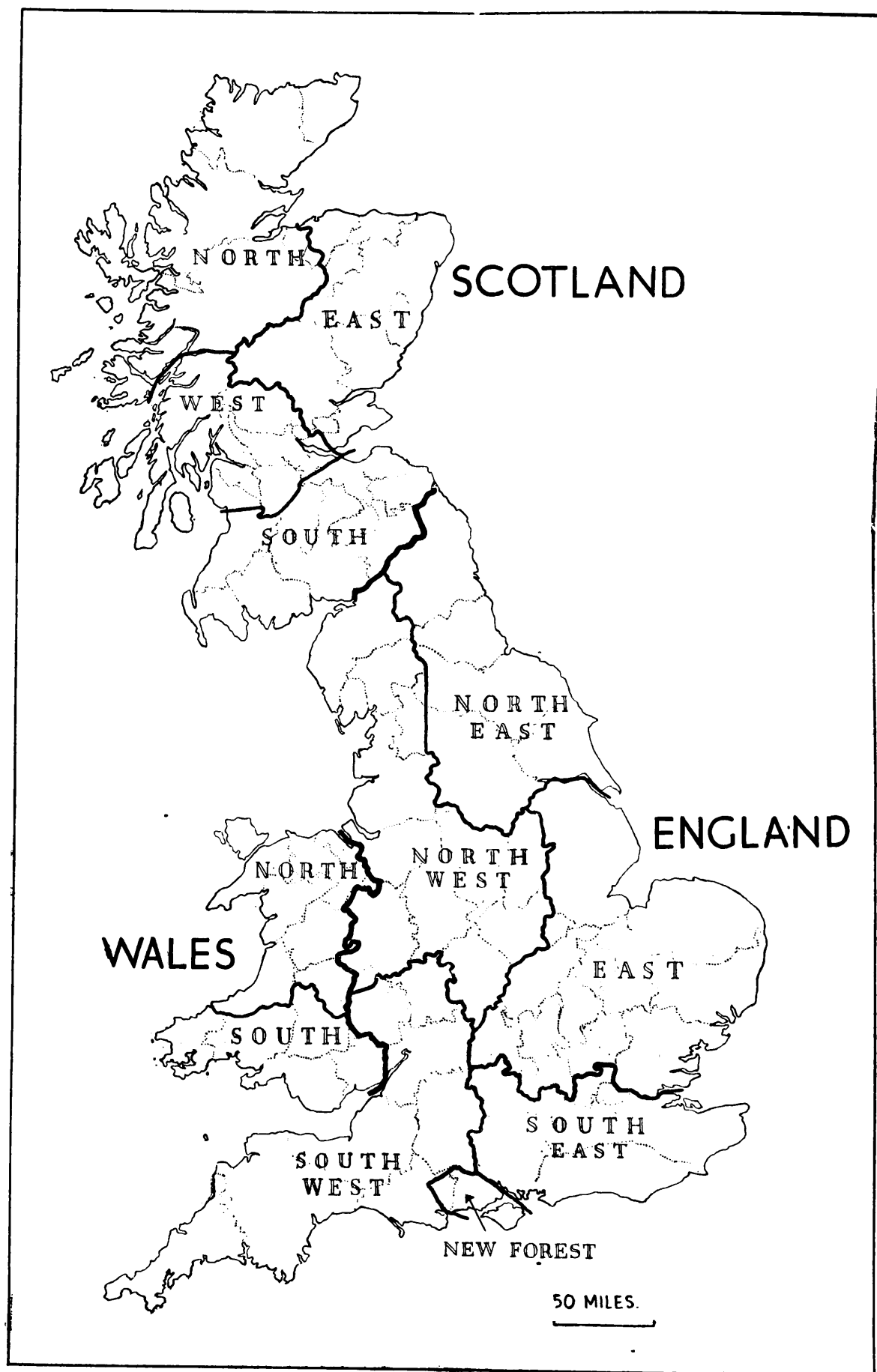
* The only island included in Argyll is Mull.

† The only island included in Inverness-shire is Skye.

