FORESTRY COMMISSION

HISTORY

OF

NORTHAMPTONSHIRE GROUP

of FORESTS.

E(E) CONSERVANCY

FORESTRY COMMISSION

HISTORY

of the

NORTHAMPTONSHIRE HARDWOOD AREAS

(ROCKINGHAM, HAZELBOROUGH, SALCEY, YARDLEY)

EAST (ENGLAND) CONSERVANCY

HISTORY OF THE NORTHAMPTONSHIRE HARDWOOD AREAS

(Rockingham, Hazelborough, Salcey and Yardley)

Contents

Page

APPENDICES

TABLES

HISTORY OF THE NORTHAMPTONSHIRE HARDWOOD AREAS

CHAIRMAN'S COMMENTS

This history is an excellent compilation and well worth the considerable trouble which has obviously been expended on it. Particularly valuable are the conclusions (pages 49 - 52) with which I am in general agreement.

Salcey and Hazelborough were the property of the Office of Woods and Forests from the time of replanting after their Disafforestation Acts until they were transferred to the Forestry Commission under the Transfer of Woods Act 1923. I do not know when the local management ceased to come under a Deputy Surveyor but when I first had to do with these two areas in 1912 a firm of agents - Messrs. Cluttons - managed them on behalf of the Office of Woods. In 1912 there was set up a Joint Forestry Branch (of which I was made Head) of the Board of Agriculture and the Office of Woods and that Branch managed these woods until the Forestry Commission was set up. The officers concerned up to 1919 were D. W. Young and G. H. Crosfield. The other areas were acquired subsequently as stated in the history.

By 1912 regeneration of the old oak had already been going on for some years. The method was to clear fell sizeable areas of ten or a dozen acres and plant up with oak transplants 4 ft. to 5 ft. high spaced as I recollect 5 ft. apart. Two things followed: frost arrested growth and a terrific growth of coppice, thorns, brambles and coarse grasses invaded the felled areas. It did appear, however, that on those edges of the felling areas which were protected by adjacent old oak the planted oak were suffering far less from frost. These considerations led to the institution of strip regeneration as also to continuous weeding after planting.

A number of attempts were made to ascertain how the older planted oak were faring but it was both difficult and painful to get in and make a proper survey (had I appreciated at the time the value of sampling methods it is possible that a better picture might have been secured).

In the event these plantations were left to take their course for a number of years, when it was easier to get in, and a certain amount of cleaning was then done to relieve those oaks which were in fact getting through. The result of all this can no doubt be observed in the plantations as they are today.

The history takes up in detail the treatment of the post-Commission areas as well as Salcey and Hazelborough. The silvicultural problems were difficult both on felled woodlands and on bare land and in fact outside our experience. Far too much reliance was placed on ash/larch mixtures. Much good ash had come out of this type of country but the silviculture of the species was very imperfectly understood. Ash in those early days was an ignis fatuus pursued not only in these areas but in a number of others.

The correct degree of weeding for oak was another disputed point and varied with changes in control. Consequently no consistent policy was followed. My own view throughout was that heavy weeding until the oak was established was the best procedure and events have proved it to be correct.

The nursing of oak also went through various phases, too much reliance again being placed on European larch and on Scots pine and too little - as it now transpires - on Norway spruce. The position has been radically changed in recent years by the high prices of small Norway spruce for Christmas trees. The history makes the points, correctly in my view, that:

(1) Oak is the correct species for much of the land;

(2) Excellent oak can be grown in close mixture with Norway spruce;

(3) After allowing for the cost of consistently heavy weeding, which is required by both the oak and Norway spruce and the systematic removal of Christmas trees, excellent young oak plantations can be established at a net profit.

These considerations should, it appears, be the basis of future procedure.

I would not abandon wholly the use of ash but confine it to small groups on the better ground or even to single trees in the oak mixtures. Something might also be done with green pruning. Nevertheless we are still in the experimental stage with this species.

I am not sure that oak plantations on these heavy soils require underplanting for good development. The growth of beech has proved surprisingly

good and if the grey squirrel menace can be overcome could be more widely used.

Finally I want to say that the time has come when, on the basis of 40 years' experience based on trial and error arising out of individual "hunches", silvicultural procedure can and should be clearly defined on paper. Having done that, departure from prescriptions should not be permitted except for definite reasons which in turn should be clearly defined and recorded.

R.

Jan. 22nd 1952

HISTORY OF THE NORTHAMPTONSHIRE

HARDWOOD AREAS

GENERAL DESCRIPTION OF THE FOREST

Situation

The units comprising the hardwood areas of Northamptonshire are the Rockingham group (Fineshade, Fermyn, Apethorpe and Bedford Purlieus), Hazelborough, Salcey and Yardley.

The Rockingham group lies due south of Stamford and extends to within a few miles of Thrapston; Hazelborough, Salcey and Yardley lie within a few miles to the south-east of Northampton and extend in a south westerly direction to within 6 miles of Brackley.

Originally the Rockingham areas formed part of the old royal forest of Rockingham and the name of the old estates into which the forest was later divided have been preserved; Hazelborough was originally part of the Hazelborough Walk of the ancient royal forest of Whittlewood and Salcey comprises the remnants of a previously more extensive royal forest.

No extensive blocks occur; the largest single unit is Salcey with 1279 acres. The surrounding countryside is made up of farming communities and private estates mainly devoted to agriculture.

Area and Utilization

Total acreage of all units is 10,994 acres.

The areas leased or purchased by the Forestry Commission had in the main been devoted to hardwood (oak) timber production and were taken over in a derelict or semi-derelict condition; exceptions to this were the Crown lands carrying timber crops at the time of acquisition and areas taken over immediately following felling.

A limited amount of derelict or abandoned arable and grazing land was also acquired, particularly in the Rockingham area. See Tables I and II.

Physiography

All the units are on gentle undulating country typical of the south midlands with elevation ranging from 100ft. to 450 ft. above sea level. Aspect and exposure are nowhere serious factors.

Geology and Soils

The areas are situated over the Middle and Lower Oolite Series and the soil is a heavy clay, which during periods of drought cracks severely, even under close canopy conditions.

While there is little variation in the texture of the soil at Yardley, Salcey and Fermyn, considerable variation occurs at Fineshade where small pockets of impervious blue clay of an estuarine nature are found.

The soil is of a more friable nature when the fissured limestone is nearer the surface; this occurs at Fineshade, Apethorpe and Bedford Purlieus.

At Hazelborough the underlying strata consists of coloured sands and clays of the Upper Estuarine Series of the Lower Oolite formation and the resulting soils vary from heavy clay to moderate loam with outcrops or pockets of sandy loam.

A gleyed horizon is developed in the clays near the surface, at all units where the water table is high.

Vegetation

The vegetation on all the units is broadly similar and characterised by the profuse growth of grasses and coppice. On felled areas, Calamagrostis epigeios, Aira caespitosa, Juncus and Carex species and briar constitute the main vegetation together with local patches of Phragmites, Holcus and meadow sweet; the whole vegetation forms a dense mat interspersed with sparse coppice.

On felled and devastated woodland areas a strong growth of coppice ash, aspen, hazel, sallow, thorn, field maple and birch, together with a lower mat of brambles and briars, is characteristic.

Derelict farm land in the initial stage carries a heavy growth of grasses (Aira and Holcus species) and this, in turn, is quickly invaded by thorns, brambles and briars, which soon produce conditions adverse to the establishment of tree crops. In general the profuse heavy vegetation on the clay soils makes afforestation or reafforestation relatively more difficult and it has a direct bearing on the rate of establishment of tree crops on this type of land.

Meteorology

Rainfall is in the region of 23 in per annum. Prevailing winds are from the south west.

Risks

(a) Fire

The heavy growth of grasses on felled areas which in certain seasons produces a bulk of highly inflammable material constitutes some risk from fire especially when the areas occur near main roads and railways as at Hazelborough, Yardley and Fineshade; in general, however, the risk from fire is very low.

(b) Frost

Late frost is a serious risk and difficulty has been experienced in establishing mixtures of European larch and ash and, to a lesser extent, Norway spruce from this factor; growth, however, may be retarded on the heavy clay soils after an exceptionally wet winter due to the late warming up of the soil, and the tendency for frost damage is, under such conditions, reduced.

Early frost (autumn) causes severe damage to growth which has not properly "hardened-off", especially on areas where weeding of the dense ground vegetation is in arrears. Inability to weed areas at the appropriate time and the associated frost damage has been one of the main factors which has prolonged the establishment period on the heavy clay soils.

(c) Vermin and Game

Rabbits, grey squirrel and, to a lesser extent, deer, require constant attention; the heavy vegetation and dense undergrowth makes trapping comparatively difficult.

The grey squirrel population and distribution in recent years has rapidly increased and now presents a serious problem over the whole of the Northamptonshire areas.

In the past game constituted a continuous source of trouble especially where oak sowings were made.

None of the units are subject to trespass to any great extent.

Roads

Access from main roads to all the units is provided; the main Hazelborough block and Salcey adjoin main roads and this, no doubt, in the past influenced to some degree the intensity of thinning and exploitation in the old crown woodlands.

A good system of rides was in general provided over all the areas in the initial stages.

Labour

In general the supply of labour has never been adequate to enable the replanting of felled areas to be completed at the appropriate time before a dense weed growth invaded the areas, nor has it been sufficient to enable proper and timely weeding of the replanted areas to be undertaken. Spasmodic supply of labour, coupled with periodic shortages, have led to arrears of weeding and cleaning and this, in turn, has resulted in heavy failures and associated heavy beating up and even, in some cases, to acceptance of the coppice regrowth in lieu of the planted crop.

In the Rockingham group, in 1937, it was necessary, on account of shortage of labour and arrears of maintenance work, to stop all planting for a period of 2 years but even after this drastic measure had been taken it was found impossible to catch up with maintenance arrears and, as a result, coppice regrowth was accepted in lieu of planted ash and poplar at Fineshade, and natural elm and ash coppice as part of the original crop of Douglas fir at Apethorpe.

During the above period pure European larch and European larch/ash plantations at Fineshade suffered severely from coppice regrowth. Within the war years the supply of labour was severely depleted, especially in such areas as Salcey and Yardley, and this made proper maintenance of the existing plantations impossible and resulted in damage to the plantations mainly through lack of weeding and cleaning; in many cases the rank growth of vegetation led to stagnation conditions which prolonged the establishment period unduly.

During the above period fencing upkeep suffered severely in nearly all the units and this led to increased vermin population.

The labour position in recent years, although improved at most units, is still inadequate and an acute shortage still exists in the Rockingham

Group, especially at Fermyn and Fineshade where the labour is insufficient to enable planting to be undertaken.

SILVICULTURE

This section is dealt with by periods.

The total period covered extends from 1826 to the present time, and the earlier periods refer mainly to Crown Lands.

1826 - 1903 Crown Lands

Following disafforestation of the Crown Lands in 1826 the areas were enclosed and planted up with oak/Scots pine mixtures.

Thinnings of the resulting crops commenced in 1853 and continued at five yearly intervals up to 1903; these thinnings took place freely in the better stands, the crops being sacrificed for good financial returns.

1904 - 1912

The practice of heavily thinning the plantation on Crown Lands ceased in 1903 and a system of clear cutting and replanting was undertaken.

At Salcey, during this period, 178 acres were felled and 165 acres replanted with oak and ash.

Clear cuttings at Hazelborough covered too large an area and resulted in deterioration of the soil, which, coupled with frost, seriously hindered the establishment of the planted crops; 104 acres were felled and re-planted namely with oak and ash, large plants being used at wide spacing (4 ft.)

1913 - 1920

At Hazelborough the oldest replantings (8-10 yrs) were in check, except around the edges of the compartments where side shelter from the surrounding crops produced some beneficial effect; a mass of thorn and briars covered the ground and it was physically impossible to ascertain the stocking on the ground but it was clear that growth in the exposed portions of the compartments was unsatisfactory.

In view of the above it was decided that the only practical solution was to let the plantations take their chance in the expectation that at least a proportion of the oak and ash would fight up through the under-growth.

It is interesting to note that some of the above plantations have now been thinned and the resulting crops are satisfactory; this clearly indicates that if oak and, to a much lesser extent, ash is well established they can successfully compete with thorn.

The experience gained both at Hazelborough and Salcey regarding clearance of large areas and the associated site deterioration and intense weed invasion making reafforestation slow and difficult led to a change in policy regarding the size and rate of felling and it was decided :-

(a) to fell and replant in comparatively narrow strips so disposed as to get the benefit of side shelter from the adjoining crop against frost and dessication.

(b) to weed the young plants until they were established.

(c) to gradually remove and replant the intervening strips of high forest; the main consideration being a balance between the provision of side shelter and the light requirements of the regeneration.

At Salcey, this procedure was adhered to up to 1939; strips of oak high forest were cleared in widths varying from one to two chains and replanted.

At Hazelborough fellings were regularised in accordance with the silvicultural requirements of the crop to be planted and, finally, averaged 8 acres per annum (the strip method being employed).

In the early years, (1914-16), large plants 3 ft. to 4 ft. high were pit planted and, in some cases, Scots pine and European larch nurses were used; the conifer nurses were later found to be unnecessary. They tended to develop into wolf trees, and were removed about 10 years after planting.

The ash, both at Hazelborough and Salcey, has proved unsatisfactory except on favoured sites of better aeration and where a relatively low water table is present in the soil.

Generally, the oak timber belts were removed 20 years after planting the strips.

1921 - 1934

During this period many of the northern units were acquired and this necessitated technique being developed to deal with :-

(i) areas containing advanced coppice growth

(ii) clear felled areas

(iii) bare ground (derelict farm land)

Categories (i) and (ii) were found on all units except Salcey and Category (iii) was present at Apethorpe, Fineshade and Fermyn.

The various techniques developed for each of the above types of area, together with results are given below :-

(i) Areas containing advanced coppice growth

(a) Treatment by groups

The Brackley Hatch section of Hazelborough contained areas of strong coppice growth and these were dealt with in 1920-21 by filling up the gaps in the coppice (oak, ash and hazel) mainly with Norway spruce although some Japanese larch, European larch and Scots pine were also used. Oak and ash were also planted in gaps in the coppice (800 plants per acre being introduced), but frost and mice caused many failures and Norway spruce was used to restock the areas (approximately 1000 plants per acre were used).

Strong natural regeneration of oak came in on these areas and beating up of the Norway spruce was considered unnecessary to obtain an effective stocking; weeding of the coppice continued until 1931. The conifers were progressively removed later and sold as Christmas trees and there is now present an excellent natural oak crop.

At Fineshade in the Westhay block, some 400 acres of coppice were treated (F.Y. 23-30) by firstly clearing groups or rings in the coppice and planting alternate rows of Black Italian poplar and ash at 6 ft. x 9 ft. and 6 ft. x 6 ft. respectively and, secondly, by clearing the coppice entirely and planting poplar at 8ft. x 8ft., 12 ft. x 12 ft. and 15 ft. x 15ft. spacing.

Growth of the above crops was very irregular and the coppice growth over the entire area soon got out of control; it was later decided (1934) to accept the scattered groups of ash and poplar which had managed to push through the coppice and thorn scrub.

Other coppice areas at Fineshade were dealt with in 1930 and 1931 by clearing irregular groups and replanting with ash; the ash checked badly and with the difficulty of weeding the planted crop was abandoned and ash and oak coppice accepted as a crop.

In 1934 and succeeding years oak was planted in the coppice at Fineshade in irregular groups and despite the lack of weeding the percentage survival is fairly high and growth is satisfactory.

Group planting in oak, hazel and maple coppice was undertaken at Fermyn in 1934-35; groups were made 21 ft. apart and a square 6 ft x 6ft. was cultivated within each group and planted with 25 (2 + 0) oak. Results from this method are satisfactory but frequent and costly brushing up of the coppice was necessary in order to avoid the smothering of the planted crop.

At Yardley 90 acres of ash, hazel and maple coppice was dealt with in 1934 by group planting with oak, groups (6 ft. x 6 ft.) were spaced at 21 ft. centre and planted with 30 (2 + 0) plants per group - heavy beating up was necessary, the oak checked badly and this prolonged the weeding and cleaning period unduly; subsequent growth has been satisfactory.

The difficulty in weeding groups in coppice areas and the frequent and costly brushing up of the coppice immediately surrounding the groups called for a cheaper and more satisfactory method to be evolved and the "strip method" was introduced.

(b) Treatment by Strips

This method entails the clearing and replanting of continuous strips of varying width through the coppice, i.e. bands of coppice alternating with cleared and replanted strips.

At Fermyn in 1935, $\frac{1}{4}$-chain strips were cleared and 12 ft. belts of coppice left standing between the strips, lines 5 ft. apart were cultivated in the strips and 3 rows of oak (1 + 0 and 2 + 0 plants) were planted at $2\frac{1}{2}$ ft. spacing in the rows. Satisfactory results were obtained, although fairly frequent brushing up of the coppice was necessary.

The strip method was continued at Fermyn up to 1940, but $\frac{1}{2}$ chain strips were cleared and $\frac{1}{4}$ chain or 12 ft. belts of coppice left standing; 5 rows of oak at 5 ft. x $2\frac{1}{2}$ ft. spacing were planted in each strip - in general these plantations have made satisfactory progress after passing the heavy initial weeding stage.

Similar technique to that at Fermyn was also employed at Knotting Fox area at Yardley and satisfactory results have been obtained.

In general results have shown that in areas of advance coppice growth, the strip method is cheaper and more easily managed than the small group

method; the small groups are difficult to weed and a lot of time is taken up in locating the groups and, furthermore, the surrounding coppice requires frequent attention to prevent it re-encroaching on the young plants - in the strip method the periodic cutting back or brushing up of the coppice is less frequent.

(ii) Clear felled areas

Initial plantings on freshly felled areas entirely cleared of young coppice growth were very varied and consisted of pure blocks of conifers on the lighter soils, oak pure and in mixture with conifers on the heavier soils and, also, ash/European larch mixtures on some of the heavier soils; details of the various plantings are given below:-

(a) Pure Conifer

Pure blocks of Sitka spruce were laid down at Fineshade and Fermyn (1929-32) and at Apethorpe in 1931; Norway spruce was planted pure during this period at Yardley and Fermyn and Douglas fir was planted as a catch crop at Apethorpe (in 1922) and European larch at Hazelborough (in 1932). The use of Sitka spruce in the drier climate of the midlands was soon realised to have been a mistake and growth has continued to be slow, particularly at Fineshade and Fermyn; the best crop of this species is at Apethorpe where advanced patches are in the brashing stage.

Growth of Norway spruce in the early years was disappointing, frost and coppice regrowth caused severe damage and a prolonged establishment period resulted; growth following establishment, however, was extremely rapid.

The Douglas fir at Apethorpe due to lack of adequate and timely weeding succumbed over the greater part of the area to elm regeneration, but where this species became established growth was rapid and today a fairly fine stand with an average height of 50 ft. is present.

At Hazelborough the European larch was planted on cleared woodland in the Bucknells block with the idea of breaking up the age classes of the oak plantations; growth was slow and coppice regrowth proved very troublesome. Many natural oak invaded the area and a mixed crop has resulted.

(b) Pure Oak

From 1929 - 1934 planting and direct sowing on cleared ground was the technique employed for the establishment of oak.

Details of the various plantations formed during this period are given below:

At Fineshade (Wakerley Block) pure planting of oak (1929/30) was tried but extensive beating up was necessary on account of vole damage.

The technique at Fermyn during this period (1929/30)was that of clearing the heavy scrub and hand cultivating lines 3ft. 6in. apart followed by sowing of acorns at the rate of 122 bushels per acre; dense growth of Calamagrostis and Aira entailed heavy weeding and beating-up of this crop was necessary up to 1936. One year seedlings at 2 ft. spacing were used for beating up.

Direct sowing was again practised at Fermyn in 1934 but the cultivated lines were spaced at 5 ft. intervals. This was not a success and heavy beating up was necessary with 2+0 seedlings in 1936. Coppice regrowth was very strong and intense weeding for a number of years was necessary.

In 1934 at Hazelborough (Bucknell's block) where the area was cleared by timber merchants, the practice was adopted of sowing or planting oak in $\frac{1}{2}$-chain strips without nurses and leaving a 12 ft. belt unplanted between each strip. Coppice regrowth in the unplanted strips was allowed to develop in order to serve as a nurse to the planted oak.

The above sowings failed badly mainly as a result of attacks by mice and heavy beating up was necessary. Growth in the planted strips was generally slow and intermittent weeding of the strong coppice regrowth was necessary for 5 years until the oak was fully established. This strip method of planting oak was continued at Hazelborough until 1943 when practically the whole block was replanted. The spacing of the oak was generally at $4\frac{1}{2}$ ft. x 2 ft.

(c) Ash/European larch mixture

Mixtures of European larch/ash and European larch/ash/Norway spruce in alternate rows were made at Yardley in 1933, and European larch/ash at Fermyn in the same year, on cleared old woodland areas.

At both the above units the plantings suffered severely from frost and went into check. This involved prolonged weeding of heavy grass and coppice and heavy beating up of European larch with Scots pine was necessary. At Yardley the above crops are only now closing canopy and gradually suppressing the briars and thorns; the ash are of poor form and the larch, although of better growth, is not thriving. The large scale plantings of European larch/ash and pure ash were uniformly unsatisfactory and it was decided that the conifer nurses were an unnecessary complication; with this in mind it was decided in future to replant cleared ground with oak as the principal species and to plant in strips $\frac{1}{2}$-chain in width leaving 12 ft. belts unplanted.

(iii) Bare Land (derelict farm land)

A preponderance of this poor type of land, usually covered with thorn, scrub and heavy weed growth, was present at Apethorpe, Fineshade and, to a lesser extent, at Fermyn.

Various plantings were made on this type of ground with or without previous cultivations. Oak (pure) was planted and direct sowing of acorns was tried as a means of establishing this species. In addition, oak was planted in mixture with conifer nurses and contemporaneous mixtures of ash and conifers were also tried out.

(a) Pure Oak Plantations

Shallow ploughing at $4\frac{1}{2}$ ft. spacing was first undertaken at Apethorpe in 1920 and the acorns were sown in the furrow bottom (3-4 acorns 4 in. to 5 in. deep every $4\frac{1}{2}$ ft.)

Pure oak blocks were formed in succeeding years up to 1928 by planting one year seedlings or by sowing acorns in the furrow bottom, but many of the acorns were eaten by game and required beating up with seedlings two years after sowing.

These sowings made little initial growth in the dense mat of grass that soon invaded the ground and, in general, it took seven or eight years for the trees to get through the grass, with only individual trees making any headway. The establishment period was very prolonged and growth was patchy.

It should be pointed out that generally only one weeding of these oak

crops was carried out. Impenetrable thorn soon invaded the area and growth in general improved in the thorn matrix but it was not until 1934 that the first plantings were really above the weed growth and established. Attempts were made to shorten the establishment period by the introduction of Norway spruce (interplanting at 8 ft. x 5 ft.) to the P.27 and 28 sowings, but these largely failed due to the drying out of the roots of the planted stock during periods of dry weather when the heavy clay soil cracked badly.

Overplanting of the P.26 oak at Apethorpe in 1936 with birch and alder nurses at 9 ft. x 9 ft. had little or no effect on the rate of establishment of the oak.

The planting of oak in the furrow bottom was a mistake since the plants were often waterlogged due to the high water table and drainage was defective because the shallow ploughing had failed to rupture the agricultural pan present over the greater part of this derelict land.

Lack of forest humus in the soil and the subsequent lack of mycorrhizal activity are also contributory factors resulting in the prolonged establishment period for both sowings and plantings on this derelict agricultural ground.

It was not until 1937 that growth in the above crops at Apethorpe became rapid and good crops are now present, mostly in the thinning stage.

(b) Oak/Conifer Mixtures

At Apethorpe in 1920 oak was planted in mixture with European larch and Norway spruce nurses following shallow ploughing of the ground at $4\frac{1}{2}$ ft. spacing. A severe drought followed planting and deaths in the oak were fairly severe.

Afforestation of bare land with oak in mixture with conifer nurses was commenced in 1930 at Fineshade and Fermyn. Scots pine and Norway spruce were used in the proportions of 2 rows of oak alternating with one row of conifer. Shallow ploughing preceded planting which was done in the furrow bottom, the spacing being 4 ft x 4 ft. and 4 ft. x 3 ft.

At Fineshade acorns were used in the oak/Scots pine mixture and in the very wet season which occurred germination was low in the waterlogged furrows and heavy beating up was necessary. Very small oak seedlings were used at Fermyn and these checked badly in the strong grass and dense thorn which invaded the area and a heavy beating up of this crop was

necessary in 1932 when some European larch was used in place of Scots pine.

Hand screefing instead of ploughing was also tried at Fermyn in 1930 and oak/Norway spruce mixture planted. A long period of check was experienced and beating up of poor patches continued up to 1937.

The Scots pine at Fineshade in particular soon developed into wolf type nurse trees and topping was carried out some fifteen years after planting. This gave the oak the necessary room for development and the crop is now closing canopy.

At Fermyn the Scots pine made very rapid growth and suppression of the oak in patches has taken place due to the tardy removal of the pine.

The Norway spruce/oak at Fineshade, despite little weeding and cleaning, produced a full crop of both species. The progressive removal of the conifer reveals that the oak are well ahead of those grown in mixture with Scots pine and are of a straighter and more vigorous form.

Similarly at Fermyn, although removal of the spruce was delayed, little harm has been done to the oak, which over most of the area has closed canopy and further, a clean floor exists after the removal of the spruce.

Growth of these mixtures on old agricultural ground appears to be closely correlated with the past treatment of the land. Where manure is said to have been extensively used a first class crop in closed canopy is now present. On the other parts, where oak/Norway spruce has been planted, growth is very irregular and even today only advanced portions have been able to overcome the extreme impoverishment of the soil and reach a stage where the spruce requires removal.