APPENDIX VII
MAPS



*Map. 1. Positions of maps selected for sampling,
under the A, B, and C schemes*



Map 2. Forestry Commission Conservancy boundaries,
as adapted for use in the Survey

FORESTRY COMMISSION PUBLICATIONS

Representative titles are listed below. A complete list (Sectional List No. 31) is obtainable on request from the Forestry Commission, 25 Savile Row, London, W.1., or from H.M. Stationery Office at the address shown overleaf. All these publications are obtainable from H.M. Stationery Office, or through any bookseller. Prices in brackets include postage.

GENERAL REPORTS

Annual Report for the Year ended 30th September, 1951. (H.C. 181)	3s. 0d.	(3s. 1½d.)
Report by the Commissioners on Post-War Forest Policy, 1943. (Cmd.6447)	3s. 0d.	(3s. 2d.)
Report of the New Forest Committee, 1947. (Cmd.7245)	3s. 6d.	(3s. 8d.)

REPORTS ON FOREST RESEARCH

Report on Forest Research for the Year ending March, 1951	4s. 6d.	(4s. 9d.)
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BULLETINS

No. 14. Forestry Practice (Revised 1951)	3s. 0d.	(3s. 2d.)
No. 17. The Cultivation of the Cricket Bat Willow. July, 1936	2s. 0d.	(2s. 2d.)
No. 18. Spring Frosts. July, 1937. (Revised 1946)	4s. 6d.	(4s. 9d.)

NATIONAL FOREST PARK GUIDES (Fully illustrated)

Argyll	1s. 6d.	(1s. 8d.)
Forest of Dean	2s. 0d.	(2s. 2d.)
Glen More (Cairngorms)	2s. 0d.	(2s. 2d.)
Glen Trool (Galloway)	3s. 0d.	(3s. 2d.)
Hardknott (Lake District)	2s. 0d.	(2s. 2d.)
Snowdonia	2s. 6d.	(2s. 9d.)

GUIDE BOOKS

Bedgebury (National Pinetum and Forest Plots)	2s. 6d.	(2s. 8d.)
New Forest	3s. 6d.	(3s. 9d.)

BOOKLETS

No. 1. Woodland Mosses (Fully illustrated)	2s. 6d.	(2s. 8d.)
No. 2. The Dedication of Woodlands: Principles and Procedure	2s. 0d.	(2s. 2d.)

FOREST OPERATIONS SERIES

No. 1. The Thinning of Plantations	1s. 3d.	(1s. 4½d.)
No. 2. The Establishment of Hardwoods by Sowing or Planting	1s. 6d.	(1s. 7½d.)

MISCELLANEOUS

Forestry Commission Yield Tables, for Scots Pine and other Conifers	1s. 3d.	(1s. 4½d.)
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LEAFLETS

No. 25. Replanting of Felled Coniferous Woodland in relation to Insect Pests	6d.	(7½d.)
No. 26. The Spruce Bark Beetle	6d.	(7½d.)
No. 27. Poplar Planting	4d.	(5½d.)

FOREST RECORDS

No. 1. Revised Yield Tables for Japanese Larch in Great Britain	9d.	(10½d.)
No. 2. The Raising of Aspen from Seed	1s. 0d.	(1s. 1½d.)
No. 3. Census of Woodlands, 1947-1949. Summary Report	9d.	(10½d.)
No. 11. General Volume Tables for Corsican Pine in Great Britain	1s. 6d.	(1s. 7½d.)
No. 12. Girdling or Banding as a means of Increasing Cone Pro- duction in Pine Plantations	6d.	(7½d.)

BRITAIN'S FORESTS

Forest of Ae (Dumfries-shire)	6d.	(7½d.)
Coed y Brenin (Merioneth)	6d.	(7½d.)
Culbin (Morayshire)	6d.	(7½d.)
Kielder (Northumberland)	1s.	(1s. 1½d.)
Rheola (Glamorgan)	6d.	(7½d.)
Tintern (Monmouthshire)	9d.	(10½d.)
Cannock Chase (Staffordshire)	9d.	(10½d.)
Loch Ard (Perthshire & Stirlingshire)	1s. 0d.	(1s. 1½d.)