At Fermyn in 1932 Norway spruce was planted pure in furrows 3 ft apart, with the intention of removing 50% as Christmas trees and interplanting the crop with oak at a later date.

Losses in the above crop were very heavy and beating up was necessary in 1933 and 1934. Oak (2 + 2) were introduced in 1938 between every second row of spruce and an uneven plantation is now present with advance growth slowly closing in and other parts definitely in check.

In 1933 at Fermyn an oak European larch mixture was laid out consisting of two rows of oak (direct sowings) alternating with one row of European larch. The take in both species was very poor and the plantation was heavily beaten up with European larch in 1934, 35 and 36, and again in 1941 with Norway spruce.

In general growth of the above crop has continued to be slow and advanced portions of European larch over the oak are only now due for removal. The European larch in general has proved unsatisfactory as a nurse to oak in these conditions.

(c) Ash/Conifer Mixtures

Ash/conifer mixtures were formed at Apethorpe and Fineshade (1923) after the shallow ploughing of bare ground. European larch and Japanese larch with ash in alternate rows at 4½ ft. x 4½ ft. were planted and a small area at Fermyn (1933) was similarly treated. Heavy failures through frost occurred in the European larch and large-scale beating up was necessary when some Norway spruce was used. The ash particularly at Fineshade checked for many years and needed extensive beating up in 1932. The European larch eventually got away about eight years after planting and in parts forms a reasonable crop. At Fineshade particularly, in certain areas European larch has got well ahead of the ash, and promises to produce for this species a high yield of timber per acre. The ash, which are drawn and spindly, are being progressively removed.

Similarly at Apethorpe on sloping ground the larch will be the main crop.

Elsewhere the ash was the most successful in getting through the thorn and has gained the ascendancy with only pockets of conifers remaining. The pure ash is on the whole an inferior crop with rough branching stems, now in the thinning stage.

Other mixtures of European larch/ash/Corsican pine and sycamore at Fineshade proved a failure. They were beaten up with Scots pine but heavy grass persisted and weeding was only spasmodic, resulting in the present open crop and continuing dense vegetation.

1935 - 1951

During the earlier part of this period it was necessary on account of arrears of weeding and general maintenance work to defer planting at certain units, this being the case at Fermyn in 1937 and at Fineshade in 1938 and 1939. Depletion of staff during the war years seriously affected the rate at which re-afforestation proceeded and at all units plantations suffered through lack of labour to carry out essential maintenance work.

It was generally appreciated from 1936 onwards that ash and ash/conifer mixtures were not suited to the heavy clay soils and only very limited small scale plantings with ash were carried out on selected sites. Ash planting took place at Hazelborough in 1937 and 1938 and again in 1944, and at Fineshade in 1937 and 1938 ash coppice (5 years old) was accepted as a crop.

Conifer planting during this period was confined mainly to areas of heavy vegetation growth especially at units where serious arrears of weeding existed. Planting, however, was on a limited scale and confined to Hazelborough, Yardley and Fermyn, and to a lesser extent at Bedford Purlieus. The use of conifers on such sites as mentioned above is now considered to be avoiding the issue and definitely bad silviculturally, since the areas in question are primarily oak sites and should be used for this crop. The main plantings from 1936 onwards were designed to produce oak as the final crop and were, on the whole, confined to the "strip method" or to oak in mixture with Norway spruce (either intimate or in strips) and to a small extent with Scots pine or to pure plantings of oak on a limited scale.

"Strip method"

At Hazelborough the practice was to plant or sow oak in $\frac{1}{2}$ chain strips without conifer nurses, leaving 12 ft. belts unplanted (coppice regrowth in the belts was accepted in place of a nurse crop) spacing in the planted strip being $4\frac{1}{2}$ ft. x 2 ft. Oak was regenerated in this manner from 1936 - 1943 when the whole block had been replanted.

Growth in the above plantations was slow and intermittent. Weeding of strong coppice regrowth was generally necessary for a period of five years following planting before the oak could be regarded as established. Up to 1945 the war fellings at Hazelborough were replanted by the above method but from 1945 onwards solid replanting took place. The early plantings (P.44 and 45) are now all out of the weeding stage.

At Yardley from 1936-1940 oak was planted in $\frac{1}{2}$-chain strips at 5 ft. x $2\frac{1}{2}$ ft. spacing and intervening 12 ft. unplanted strips were left between the $\frac{1}{2}$-chain strips(coppice was allowed to develop in the unplanted strips). Dense growth of Calamagrostis and Aira entailed heavy periodic weedings over a six to seven year period after planting.

Felled woodland at Bedford Purlieus was replanted with oak in 1935 in 12 ft. strips at 3 ft. x 3 ft. spacing, leaving narrower strips of unplanted

ground between. The 12 ft. strips have proved to be too narrow and constant brushing up of the encroaching maple, aspen and ash coppice has been, and still is, necessary.

Subsequent replantings with oak at the above unit were confined to ½-chain strips with 12 ft. unplanted belts between the strips. In general the Bedford Purlieus area suffered from lack of attention to weeding and cleanings were neglected, particularly during the war years. Most of the earlier plantings are now well established but the later plantings (1940 onwards) are only now coming out of a dense growth of thorn, briar and coppice and many failed patches are evident.

The strip method was employed at Fermyn in 1947 and 1948. No beneficial effect is noticeable from the coppice regrowth in the unplanted belts and the oak are only now showing in patches above the dense growth of Calamagrostis.

In general the strip planting of oak (e.g. Yardley, Hazelborough, Fermyn and Bedford Purlieus) was employed in order to obtain (a) shelter from the coppice growth and a possible nursing effect on the oak and (b) a reduction in the oak area to be weeded. No pronounced success has been achieved, weeding costs are still high and the oak does not appear to have achieved any marked benefit from the coppice strips which in turn require attention after the establishment of the oak in order to prevent the adjacent rows of oak from being suppressed.

Oak/Norway spruce Mixtures

During the period 1942-45 Norway spruce was planted in mixture with the oak instead of leaving 12 ft. unplanted strips for coppice regrowth, i.e. strips of oak alternating with strips of Norway spruce.

At Fermyn 6 rows of oak alternated with 3 rows of Norway spruce.

The replanting of the war fellings of oak high forest blocks at Salcey was done with oak/Norway spruce mixtures, six rows of oak alternating with 3 rows of Norway spruce, while at Yardley the Norway spruce was planted in 12 ft. belts at ½-chain intervals.

This planting of Norway spruce was justified in view of the flourishing trade in Christmas trees of all sizes.

The principle behind the technique was that the outer rows of spruce would be removed at an early date leaving the centre row of spruce to go

up for a time with the oak crop until the outer rows of oak closed canopy; in general this procedure has been followed.

It has been found, however, that in the dense Calamagrostis growth which follows felling, it is necessary to clean weed the spruce annually until such a time as a well furnished 3 ft. to 5 ft. tree is obtained. Non-weeding results in the lower branches being killed off and renders the trees useless or greatly reduced in value as Christmas trees. The need for the above full weeding was not appreciated initially and most trees in the heavy grass areas will have to be kept for several years longer than should have been necessary. Again, in many cases, the growth of the Norway spruce in recent years has been so vigorous that many of the trees are too open in habit for Christmas trees. The spruce trees are well ahead of the oak and, provided they are not allowed to get out of hand, a beneficial nursing effect should be afforded to the oak coupled with suppression of weed growth. In order that the oak should receive the full benefit from the clean annual weeding, which is entirely justified in view of the financial return received in recent years (total receipts from sale of Christmas trees from a 6-year old plantation at Salcey covered the cost of establishment and weeding to date for the plantation) it was decided in 1949 and 1950 at Hazelborough and Yardley to plant the oak/Norway spruce in alternate rows, or in alternating double rows of each species.

This practice of alternate rows of Norway spruce/oak reverts back to that used in Fineshade in 1929-32 on cut over coppice and on bare ground at Apethorpe, Fermyn and Hazelborough 1927-33. The results from these early plantings have been excellent but the Norway spruce in all cases were retained too long and the high early financial returns from sale of the spruce as Christmas trees were not obtained.

Rates of growth of different crops are given in Appendix III.

General observations on Drainage, Weeding and Cleanings, Underplanting and Thinning

Drainage

Drainage is of prime importance on the wet heavy clay land encountered at Yardley, Salcey and Fermyn and, to a lesser degree, at Hazelborough.

On the old Crown Lands the importance of drainage was well appreciated and a good system of drains was laid out. Large scale clearance of timber

such as occurred over most areas but with particular reference to Yardley and Salcey led to complete blocking of the existing drains and this, in turn, gave rise to a high water table and subsequent ground stagnation. Intensive drainage of such areas was necessary prior to planting.

Care has to be taken to ensure that the drains are properly levelled; this applies particularly to relatively flat ground where long drains with little fall are common.

In the heavy clay the drains retain their actual shape for a long period but the dense annual growth of grasses coupled with the re-coppicing of thorn, maple, Viburnum spp., etc., makes maintenance very necessary.

Fence lines also require constant inspection to ensure that they are not weakened by the overgrowth of bramble and coppice.

Weeding

Weeding conditions are similar on all areas but the heaviest weed growth occurs on the flatter sites such as at Yardley and Salcey where drainage is difficult and a high water table results. Calamagrostis epigeios, Aira caespitosa, meadow sweet and Carex spp., grow profusely on felled areas and soon produce a dense mat.

Bracken with some Holcus occurs on the lighter soils. Bramble, briars, blackthorn, field maple, Rhamnus and Viburnam spp., ash, willow, hazel and alder coppice, soon invade the areas in varying proportions.

The initial policy in respect of oak weeding was that only one weeding was necessary but in many areas no weeding was carried out because of a shortage of labour.

About 1933 the weeding of oak was discontinued. It was thought at that time the plants would come through the grass unaided. This policy resulted in heavy losses in the dense Aira caespitosa areas and, consequently, no beating up was possible since the areas could not be assessed without first weeding them.

Similarly in coppice areas losses were suffered through lack of weeding and it became apparent that intense weeding was essential from the time of planting until the oak crop was established.

In F.Y.37 at Fermyn, planting was postponed in order to permit arrears of maintenance work (mainly weeding and cleaning) to be undertaken

and this was also the case at Fineshade in F.Y's 38 and 39. In the colder, heavier soils of Salcey and Yardley where tree growth is slower it is necessary to clean weed the grass and to cut the coppice flush with the ground annually. This annual weeding is generally necessary for a period of eight years, by which time the oak is established and capable of competing with the thorn, etc.

On the lighter soils, such as occur at Hazelborough, annual weeding is usually necessary for a four to five year period before the crop becomes established.

The period of non-weeding in the heavy grass areas led to stagnation conditions in which the oak became weak and spindly and were unable to 'stand-up' when eventually weeded.

Blackthorn formed an impenetrable mass in the early years of little weeding but even under these conditions the oak managed to come through and have since developed into fair crops (Salcey and Hazelborough). It has been noticed, particularly at Salcey, that, where thorn invades the area, tree growth is generally better and this may indicate that the presence of thorn is associated with improved soil conditions (possibly moisture and aeration).

Coppice weeding in the early conifer plantings was badly neglected because of the belief that Norway spruce and Douglas fir were capable of competing with the coppice; this entailed heavy beating up and even in some cases to acceptance of the coppice which suppressed the conifers (Fineshade and Apethorpe).

Cleanings were also neglected in the earlier plantings, and during the war period, with the result that much damage occurred to both conifers and mixtures by suppression and whipping caused by rank coppice growth.

In general intensive cleaning of oak is not necessary once the crop is established, in fact, the oak at this stage is quite capable of competing with coppice regrowth and appears to benefit from slight competition. Periodic cleanings, however, are necessary even after the establishment stage is reached but these can be so regulated as to provide saleable material (pea and beanstick, hedge stakes and binders), returns from which can be offset against the cost of cleaning.

Underplanting

Underplanting has been practiced on a very limited scale and the results are very variable but, in general, underplanting with beech has been carried out at too early a stage in the development of the overwood.

Exceptions to the above are the underplantings of the 1820 oak at Salcey and Hazelborough with beech in 1914; these delayed underplantings have not resulted in any improvement in the overwood and have only produced clean forest floor conditions.

At Hazelborough in 1914 beech was introduced under a 1905 oak/European larch mixture and by 1929 the beech was topping the oak and had to be removed. This same crop was again underplanted with beech in 1941 after removal of the European larch as pitwood and the results obtained are promising. The underplanting of 1901 ash at Salcey with beech in 1940 has yielded a promising crop of vigorous beech and similar underplantings of coppice ash with beech at Fermyn (1940) and Apethorpe (1930) have been successful.

Thinning

The thinning of hardwoods has usually been on a 5-year basis and the policy has been to favour the oak as the final crop except where good ash occurred.

In general, tardy and inadequate attention was given to the oak/conifer mixtures in the early stages of development and in many cases the nurse crop topped the oak and had to be retained (this applies mainly in the case of mixtures of oak and European larch and oak and Scots pine and to a lesser degree in oak/and Norway spruce.) The work carried out at each unit is given below:-

Hazelborough

The bulk of the early thinnings in the Northampton group of forests was confined to this unit, mainly in acquired plantations, but, in recent years, thinning in plantations formed by the Forestry Commission has taken place.

Tardy and inadequate attention was given in the early years to the oak/European larch crops and in many cases the European larch topped the oak. Heavy thinnings occurred in 1940 when the European larch was removed wholesale and this caused many of the oak to flop over and a gappy crop has resulted.

In the P.05 oak/European larch, Norway spruce acquired plantations early frequent thinnings (heavy in the war years) of the conifers took place, and these have yielded for the most part an excellent oak crop with straight vigorous stems up to 30 ft., well cleaned by the conifers but, in other plantations insufficient oak are present and a mixed crop will have to be retained.

Thinning increased during the war years, particular attention being paid to the oak/conifer mixtures and to the natural oak areas in the Brackley Hatch section of the forest.

In recent years the 1928 oak/Norway spruce mixture has been thinned heavily and practically all the Norway spruce have been removed. An excellent oak crop over most of the area is now present but the Norway spruce could have been removed at a much earlier stage and yielded a higher financial return as Christmas trees.

The annual thinning programme for this unit is now 100 acres.

During the war years 245 acres of high forest were felled; this area has now been replanted.

Most of the produce resulting from thinnings finds a ready market in the nearby village of Silverstone where 14 timber firms are established.

Yardley

Thinnings at this unit have been mainly confined to the acquired plantations of poplar and mixtures.

Due to the slow growth resulting mainly from lack of attention in the initial stages of development of the crops, produce is small and only suitable for fence stakes and firewood.

The acquired poplar plantations are promising. Approximately 30 acres are thinned annually at this unit, and the thinnings are generally sold standing.

Salcey

Thinning was commenced about 1932 in the 1901 ash and continued thereafter at intervals of five years in the early mixtures of oak and ash. A regular system of thinning is now laid down with an annual average of 20 acres; thinnings are sold standing whenever possible.

Produce to date is small and is used locally for posts, rails, stakes and firewood.

Fineshade and Fermyn

Thinnings have only begun within the last few years and have primarily been concerned with the removal of conifer nurses in the oak mixtures.

At Fermyn the removal of the Scots pine was overdue, with the result that in parts it is not now possible to remove the pine completely and a mixed crop will have to be accepted for several years. The tardy removal of the pine has produced a somewhat whippy crop due to partial crown suppression of the oak.

Although thinnings in oak/Norway spruce plantations have been unduly delayed, relatively little damage has been done to the oak by the spruce. The complete removal of the spruce has been carried out in the first mixed plantings at Fermyn and an excellent oak crop is present.

Advanced portions of the European larch/ash mixtures have been thinned at Fineshade and have mainly resulted in the removal of the ash.

Thinning of the hardwood belts in the early oak strip plantings at Fermyn is now being undertaken by a contractor.

Apethorpe

In 1943 thinning of the first Norway spruce/Scots pine/ash and the European larch/oak mixtures was carried out, and the 1922 Douglas fir was also thinned at this time.

Within recent years the oak sowings and plantings have reached the thinning stage and portions of the 1921, 1923 and 1924 areas have been thinned and dewolfed.

Delay in thinning the 1927 oak/Norway spruce mixture has resulted in the complete suppression of the oak in patches so that the Norway spruce will have to be accepted. Progressive removal of the spruce where possible is now taking place. Thinnings at this unit have in the main been carried out by Commission staff, the produce being sold in the length at rideside.

NURSERIES

The nursery area has been very limited, mainly due to the absence of suitable soils. Initially 5 acres at Fermyn, 3 acres at Apethorpe and 3 acres at Hazelborough were laid down.

Although many good stocks of plants were obtained, the heavy ground and associated difficult working conditions and high costs led to the

closure of the nurseries at Apethorpe and Fermyn in 1948 and 1949 respectively.

Notes on the main species

Broadleaved species

Oak

In general the heavy clay soils on which the forests are situated are suitable for the growth of oak and results obtained with this species have been on the whole satisfactory except in places where soil conditions have mitigated against tree growth. (Old arable land at Apethorpe and Fermyn).

Ash

This species was initially planted on a large scale on woodland and old arable land and the results in general have been uniformly unsatisfactory. On the old woodland sites, small plants were used in the initial plantings with disastrous results but the crops obtained by replanting with large plants are very poor.

Ash/European larch mixtures on old arable land are unsatisfactory. On the poorest land European larch fails at the start and ash gains the ascendency and poor crops result. On the better sites European larch suppresses the ash from an early age and a poor larch crop is obtained.

Although ash (coppice and maidens) occur on most felled and devastated woodlands on the heavy clay soils, their presence is no indication as to the suitability of the soil for this species and only in isolated cases has satisfactory ash been obtained, such as at Salcey mainly along drain sides and small areas of better drainage.

Future plantings of ash should be very limited and confined to small groups on selected sites.

Beech

Beech has shown good growth on the heavy clays in the initial stages and 30-year old beech at Salcey in mixture with oak is still vigorous.

The grey squirrel population is a factor mitigating against beech and, unless this pest can be controlled, there appears to be little future for this species apart from underplanting for soil protection and improvement.

The introduction of beech under oak and ash crops where underplanting is desirable requires careful consideration before it is carried out, since

numerous examples exist where the beech have been introduced too early and premature removal or topping of the beech have been necessary in the interests of the overwood.

Poplar

This species has given very poor results due, in part, to lack of attention in the initial stages (Fineshade) and competition from coppice which is an ever present feature of these plantations (Yardley).

Factors against the use of poplar on areas of intense coppice growth are, firstly, the difficulty of maintenance (weeding, cleaning and pruning) and, secondly, the failure of the poplar crop to kill out the coppice and undergrowth and thus leave the ground in a clean state for the next crop.

Ground of the type indicated above is better suited to the production of oak timber under the oak/Norway spruce system.

Conifers

Norway spruce

When established, Norway spruce has shown very fast growth and is still growing well at 40 ft. (Hazelborough) but the main use of this species is a nurse for oak and in this respect it is the most suitable of all the conifers.

Sitka spruce

This species is entirely unsuited to the Northampton areas, largely on account of inadequate rainfall.

Scots pine

Scots pine grows extremely rapidly on the heavy clay soils and rough open crowned crops result, which do not suppress the weed growth effectively.

On account of its rapid growth and coarse quality, Scots pine is of no value as a nurse to oak; where it has been used as a nurse to oak, it has either suppressed the oak or drawn it up too much, or alternatively, the pine have required cutting before reaching suitable marketable sizes.

Corsican pine

On the lighter and more friable soils this species grows exceedingly well, but its use on the heavy clay with its associated intense weed competition is not recommended owing to the difficulties of establishment under such conditions.

Douglas fir

This species has grown moderately well but requires careful attention in the early stages of development, especially in areas of intense coppice regrowth.

European and Japanese larch

The larches grow moderately well where drainage is adequate but on the whole these species have produced unsatisfactory crops. As a nurse to oak and ash both larches have proved most unsatisfactory.

Thuya

This species has been used only on a very limited scale but initial growth is good and, further, it gives promise of having suitable nursing qualities for oak, should an alternative nurse to Norway spruce be required.

RESEARCH - Notes by Research Branch

The experimental work for these areas lies mainly in two forests - Rockingham and Yardley Chase.

There were some thirty-five experiments in all, the majority of which were carried out between 1929 and 1938. In addition there were some sample plots at Salcey and Apethorpe.

As to distribution - nineteen experiments were in the old Drayton area, two at Fermyn (Harry's Park Section), three at Oundle Wood, two at Apethorpe and nine at Yardley Chase.

The following Table groups the experiments under convenient headings at the same time indicating the individual number and place of each.

Subject Groups	Rockingham Forest Planting Years													Yardley Chase Planting Years			
	1929	30	31	32	33	34	35	37	38	46	50	51	52	1932	35	37	37-52
Species trials				1(D)	4(D) 5(D)										6		
Nurse crops			1(F)		6(D) 7(D) 8(D) 9(D)									1 2			
Weeding			2(F)														
Age and Type		1(O)	3(O) 2(F)			10(D)											
Manuring			2(O) 1(F)			10(D)		14(D)	15(D)								
Planting Methods					2(D) 3(D) 4(D)												
Group Planting	1(A)	1(O)	2(O) 1(F)		8(D) 9(D)	10(D)											
Poplars											17(D)	18(D)	19(D)	3 4 5	7	8	9
Nursery extensions							11(D) 12(D) 13(D)										
Miscell-aneous	2(A)		2(O)			10(D)				16(D)							

NOTE:- (D) = Drayton; (A) = Apethorpe; (F) = Fermyn (O) = Oundle

SPECIES TRIALS

Excluding poplars, some twenty five species have been tried in the various experiments and the following Table gives some idea of their relative behaviour.

SPECIES	HEIGHT IN FEET AFTER 20 YEARS	REMARKS
Scots pine	24.0	Grows coarsely on these heavy soils. Suppresses vegetation fairly well but not so thoroughly as does Norway spruce.
Pinus contorta	20.5	Not so vigorous as Scots pine or so coarsely branched. Really surprisingly good, considering the heavy soil and low rainfall.
European larch	27.0	Grows very strongly after a slow start but the combination of frosts and drought make establishment difficult.
Japanese larch	20.0	Much poorer than European larch. Climate is too dry for this species.
Norway spruce	22.0	Slow to start but very dense and strong later. A very good species.
Omorika spruce	19.0	A very promising species though slightly slower than Norway spruce.
Thuya plicata	18.0	Another promising species on these soils. It is of narrow habit and might well be a good nurse for oak.
Cupressus lawsoniana	15.0	Very similar to Thuya but rather slower.
Cupressus nootkatensis	7.0	Too slow to be of economic value.
Tsuga heterophylla	13.0	Drought and frost make this species difficult to establish.
Oak	16.4	Very slow without a nurse. With Norway spruce, alder, or European larch nurses the height after 20 years is approximately 24 feet.
Ash	22.0	Has given very erratic results. On open grassland only averaged six feet after 20 years. The 22 ft. quoted refers to Oundle - an old woodland site.
Beech	-	Only introduced in P.45, but is growing well - average height in 1951 - 4 ft.
Hornbeam		Slow to start and heavy deaths due to frost, drought and heavy weed growth.
Nothofagus obliqua Nothofagus procera	- -	Introduced in P.38 but the combination or frost, drought and heavy weed competition was too much and both species gradually failed.
Alnus glutinosa	17.0	Has not lived up to its early promise. The poorest of the four species.
Alnus Oregona	24.0	The best of the alder tried
Alnus incana	20.0	More uneven than Oregona
Alnus cordata	20.0	Only one small plot but it appears stronger than incana or glutinosa.

SPECIES	HEIGHT IN FEET AFTER 20 YEARS	REMARKS
Rhamnus phyrshiana	9.5	Not suited to this site climate - very slow and of poor shape.
Sallow willow	18.0	Vigorous and makes a possible nurse on sites too heavy for pines and too frosty for most other species.
Juglans regia) Juglans nigra)	6.0	Frost drought and too much weed competition during the war years ruined these plants.
Pyrus intermedia	-	Introduced in P.36 and averages 12 ft. high in 1951. It is not good for suppressing the ground vegetation, its crown being too light.

Although oak is the species to be aimed at on these heavy soils it is very slow unless grown with a nurse crop.

Of the hardwoods other than oak, ash has been used most but with very erratic results and it can only safely be planted on a small scale on selected sites.

Hornbeam has been difficult to establish but grows quite well once it gets going.

Beech suffers from both frost and drought in the early stages, but once established grows quite strongly.

Both Alnus oregona and Alnus cordata are worth further trial.
We have no experience with sycamore, but it should not be overlooked.

Poplars are dealt with separately in a later section of this report.
Pines grow coarsely on these heavy clays and are not usually to be recommended.
Owing to the low fainfall European larch usually does better than Japanese larch but on the stiffer clays and in areas subject to spring frosts neither species can be relied on.

Norway spruce grows very well after a rather slow start and is one of the best trees, especially as a nurse for oak. Picea omorika is most promising and deserves wider trial.

Both Thuya plicata and Lawsons cypress are decidedly good.

Nurse Crops

(a) Species used:

The nurse species of which we have some experimental evidence in the the heavy clay areas are Scots pine, European larch, Norway spruce, common alder and sallow or goat willow. All were employed to assist oak or ash.

Scots pine

On these sites Scots pine grows fast and develops a coarse habit. The crowns are unusually wide but not very dense and suppression of ground vegegation is not so fast or so complete as with spruces. It cannot be recommended as a good nurse for oak, being difficult and costly to manage and of small value when cut in its younger stages - as it usually has to be to prevent suppression of the oak.

European larch

On selected sites this species has given very good results and is a good nurse in many respects.

Unfortunately in many places the combination of frost and drought coupled with the heavy soil results in heavy failures and it would not be safe to use this species on a large scale.

Norway spruce

Considering all points this seems to be the best and most reliable nurse species for oak or ash on heavy soils. It is rather slow to start and, if to be used for Christmas trees, needs very thorough weeding in the early years but it grows well, gives excellent suppression of vegetation and does not require anything like the same amount of cutting back that is necessary with pines to prevent damage to the hardwood.

Common alder

It is unfortunate that common alder was the only one used in our early experiment here because it would appear that both Oregona and Cordata would have given better results.

However, any of the alders have the same tendency to grow too rapidly and coarsely in the early years resulting in difficult and rather expensive treatment becoming necessary in order to save the nursed hardwood from suppression - particularly if, as was the case in most of our experiments,

the spacing between the nurses and the nursed trees was rather close. There should be at least 5 ft. between the alder and the oak or ash, but this in turn means that the benefits of the mixture will not be effective so quickly.

On the whole, our evidence suggests that alders are worth further trial particularly on the wetter areas.

Sallow Willow

This species was disappointing in that although it took well, it developed a straggling habit and did not suppress many of the more vigorous herbs, grasses and briars. There seems no point in its further use.

Before leaving the subject of nurse species mention should be made of Thuya plicata and Lawson's cypress, both of which are of narrow habit and have grown well as pure plots in the experiments.

It seems likely that either would make excellent nurses for oak or ash and a small plot of Thuya/oak in the conservancy plantations at Rockingham is exceedingly promising with beautifully straight oak going up between the narrow crowned Thuya.

(b) Arrangement of nurse mixtures

There are very few comparisons possible between different arrangements of mixtures in our Northamptonshire experiments.

Most of the areas are either six foot square oak or ash groups spaced at approximately 20 ft. apart, in a matrix of nurse species or in a strip system with six rows of hardwood and three rows of conifers.

The one more intimate mixture of oak, alder and European larch in Yardley Experiment 1 P.32, was unhappily destroyed by fire in 1943 just when it was becoming really interesting.

In general although the group system may give the most even distribution of final crop trees it is more difficult and expensive to manage than strip planting. If, however, one is considering derelict woodland of the type where the object is to enrich an existing scattered stocking of seedlings or coppice trees then an adaptation of the group system making use of existing species may well be the best scheme. On the other hand, starting with a bare area, then a strip system is probably preferable or, if the Christmas tree market is to be specially considered, a very intimate mixture

such as line by line with Norway spruce would be feasible.

It should be borne in mind, however, that single line mixtures are of little use if it is intended to try and retain at least some of the nurse crop into the later stages of the plantation; if that is required then there should be at least three rows of the nurse crop separating each hardwood strip.

(c) Effect of nurse crops on rate of growth

We have no experiments specifically designed to test this point but there is good evidence available from the different sections of Experiments 5, 7, 8 and 9 at Drayton.

Even allowing for the fact that oak of different origins were used in these plots there is obviously an improvement due to nursing.

Crop	Mean height (in feet) of oak		Remarks
	After 5 years	After 10 years	
Pure Oak	1.2	3.0	
Oak groups in alder matrix	2.0	6.0	Oak and nurse species planted simultaneously.
Oak groups in European larch matrix	2.0	5.75	
Oak groups in matrix of sallow with ash and hazel coppice	2.5	7.0	Oak introduced into a matrix already 7 ft. high.

Weeding

Experiment 2 1931 at Fermyn (Harry's Park) compares three grades of weeding oak in two separate sections - one planted seedlings and the other a direct sowing. Unfortunately there are only two replications in each section and changes in vegetation type, from pure Calamagrostis grass through briars and brambles and on to birch scrub and dense aspen thickets, necessitate caution in making any deductions from results.

The three original treatments were no weeding, light weeding, and full weeding but in 1939 it was decided to split the no weeding plots, leaving only one third of each not weeded and weeding the remaining sections sufficiently to at least relieve the oak crowns.

The results of this experiment may be summarised as follows:

1. Where the vegetation was heavy birch scrub, dense aspen thicket, dense blackthorn or thick Calamagrostis the no weeding policy resulted in partial failure of the oak but where there was a grass-herb type or a medium sized mixed scrub of thorn, briar, bramble, sallow, etc., sufficient oak got through to provide an adequate choice of stems for a good final crop.

2. The lightly weeded units are little better than the unweeded plots in the Calamagrostis areas but in the heavier vegetation this treatment has saved a good many plants and resulted in a more even stocking.

3. The full weeding has, of course, given the best results as regards good uniform stocking but mean height is rather less than in some of the unweeded and lightly weeded plots and, although the experiment was not actually costed, it would be safe to say that the heavy cost of the full weeding, over so many years, has not been justified.

4. The units that were weeded in 1939, but not previously, have responded well and are very much better now, in 1952, than those sections that have never been weeded.

Age and type of plant

As in all our old experiments this question is confused by the use of plants of different origins.

Ash

In Oundle Experiment 1, 1930 and Experiment 3, P.31 several ages and types of ash plants have been compared with the following results:

1. Transplants gave far better results than 1 + 0 seedlings but no better than good 2 + 0 seedlings.

2. 2 + 2, 1 + 2 and 2 + 1 plants gave very similar results and older plants than these showed no advantage. There were no 1 + 1 plants of the same date of planting but trees of this age planted six years later did very well.

Oak

We have no direct evidence on age and type of oak in our Northamptonshire experiments but a few points are worthy of mention.

Very good results were obtained both at Fermyn (Harry's Park area) and at Apethorpe from direct sowings though at the latter area strong 1 + 0's gave an even better crop.

In the few cases where we have used oak transplants here they have given no better results than good 1 + 0 seedlings although this has not always been the case in other parts of the country.

Manuring

Very little work has been carried out under this heading as the soils of the area are, on the whole, fairly fertile.

Iron sulphate was tried in two experiments (Fermyn No.1 and Drayton No.10) to see whether its coagulating effect on clay particles would be beneficial but it did not show any marked result in either case.

Basic slag gave a negative result when applied to oak and only a slightly beneficial effect with ash. An I.C.I. balanced fertilizer gave a good early result with ash but the effect only lasted about three years and was not cumulative. Oregon alder did not respond to either ground mineral phosphate or superphosphate.

In Experiment 14, at Drayton, ash responded to an application of ammonium sulphate but it is interesting to note that removal of the competing grass sward produced a larger response than did the manure and in any case the improvement due to the fertilizers was short-lived (2 - 3 years).

Planting methods

In Experiment 4 at Drayton we have a comparison of two planting methods (a) Proper pit planting with pre-prepared pits allowing for some weathering of the out-turned soil as against (b) mattock planting into patches in which the soil was stirred with the mattock immediately befofe planting.

On survival the pit-planting gave worth-while benefit to oak, European larch, alder, Picea omorika, Norway spruce and goat willow, but the mattock planting was almost as good or in some cases rather better for pines, Lawson's cypress, Thuya and Japanese larch.

If, however, we take subsequent growth rather than survival, then the position is different and the pit planted shows up best in the case of European larch, Japanese larch, pines, Lawson's cypress and alder.

There is no doubt that in a case like this most weight should be given to actual survival or very patchy and expensive plantations will result.

Experiments on 'stump-planting' of both oak and alder showed that no benefit was gained by the special treatment and that losses were actually heavier than with normal stock.

Group planting

We have seven experiments in these areas that have been planted or sown by the group method - five dealing with oak and two with ash.

All are set out in small groups, usually 6 - 7 ft. square, spaced at from 16 to 21 ft. apart, centre to centre and having from 16 to 40 plants per group.

In several cases there are strip plantings of the same species adjoining which give us a fair, though not statistical, comparison.

It is, of course, too early to forecast how the crops will compare in their later stages but we can say that after twenty years there is no great difference in the form or height of the trees as between strips and groups.

In one or two cases the groups have resulted in a slight increase in height and they are undoubtedly rather more sheltered than the strips.

The main disadvantage of the groups is the cost of weeding and cutting back side growth from around them; this expense is much less in the case of strips.

Some sort of group system may be used with advantage to enrich derelict woodlands in cases where there are a reasonable number of acceptable stems scattered irregularly over an area.

Poplars

Most of the early poplar experiments were at Yardley and concerned age and type of plant and different planting methods.

Results were very conflicting and unsatisfactory because the work was not carried on long enough to cover seasonal variations.

The only definite point that emerged was that on these heavy clay soils some form of mound planting is preferable to notching or pit planting.

It may also be noted that sets planted at Yardley in 1937 grew just as well as rooted plants.

Yardley Poplar Garden

This is a trial of varieties started in 1937, with planting continued each year until 1946 when 73 plots had been laid down. Subsequently as a result of some varieties having failed, several plots have been replanted - mainly during P.50 and P.51 - with new varieties introduced into this country since the early plantings. The remaining plots, abandoned during the last two or three years, will be replanted with other varieties.

Initially, it was intended that a plot should contain 36 trees. However, it has only been possible to beat-up fully the later plantings and many of the older plots are not fully stocked.

Altogether thirty varieties are under trial, of which over half were introduced into the Garden during the three years from 1936 to 1939. Only the older plantings are as yet informative and although seasonal growth is variable and relatively limited, variations in height growth between a number of varieties are becoming more noticeable. It is interesting to note that the clones with mean plot heights of 25 ft. and over - as assessed at the end of the 1951 growing season - all are black hybrids. The mean heights, of clones planted 1937 - 39 and now over 20 ft. are given below:

	Group	Mean Plot Height in Feet
x P. carrieri	Black Hybrid	28.5
x P. rubra poiret	" "	28.4
x P. laevigata	" "	26.3
x P. robusta P.H.	" "	25.6
x P. regenerata	" "	25.0
P. canescens	Grey	24.2
x P. berolinensis	Black and Balsam	23.8
x P. marilandica F	Black Hybrid	23.7
x P. robusta A.E.	" "	23.4

Of the first five, only x P. carrieri is known to be susceptible to bacterial canker attacks under normal plantation conditions.

Because of the lengthy establishment period required on this site - recognised as a poor one for poplars - none of the later plantings are yet very useful guides of the potentialities of the introduced Italian selections which were planted between 1941 and 1944. Of the eight Italian selected clones in the Garden, P.65A and P.30A are doing rather better than the others whilst P.B.L. has been scrapped altogether.

The varieties introduced since 1950 are :-

P. tremula x tremuloides - P.50

P. alba x tremula - P.50

P. trichocarpa C.F. - P.50

P. deltoides missouriensis - P.50

P. O.P.63 - P.50

P. O.P.60 - P.50

P. robusta H - P.52

but it is too early to say which of these are likely to succeed.

Mulching of Checked Poplar

A small but very interesting experiment (No.7 at Yardley) was started in 1937 but had to be abandoned in 1941 because the ground was taken over by the War Department.

Heavy mulching with dense Calamagrostis vegetation was applied to poplars in check six years after planting.

The effect was remarkable; not only was the shoot growth greatly increased but both the leaf size and the crown volume of the mulched trees were far greater than in the case of the controls.

The assessment of October 1939 gives an idea of the improvement by mulching and it is a great pity that no further measurements could be obtained.

		1937 (before treatment)	1939 (after three years mulching)
Control trees	Mean height	70.0"	75.0"
	Mean shoot	2.0"	4.0"
Mulched trees	Mean height	70.0"	98.0"
	Mean shoot	2.0"	15.0"

Poplars from Kew

In 1932 a small trial was made at Yardley of five varieties of poplar supplied from Kew Gardens as follows:

P. marilandica

P. nigra var. thevestina

P. nigra var. viadrii

P. serotina var. erecta

P. 672 Purdom

Of these P. serotina var. erecta was much the best and in twenty years reached a mean height of about 37 ft. and was of good form and quite free from canker.

The height would probably have been considerably better had it not been for competing vegetation during the war years.

New Poplar Work

New poplar experiments have been established at Drayton during the last three years dealing with age and type of plant, manuring, mulching and varietal trials but it is too early yet to comment on the results.

Poplars (general)

Before leaving the subject of poplars it is interesting to observe how at Yardley Poplar Garden, the establishment of newly planted trees became more and more difficult as the dense vegetation increased each year after the initial complete clearance of the ground. It is obvious that poplar is a species that is very susceptible to heavy competition from surrounding vegetation for the first few years after planting.

Nursery extensions

There have been only three nursery extension experiments in these areas and none of them gave any significant results.

The first dealt with 2 + 2 ash transplants from various nursery manurial treatments; the second, 1 + 2 oak from similar treatments and the third 1 + 2 oak from lining out ground treated with a heavy dressing of humus.

It is our general experience that most nursery extension experiments give no useful differences after a year or two in the forest.

Miscellaneous

Side Shelter

A small experiment was laid down at Apethorpe testing the effect of ordinary earthenware drain pipes as shelter for newly planted oak compared with hurdle shelters.

The pipes were unsuccessful because if long enough to afford shelter for any length of time the plants became drawn up and many died out.

The hurdles were good giving both increased height growth and a ten per cent decrease in deaths. Though impracticable on a large scale they served their purpose as a demonstration.

Trial of Lupins as a Nurse and Soil Improver for Ash

The lupin crop germinated well and with artificial manuring came up so densely that many of the young ash plants were smothered but the survivors showed slightly increased height growth for the first three years.

The difference was not large enough to justify the expense of the lupin sowing and in any case after ten years all units showed almost identical growth.

Effect of Iron Sulphate on the Growth of Oak

This chemical gave no marked result and is dealt with in the section on manuring.

Effect of Application of Oak Leaf Mould at the Time of Planting Oak.

Experiment 16 in the Drayton area was carried out in 1946 and compared various methods of applying leaf mould to oak at the time of planting. On this particular soil, which is one of the better types of the district, the leaf mould gave no useful result but with beech on a fairly shallow soil over chalk at Buriton Forest a marked improvement resulted from incorporating the leaf mould in the soil - both as regards height growth and survival.

SUMMARY

Species trials

Oak is the species best suited to these heavy clay soils and it can be successfully raised by means of suitable nurse crops.

Without a nurse crop it is very slow in the early stages and in any case there seems little point in not taking the economic advantage of the early returns obtained when the nurses are removed.

Beech suffers from both frost and drought in its early years but once established it grows well - it may be that its main use will be the under-planting of oak crops.

Ash has given erratic results and should only be planted on carefully selected sites.

European larch is better than Japanese larch, probably because of the low rainfall, but neither can be relied on for large scale work. On the better drained, less frosty sites, European larch should not be neglected.

Norway spruce though rather slow to start grows well and is one of the best species.

Picea omorika is also very promising.

Thuya plicata is a promising species and Lawson's cypress is also worth further trial.

Pines grow very vigorously but tend to be coarse branched with rough open crowns. In general the soil is too good to justify pine crops.

Poplar - of limited use on these heavy clay soils but will grow to large dimensions on selected sites.

Nurse Crops

Norway spruce appears to be the best nurse for oak, but Thuya plicata, Picea omorika and Lawson's cypress are all very promising.

On selected sites European larch should not be neglected and on wetter sites Alnus cordata or Alnus oregona are worth further trial.

As regards method of arranging mixtures for nursing - results are rather conflicting but the following points may be considered.

1. Groups are more expensive to maintain and weed than are strips but some form of group system may well be the best method of treating much of our derelict woodland areas.

2. If the Christmas tree market is being studied, then an intimate line by line Norway spruce - oak mixture gives very good results; but in such a mixture it will not be possible to retain any of the spruce for very many years.

Weeding

Experiments showed that the degree of weeding necessary for oak depends on the vegetation type on the site in question.

On most of the heavy clay areas the vegegation is very dense and vigorous and thorough weeding in the early years is essential. Calamagrostis areas are fatal if not well weeded.

Where, however, a medium grass herb type or rather light scrub type occurs, then quite light weeding is sufficient and considerable expense may be saved.

Age and Type of Plant

For oak strong 1 + 0's or 2 + 0's have given excellent results. Direct sowings have sometimes been very successful but are rendered doubtful by exceptional vermin attacks and by drought seasons.

In the case of ash, either transplants or strong 2 + 0's have given the best results.

For conifers strong 1 + 1's or 2 + 1's have usually been used.

Manuring

Generally manuring is not necessary on these soils.

Planting methods

Good pit planting is very successful but also very expensive. On these heavy soils the great point is to avoid any form of notching that leaves an ill-joined slit that will open out during the spring and early summer droughts. Good firming is essential and ordinary spades usually better than Schlich spades.

Group Planting

See remarks under Nurse Crop.

Poplars

The best varieties so far are P. carrieri, P. rubra-poir, P. laevigata, P. robusta, P. regenerata, and P. canescens, but it is likely that some of the newer varieties recently planted, may give better results.

Of the six mentioned above, all but carrieri are thought to be canker free.

On these heavy soils mound planting has proved to be the best method.

It is obvious that poplars are very sensitive to any heavy grass competition and killing the grass by mulching gave excellent results.

The planting of unrooted sets is worth further trial.

Miscellaneous

Hurdle side shelter improved the growth of oak.

Iron sulphate applied to coagulate the clay particles produced no beneficial effect on oak.

Oak Sample Plot No. E.119 Salcey Forest

In 1934 one sample plot was established in Compartment 14, Salcey forest. The site is 400 ft. above sea level on a very gentle slope with a slight north easterly aspect. The plot is moderately sheltered. The soil is a clay-loam and contains many flints. There is a covering of 1 inch of semi-decomposed leaf litter over 9 in. of dark brown loam. The soil gets progressively more and more clayey and lighter in colour with depth and chalk fragments are found in the lower layers of the pit. Roots descend to about 21 in.

Before the sample plot could be established, a dense undergrowth of thorn and hazel had to be removed. A few selected hazel were left for soil cover, there were also a number of beech in the crop but most of these were removed in the first thinning as they overtopped the oak by five or six feet. On establishment of the sample plot the stocking was fairly dense, distribution was regular and the canopy almost complete. The crowns of the oak were well shaped and the branching was light to medium, but there were a few stems scattered throughout the plot, which had evidently grown from coppice shoots, on which the branches were coarse and heavy. Dead branches were persistent and were rotting back into the stem. Many were infected with Stereum spadiceum.

One hundred trees were selected throughout the plot. Of these 50 were pruned to a height of about 17 ft. and 50 were left untouched. These trees were to be examined at future measurements to ascertain :-

a. The progress of occlusion,

b. The presence of Stereum spadiceum,

c. The girth increment of the pruned trees and the unpruned trees.

In 1937 when the plot received its second measurement and thinning; no infection of Stereum was recorded. The occlusion of the branch wounds had been very rapid and it was reported then that the wounds should be completely occluded in a further two years time. The difference in basal area increment between the pruned and unpruned trees was found to be negligible. There were numerous epicormic shoots on the pruned trees and these were brashed off. In 1940 the occlusion of the wounds was complete. No fresh Stereum was reported but there was much Jew's Ear fungus Hirneola auricula - Judae, on the old branches left from the previous thinnings. Epicormic shoots

were still present on many of the smaller trees but there was no recurrence on the larger stems. The crop received further thinnings in 1944 and 1949.

The crop has been thinned throughout to a light crown (L.C.) grade. The height of the largest trees was 28 ft. and the crop was 25 years old when it received its first thinning in 1934. In the five thinnings it has received so far the crop has been reduced from 1373 stems per acre to 582. The height growth has been very slow, the top height of the crop having only increased by $5\frac{1}{2}$ ft. in 16 years, and it is now Quality Class IV (40 ft. at 50 years. Provisional Yield Table for Oak 1952.) The following table shows the measurements of the standing crop in 1949 and the yield to date.

RECORD OF MEASUREMENTS PER ACRE

Age of Crop	MAIN CROP							TOTAL YIELD FROM THINNINGS Since 1934			TOTAL CROP YIELD TO DATE		C. A. I.
	No. of trees per ac. after thinning	Height		Form Factor	True Girth at 4'3"	Basal area per ac. after thinning Q. G.	Vol. per ac. (U. B.) Q. G.	Number of trees	Basal area per ac. Q. G.	Vol. per ac. (U. B.)	B. A. Q. G.	Vol. (U. B.) Q. G.	Vol. (U. B.) Q. G.
		Av. of 100 largest trees	Av. of Crop										
yrs		ft.	ft.		ins.	sq. ft.	cu. ft.		sq. ft.	cu. ft.	sq. ft.	cu. ft	cu. ft.
													(6 yrs)
41	582	33½	31	.371	15	56.9	646	791	43.4	357	100.3	1003	38

Sample Plots E.249 Oak and E.250 Ash at Apethorpe Forest, Northamptonshire

These two sample plots occur on very good sheltered sites in Apethorpe Forest. The soil in both cases is derived from Oolitic limestone of the Jurassic system and consists of a good deep clay-loam, utilised for many years as farmland. The rainfall is approximately 22in. and is distributed throughout every month of the year. Frosts are sometimes troublesome and may account for some of the forking which has occurred in the ash plot. Two sample plots have been established to provide data to be used towards the computation of yield tables and have been designated a C/D grade of thinning. This grade can best be described as a normal silvicultural thinning. The ground vegetation in both plots consists of a 50% - 75% covering of Rubus fruticosus, Thuidium tamariscinum, ash seedlings and other mosses and herbs.

Sample Plot E.249 Oak, Map reference 52/007928

This crop of oak occurs in Compartment 26, Apethorpe Forest. The plot lies at the bottom of a shallow dry valley and is sheltered both by the nature of the topography and by the surrounding woodlands. Coniferous trees were used as nurses to the oak and have now all been removed, so that the crop is practically pure, apart from a few natural ash intruders.

The oak received its first thinning 1949 when it was 29 years old and at a top height of 33 ft. The thinning aimed at removing most of the wolf trees and also the dead and moribund smaller tree classes. The crop was described after thinning as growing vigorously, with good stem and crown formation. The best trees were pruned to a height of 12 ft.

E.250 Ash, Map reference 52/000932

Compartment 8 of Apethorpe Forest contains this vigorous ash plot which is fully sheltered by the surrounding ash plantations. The crop was planted in 1923 with coniferous trees as nurses which have since all been removed. In 1949 the ash received its first thinning when the top height was 40 ft. and aged 27 years and was described later as being fully stocked, and containing evenly distributed dominant trees with good symmetrical crowns and straight stems. Many forked stems were removed in this thinning.

1949 measurement for sample plots E.249 and E.250 are given overleaf:

Plot No.	Species	Age	Main Crop					Thinnings			Total Crop	
			Number of Trees	Top Height	Girth at 4'3"	Basal Area	Volume U.B. Q.G.	Number of Trees	Basal Area	Volume U.B. Q.G.	Basal Area	Volume U.B. Q.G.
E.249	Oak	29	893	33	12	58.6	572	347	16.9	113	75.5	685
E.250	Ash	27	700	40	13½	56.4	758	150	11.4	136	67.8	894

D. Earl

March 1952

Mensuration Section

Conclusions

1) The heavy clay soils on which the Northampton group of forests are situated are primarily suited to oak production, and successful crops of this species can be obtained provided proper technique is employed.

2) Unsatisfactory growth of oak and other species on old arable agricultural land is considered to be due to the presence of an agricultural plough pan which impedes drainage, and also partly to lack of humus and the associated mycorrhizal activity in the soil.

3) Ground stagnation on felled woodland areas is primarily due to faulty drainage which in turn leads to a high water table and site deterioration.

4) Competition from strong weed growth and coppice regrowth is a factor which mitigates against tree growth, and if replanting of felled and devastated areas or afforestation of derelict agricultural land is to succeed, then, intense weeding in the initial stages of the crop is essential.

5) Failure to weed in the initial stages of development of crops has greatly prolonged the establishment period, and has also resulted in heavy failures and the associated high costs of beating up.

6) Invasion of the planting sites by bramble, briars and thorn (normally a slow process) usually denotes an improvement in soil conditions and consequently plantability conditions. The presence of this type of vegetation is considered to indicate a lower water table and improved soil moisture conditions. The vegetation successions on the heavy clay sites require to be worked out, since they have an important bearing on silvicultural technique.

7) Once oak is established, it can compete successfully with thorn, briars and coppice regrowth, and cleanings of crops in this stage of development can be overdone. The cleanings can be so regulated to provide saleable material (pea and bean sticks etc.) returns from which can be offset against the cost of the operation.

8) Ash and ash/conifer mixtures are unsuited to the heavy clay soils except in very limited sites of better drainage. The presence of ash (coppice or maidens) on felled and devastated areas is no indication as to the suitability of the sites for the growth of this species.

9) Poplar has given patchy results and growth is mostly poor. On the evidence available the planting of poplar on areas where there is strong competition from coppice etc. is a very uncertain venture.

10) Beech has shown remarkable growth on the heavy clays, but there is little future for this species in the Northampton forests unless adequate control of the grey squirrel can be achieved.

11) The underplanting of oak and ash with beech has usually been carried out at too early a stage in the development of the overwood. The exact stage at which the beech should be introduced has not been determined, but it must be introduced at a stage before intense ground vegetation invades the area.

12) The difficulties of re-afforestation associated with site deterioration and weed invasion following clearance of large areas of high forest at Salcey and Hazelborough, led to the introduction in 1914 of the "strip method" of planting oak, which has in the main been successful.

13) The "Group method" of planting oak in areas containing advanced coppice growth was first introduced at Hazelborough in 1920-21, and this technique was employed on other areas up to 1935. Fairly satisfactory results have been obtained, but the high costs of maintenance associated with the frequent "brushing-up" of the coppice is one of the main disadvantages of this system.

14) The introduction in 1934 of the "strip method" of planting oak in areas of advanced coppice growth, aimed at a reduction in the cost of establishment but this method has not been a pronounced success. The anticipated benefits to the oak from the coppice side shelter have not been achieved and weeding costs are still high. "Brushing-up" of the coppice strips, although not so frequent as that necessary in the "group system" still remains an expensive operation.

15) The method of alternate strips of oak and Norway spruce introduced in 1942 on felled and devastated areas, has not lowered the costs of establishment of the oak, and the benefits both immediate and ultimate from this system are not apparent. Benefits from this method were to have been a high financial return from the sale of the Norway spruce as Christmas trees and shelter to the oak from a percentage of the Norway spruce which would be retained as a nurse crop. Inadequate weeding has prevented the removal of the spruce as Christmas trees, and even if removal had been possible only the adjacent rows of oak would have benefitted.

16) Analysis of the results obtained from the P.28 to P.31 oak/Norway spruce alternate row and 2 row/1 row mixtures (Fineshade, Fermyn and Hazelborough) clearly indicates that even with the tardy removal of the spruce, excellent crops of oak have been obtained coupled with clean floor conditions and high financial returns from the tops of the Norway spruce thinnings sold as Christmas trees.
In view of the above it has recently been agreed that the best method to date of regenerating oak on cleared woodland areas and old agricultural ground is the alternate row mixture of oak/Norway spruce.

17) The intimate mixture of oak/Norway spruce has the following advantages, provided timely removal of the spruce is undertaken :-

(a) The oak receive maximum benefit from the clean weeding which is also essential in the production of fully furnished Christmas trees.

(b) Weeding of the oak is facilitated especially if Norway spruce are used in the oak rows as markers.

(c) Clean floor conditions are produced relatively more quickly and uniformly.

(d) 50% of the spruce can be removed at the more profitable Christmas tree size (3 ft.), and the remainder at 5 ft. or 6 ft. thereby yielding a high financial return to offset the initial cost of establishment. Where necessary the bottom whorl of spruce branches can be left to cover the ground, especially in areas where oak development is retarded, and where removal of the spruce would result in the re-invasion of weeds.

(e) The Norway spruce have a decided nursing effect on the oak, which later have a very healthy bright-coloured bark, and for the most part are markedly straight and vigorous.

18) Norway spruce is the most suitable of all the conifers as a nurse for oak, even at an advanced stage (15 ft.) the oak keeps well up with the spruce which does not interfere unduly with the hardwood.

19) Scots pine on account of its rapid coarse growth on the heavy clays is wholly unsuited as a nurse to oak. The ground vegetation is never adequately killed out, unless the canopy is kept close which in turn means virtual suppression of the oak, and further the produce resulting from early removal of the nurse, yields a low return, since it has to be cut at an unprofitable stage in development.

20) As a nurse to both oak and ash, the larches (European and Japanese) have proved most unsatisfactory in all but exceptional cases.

21) The planting of pure conifers on the heavy clay soils is now considered to be avoiding the main issue, since the areas in question are primarily oak sites and should be used for the production of oak.

22) In view of the inherent tendency of the heavy clay soils to crack during spring and summer droughts, early planting is essential.

23) The planting of good strong oak seedlings (1 yr. and 2 yr.) is more successful than the direct sowing of acorns. Well balanced sturdy plants are essential in order to compete successfully with the intense weed growth, and also to facilitate weeding.

24) Evidence has shown that close planting of oak, i.e. 4 ft. x 2 ft. and 3 ft. x 3 ft. is unnecessary and indeed wasteful. The planting spacings now recommended in mixture with Norway spruce are $4\frac{1}{2}$ ft. x $4\frac{1}{2}$ ft. or 4 ft. x 4 ft.

25) Following de-wolfing, the first thinnings in oak should be comparatively light.

APPENDIX I

NOTES FROM INSPECTION REPORTS

HAZELBOROUGH

3.6.29 - Technical Commissioner

Natural ash groups were to be gone through and thinned, leaving the best stems, i.e. those in gaps between the large oaks. The remaining ash to be coppiced if saleable. In good ash groups it was recommended to bring in beech after thinning. In future oak plantings, owing to the presence of coppice in the greater part of the area and the rate of growth of the larch, the use of larch nurses was considered unnecessary.

Oak to be planted pure, one-year seedlings at $4\frac{1}{2}$ ft. x 2 ft.

28.8.30 - Assistant Commissioner

Future plantings in coppice (P.31) to be in lines instead of filling up irregular groups.

30.10.31 - Assistant Commissioner.

No conclusions.

30.9.52 - Mr. O. J. Sangar.

Inspection regarding progress of plantations to date.

19.7.33 - Chairman

Thinning of the early oak/European larch mixtures to be done to favour the oak. Heavy coppice in recent plantings was to be cut hard back until the oak was ready to go up with the coppice. The adequate thinning of ash was emphasised to ensure full crown development before the stems became too whippy.

5.9.33 - Assistant Commissioner.

Oak tellers over the early irregular planting in coppice were to be ringed where they were suppressing the plants.

20.5.35 - Sir Alexander Rodger.

General inspection of the progress of the plantations.

27.3.42 - A/Assistant Commissioner

The vigorous crop 20 ft./30 ft. high of oak/Norway spruce P.28 in alternate rows was commented on. It was thought this was due to the plantation being formed on clean pasture land and having had little competition from coppice growth.

The success of the natural oak in the Hatch area was noted where a first rate oak stand was in being.

In viewing the early P.30 pure oak plantings now rather an open crop it was pointed out that oak needed to be weeded hard right from the start until it got away.

30.4.42 - Chairman

It was pointed out that up to about 1924 oak was planted pure, then larch/oak was planted and the results had been uniformly unsatisfactory.

The P.28 oak/Norway spruce on a bare field seemed to be the correct mixture for this type of land. Provided the Norway spruce were removed gradually and in good time a fine crop of pure oak should result.

The policy of retaining coppice belts for shelter to be continued with, in coppice areas where oak was to be grown no conifers should be planted.

On inspection of the growth to date no particular advantage was gained by sowing acorns, they took a long time to come up and added to the costs of weeding.

5.7.44 - Chairman

It was decided to fell 52,300 cu.ft. approximately of old oak to meet the demand of local timber merchants. In general the hardwood plantations were developing very well. The oak/Norway spruce P.28 mixture would require careful and repeated treatment if, as was the intention, an oak crop was to be secured.

5.6.48 - Chairman

The high cost of establishing pure oak plantations was discussed and it was considered that, after viewing the progress of the older oak/Norway spruce mixtures to date, oak should be planted in alternate rows with Norway spruce at 4 ft. x 4 ft. spacing. As the plantation became established the spruce would be progressively removed for Christmas trees thereby yielding an enhanced intermediate yield to balance against establishment costs.

24.2.50 - Director (England)

It was indicated that as one of the objectives of the department must be the early provision of millable hardwood timber, thinning would have to be done more heavily than in the past. At the same time a 25 ft. clean bole was necessary and pruning might be needed, particularly so where there were insufficient naturally clean stems, and by adopting this procedure

it should be possible to produce good oak from what had hitherto been considered as inferior and too rough.

14.5.51 - Chairman

A general inspection of the older plantations was carried out.

SALCEY

21.10.27 - Technical Commissioner.

Regeneration. In view of the (moribund) state of the oak, it was decided to speed up regeneration. It was decided that 400 acres would be regenerated in the next 20 years. Judging from past experience the regeneration period may be taken as 20 years. This would give an annual regeneration area of 20 acres. As the total acreage of Salcey was 1240 acres approximately, the regenerating in the first period of 400 acres would upset a proper sequence of age classes, it was decided to regenerate probably half the area with sycamore or ash which would be cut on a shorter rotation. Such areas would come in for oak regeneration later. The regeneration areas of the different species to be kept in different compartments.

Methods of Regeneration. The wood to be regenerated in strips probably 1½-chain wide, leaving cross belts.

In the oak areas, lines to be cultivated 3 ft. apart and plants to be spaced 1 ft. apart in the lines.

Oak seedlings to be used where possible without nurses. Good seed years to be utilized whenever possible for natural regeneration. In sycamore and ash areas big plants to be used.

Thinning. Scattered ash groups to be thinned.

3.6.29 - Technical Commissioner.

The development of the oak and ash P.14 regeneration was considered good and it was decided that in future establishment of oak plantations where there is a shelter-wood, to adopt this method.

All natural ash in strips or groups to be thinned, selecting the best poles, and beech to be brought in.

Inspection racks to be cut through plantations which have closed up.

A warrener to be kept on in view of the number of rabbits present.

15.7.31 - Technical Commissioner

P.28 - 30 Oak. Definite lines of grass to be left between the rows. It was considered that in thick grassy areas oak should not need to be weeded after three or four years.

P.25 Scots pine nurses in oak groups to be cut hard back. They were considered unnecessary as sufficient shelter was afforded by the surrounding belts.

Ash to be thinned out where necessary, wherever it tends to become whippy and where it is coming up through gaps in the old oaks; the best ash being selected to remain.

30.10.31 - Assistant Commissioner.

P.14 Oak strips. The standing belts should be removed as soon as possible.

20.7.33 - Chairman.

It was not considered necessary to clear thorn under P.01 oak as it acted as a soil covering.

P.30 2-year oak seedlings were coming through the grass. No further weeding was considered necessary except to keep scattered coppice down.

20.5.35 - Sir Alexander Rodger

General inspection.

13.4.37 - Sir Alexander Rodger

Rabbits were still causing trouble, they were difficult to eradicate due to thick undergrowth.

The amount of weeding necessary was a debatable point; it was now thought that in the dense grass areas young oak must be weeded until they definitely make a start, also that it would be preferable to at least slow down the planting programme until more of the earlier plantations became established in order not to increase the weeding programme.

20.10.37 - Chairman

Discussion on preparation of working plan.

30.6.40 - Assistant Commissioner.

It was decided that blanks in the younger oak plantations be filled up with Norway spruce.

It was considered inadvisable to leave belts of old oak as a shelter-wood when planting areas of oak as frost tends to collect in the strips and

no real shelter is provided. Oak would respond better if planted in larger open areas with Norway spruce as nurses. Ash was considered an unsuitable tree to plant here.

21.2.41 - Chairman.

It was considered a mistake to beat up P.30 oak at this stage with Norway spruce.

The strip method of regeneration prescribed in the working plan had not been entirely adhered to in that final fellings of the intervening old oak belts have been done wholesale, they should have been removed more gradually.

23.7.41 - Chairman.

Weeding of oak must be discontinued whenever it shows signs of getting away. It should not be expected to get a 100% crop after having planted at 5 ft. x $2\frac{1}{2}$ ft. so long as there is a good stocking and plants are growing strongly, the oak should be left to close up and form canopy.

Beating up of odd blanks in the original spacing of 5 ft. x $2\frac{1}{2}$ ft. is not necessary. 2,000 oak per acre evenly spaced are sufficient to ensure a full stocking by the time canopy is formed.

The practice of beating up with odd Norway spruce was to be discontinued.

A start should be made in the gradual removal of the belts so as not to expose the regenerated areas unduly.

14.5.51 - Chairman

The benefits from side shelter to the growth of oak was indicated by several examples seen, particularly in the P.15 strips. Good clean stems of ash were seen, the results of early selection and regular attention to pruning.

It was indicated how the development of these stems in full light had a distinct bearing on the question of free growth of ash. A few selected stems were to be felled and their timber investigated as to quality at Princes Risborough and a few sold to a merchant who dealt in ash to get some idea of their current market value.

YARDLEY

July 1931 - Technical Commissioner.

General Future Treatment. The woodland area consisted of approximately 1800 acres which the estate were handing over in large blocks, about 100 acres per annum. Planting would probably be completed in 18 years time. From past experience it would be 25 to 30 years before any thinnings could commence in a hardwood crop. In these circumstances there would be insufficient work for F.W. holders and other labourers for about 10 years after the whole area is planted.

In addition to this each year large open areas would be taken over for planting and optimum conditions as regards shelter will not obtain if a pure hardwood crop is planted.

To obviate this and produce early thinnings it was decided that at least 40% of the crop should consist of conifers in pure blocks. European larch and Norway spruce would be planted according to their suitability to the factors of the locality, preference being given to European larch wherever possible.

It was decided that oak would form the major part of the hardwood crop nursed by European larch and Norway spruce in portions where the growth of coppice was scanty.

November, 1931 - Assistant Commissioner.

New plantings were to be of European larch/ash in even mixture and European larch/ash/Norway spruce - one-third each.

July 1933 - Chairman

The forest was to be managed as a hardwood forest. The use of conifers was to be restricted first to "catch crops" leading to a better adjustment of age classes than is possible at the first planting, and second to nursing the hardwood crops.

It had been laid down that the planting was to be in the average ratio 60% hardwood to 40% conifers, though necessarily there may be year to year variations from that figure.

Care would have to be taken that the proportion of hardwoods did not fall below 60% and plantations of ash or poplar (i.e. relatively short rotation crops) should be made at the expense of the conifers.

Growth conditions were governed chiefly by topography, the lowest ground tending to be the wettest and most exposed to frost. Other main

factors affecting choice of species were weed and coppice growth, the latter needed careful consideration. It could be an asset in nursing species which require shelter or it could be an expensive nuisance with species which required full light.

Taking the different species in turn:-

Hardwoods

Oak should form the bulk of the hardwood plantations, it would require nursing and hazel coppice where present would help. It was doubtful whether conifer nurses were really satisfactory on this type of ground and equally doubtful whether, when account was taken of the extra weeding and beating up (e.g. with larch) or the low value when cut out (e.g. spruce) they would prove financially successful. It was thought, therefore, that hardwood nurses which can be cut about if they got out of hand and still function efficiently were to be preferred. Alder was probably the most suitable and some birch should also be used.

Oak spacing should be at 5 ft. x $2\frac{1}{2}$ ft. in preference to the existing 4 ft. x 3 ft. to give more room for disposal of weedings.

Beech should grow well but would require nursing. Open ash coppice provided about the right amount of shelter, planting should be at the rate of about 1200 per acre, and preferably stout plants should be used.

The intention would be to get a beech crop in which selected ash poles were allowed to run on. Unthrifty ash poles should be coppiced back at time of planting.

Ash. The extensive planting of ash with or without conifer nurses had to stop. No evidence was available that we could establish effective large-scale ash plantations in this way, opportunity should only be taken of group fellings in standing woods.

Sycamore. A little sycamore should be tried, it required nursing.

Conifers

The most useful conifers would be European larch, Norway spruce and Sitka spruce. The best distribution would be as follows:-

European larch on the better drained sloping sites, spruce on the wetter ground with Norway spruce in the hollows liable to frost.

If it was necessary to put coppice areas into conifers weeding would have to be effective from the beginning and continued until the crop was established.

Poplars 3-5 acres should be planted annually.

May, 1935 - Sir Alexander Rodger

April, 1937 - do

June, 1937 - Assistant Commissioner

Weeding and cleaning to be started as early as possible.

October, 1937 - Chairman

Main points mentioned were -

(a) the most successful regeneration was obtained by raising oak in strips, utilizing intervening strips of coppice as side shelter.

On the majority of areas sufficient birch and coppice will come up to form adequate shelter.

(b) Weeding. Both with conifers and hardwoods weeding must be heavy and all coppice growth must be cut back to the ground until the young plants are safe. In the strip and group methods this cutting back will naturally be confined to the strip or group.

(c) In view of the slow start made by the conifers and the general unsuitability of the soil for conifers, the original project to split up the oak age classes by planting 40% of the area with conifers to be discontinued. Unless any small local conditions made the use of oak unsuitable, the area to be planted up with oak in strips at 5 ft. x $2\frac{1}{2}$ ft. leaving intervening belts of coppice. Groups of ash and sycamore to be introduced. Where fields are being planted alder to be used in lieu of coppice.

Wherever shelter is available beech to be planted in belts after 10 or 15 years to eventually form a mixed crop of oak and beech.

23.7.41 - Chairman

The practice of full planting of oak with one Norway spruce spaced every 18 ft. in the row, P.41, was to be discontinued and the former practice of planting in strips leaving belts of coppice or alternatively planting belts with coppice to be followed in future.

Reference was made to the notes of inspection in July, 1933, especially with regard to the planting of conifers. The development of these seemed so poor, however, as to throw doubts on the wisdom of this procedure.

26.9.41 - Chairman and Assistant Commissioner

General remarks made:- The necessity of cutting coppice right back to the ground in the strips of oak until the latter are safe. Alder nurses were beginning to suppress the oak and needed cutting back.

A meeting was held in Northampton with officials of the Ministry of Works and Buildings and others regarding the handing over of certain areas in the forest for the erection of a depot and storage buildings eventually.

13.5.51 - Chairman - See note on Rockingham Forest.

ROCKINGHAM

17.8.27 - Assistant Commissioner

Apethorpe:-

Norway spruce was to be used in beating up the larch/ash mixtures except on high ground. In future mixtures spruce was to be used generally as a nurse.

Fineshade:-

Regarding arrangements to be made with the estate in connection with the handing over of clear areas for replanting.

20.10.27 - Technical Commissioner

Fineshade:-

The use of big ash in the larch/ash mixtures was considered essential. In the P.23-25 poplar/ash areas one last hard cutting back of the coppice to be made after which no further weeding was to be done. Growth was considered disappointing. For the P.27 planting all scrub growth was to be cleared and the poplar planted at 15 ft. x 15 ft.

1.9.28 - Sir John Stirling Maxwell

Apethorpe:-

It was considered that the oak sowings showed great promise being preferable to the planted oak.

Fineshade:-

In the P.27 and 28 ash/larch mixtures the conifer had failed largely due to frost, it was decided to try sycamore as a beat up.

3.6.29 - Technical Commissioner

Apethorpe:-

The pure planting of ash in large blocks with small plants in Oundle wood was not approved. Future plantings were to be done in groups or strips

in the coppice.

Oak sowings at Apethorpe were considered satisfactory, very little weeding needed to be done. It was thought that direct sowings on the bare land were preferable to planting.

Fineshade:-

It was considered that replanting would be unnecessary on the recently burned area of ash and poplar in view of the re-coppicing.

20.6.30 - Assistant Commissioner

Fineshade:-

The necessity of weeding early on areas where heavy weed growth occurs was emphasized. Large plants must also be used.

15.7.31 - Technical Commissioner

Apethorpe:-

The oak sowings even after 6 years were making no growth and it was thought that such pure plantations might require nursing. Hardwoods appeared to be preferable to conifers and it was decided to use birch experimentally at an espacement of 9 ft. x 9 ft. between the rows.

In mixed oak/ash with conifer nurses, when 800-1000 hardwoods per acre are established the areas should be left alone. The aim should be to ensure a final hardwood crop; beech and ash were to be introduced if necessary where gaps occurred.

The first plantings of small ash required heavy beating up with large plants. Beech was to be underplanted after thinning out the coppice ash.

17.11.31 - Assistant Commissioner

Apethorpe:-

The recent sowings of oak were seen to be stagnating in the dense mat of grass which required pulling to one side. In the Douglas fir only the tops of existing trees were to be cleaned for the last time.

Fineshade:-

In the Wakerley block oak was to be the main crop in future and no clearing was to be done unless oak plants were available for planting in the same year.

At Duddington European larch/ash was to be continued with and the necessary beating up and replanting of failures was outlined.

Fermyn:-

The importance of adequate drainage in the Harry's Park was emphasized.

30.1.33 - Mr. O. J. Sangar

The visit was for the purpose of studying the weeding position more especially in oak plantations.

Apethorpe and Fermyn:-

General observations

1. Oak areas

(a) the general indications were that growth and form suffer from grass weeding.

(b) If continued until plants were through the dead grass weeding would have to extend over at least 7-8 years at Apethorpe and about 2 years less at Fermyn. This might be extended by checked growth and matting of the cut grass in the lines.

(c) One grass weeding is necessary a year or two after planting where beating up is to be done.

(d) The cost of weeding in thorn together with the resultant damage by whipping or extra cost to obviate the latter may be more serious than any deaths by suppression from entire lack of weeding.

2. Ash areas

(a) Small plants gave a check period of 4-5 years. Good strong plants would reduce this to 2-3 years.

(b) When plants were firmly established, growth was greatly enhanced when adjacent thorn or coppice reached a height of 2 ft. to 3 ft. above them.

(c) There was no definite evidence of suppression of ash by thorn.

(d) Ash were damaged as much as oak by the whipping of thorn shoots after light weeding, and damaged equally little in pushing up through the older growth.

(e) Unless weeding was done in the first or second year to ascertain beating up, by using vigorous stock, one weeding at most in the third or fourth year should suffice.

Chairman's observations.

Weeding of oak - a reasonable course would be to weed the first year to ascertain that failures are not abnormally heavy and then let the plantation go. Scattered failures could be made up later with beech or conifer or with large oak if failures were in big groups.

Ash - The use of small plants should not be permitted.

June, 1934 - Mr. O.J. Sangar

Apethorpe:-

Evidence of the plantations in Oundle wood generally supported the conclusions of 30.1.33 above. With the right type of plant, planting and soil conditions ash here come readily out of check without close nursing.

20.6.34 - Assistant Commissioner

Fermyn:-

The tendency to over-weed was to be checked and a careful watch kept to see that no unnecessary beating up was done.

Fineshade:-

In connection with the Duddington area it was decided that it was a mistake to plant up ash in pure blocks. Poplar in Westhay were to be pruned up as soon as possible.

Bedford Purlieus:-

Oak was to be the main crop.

20.5.35 - Sir Alexander Rodger

General inspection re progress.

3.4.37 - Sir Alexander Rodger

Divisional Officer's observations:- Conclusion now definitely come to was that in the dense grass areas oak should be weeded until they are firmly established and making a start.

7.6.37 - Assistant Commissioner

No more Sitka spruce was to be planted on the clay areas.

All conifer areas still in difficulties were to be weeded thoroughly. All coppice and briar to be cut flush with the ground when weeding.

It was decided to hold up all further new planting in the Rockingham area (except Bedford Purlieus) until arrears of maintenance had been overtaken.

20.10.37 - Chairman

Apethorpe:-

Oundle wood - where the group and strip methods were adopted all coppice growth within the group to be kept well down as all necessary shelter was afforded by the surrounding coppice.

In the 25% oak with conifer mixture at Apethorpe it was emphasized that there should be no drastic removal of the conifers; the large ones with the spreading crowns should be first removed, no attention to be paid to small suppressed oak. Unsaleable poles should be left in the plantation.

No benefit to date was noticed in the overplanted P.28 oak by alder and birch nurses in P.35.

11.8.39 - Assistant Commissioner

Fermyn:-

In Harry's Park test plots were to be laid out to ascertain the stocking of oak in the grass and to determine whether any further weeding was necessary.

Drayton - it was considered advisable to plant groups in coppice at a closer spacing of 15 ft. apart to ensure at least 200 trees per acre at the age of 25-30 years.

Apethorpe:-

Experimental plots of sowing and planting of oak showed better stocking in the latter.

29.6.40 - Assistant Commissioner

Apethorpe:-

Results to date showed that it had been fatal to neglect weeding and thorn was detrimental to the oak. Fineshade, Westhay, planting had resulted in virtually a blank through trying to do things too cheaply.

Fermyn:-

The desirability of retaining tall belts of coppice was questioned. Sufficient shelter was afforded to the oak by the regrowth of coppice and grasses.

22.7.41 - Chairman

Apethorpe:-

The alder nurses over the oak would require watching to see that they did not suppress the latter. The early oak sowings and plantings were now forming canopy.

Fermyn:-

On the old pasture land transplants were noted to have been more successful than sowings.

In the groups and strips oak had done very well and now required more light.

Fineshade:-

Areas of advanced coppice growth handed over by the estate should be treated by singling out the coppice shoots and accepting what is on the ground as a crop.

27.9.48 - Director (England)

A comprehensive investigation was needed regarding the choice of species for underplanting ash suffering from die-back.

11.5.51 - Chairman

Apethorpe:-

The importance of the oak/conifer mixtures in relation to afforestation of bare land was emphasized. In particular Norway spruce was valuable in that besides being a useful nurse (yielding a high intermittent financial return) it helped to build up a humus which appeared to be necessary for the establishment and well being of the hardwood.

Bedford Purlieus:-

The disadvantage of planting in narrow 12 ft. strips was now very obvious particularly as cleanings had not been maintained. This had been done in the belief that oak needed side shade, while in actual fact plenty of light is needed for its development.

Fineshade:-

Where the coppice had overcome the early plantings of poplar and ash the policy should be to make the best of what we had got in the coppice and thin it out. A small area was to be treated experimentally in the first instance.

15.5.51 - Chairman

Fermyn:-

In the Norway spruce overplanted with oak mixture the treatment of removal of the Norway spruce was explained.

The preservation of any humus which the spruce may have helped to form was essential to the future development of the oak. In order to maintain this humus it was suggested that we should experiment by leaving one whorl of living branches on the stump when removing the spruce as Christmas trees.

14.5.51 - General note on Northamptonshire units

On the heavy clays the vegetation on both old arable and woodland areas passes through various successions to almost impenetrable thickets of thorn. These successions should be worked out as they are of importance to silvicultural technique. Invasion by other species such as brambles and thorn is slow but apparently indicates an improvement in plantability conditions.

Oak

The strip and group method dating from 1914 (Salcey and Hazelborough) has in the main been successful. Strip planting introduced in 1934 has not been a pronounced success; the benefits from side shelter are not apparent and weeding costs are still very high. The procedure of alternate strips of oak and Norway spruce (1942) has also not lowered the costs, and the benefits both immediate and ultimate are not apparent.

The method of alternate row mixtures of oak/Norway spruce was discussed in some detail. Early weeding would be intense for full furnishing of the spruce which would be systematically removed for the most part as 5 ft. Christmas trees but also as poles so that at a relatively early age(20-25) very few Norway spruce would remain. Although there would be no reduction in the initial cost of establishment the return from Christmas trees is claimed to be so high that an established crop would be obtained at 10-11 years not only at no net cost but probably at a considerable profit.

This method requires serious consideration provided the oak/Norway spruce plantings can be so managed as to produce good oak. There is a good deal of evidence to show that the mixture is a good one provided the spruce are removed in good time which, in most cases, they have not been. The Norway spruce get ahead and seem to have a decided nursing effect on the oak which later has a very healthy bright-coloured bark and for the most part are markedly straight and vigorous. The critical stage is reached when the oak begin to get too far behind and too whippy and may be ruined as a crop.

In the oak/Norway spruce plantings on old arable (Apethorpe and Fermyn) the original difficulty in getting the oak to start appears to have been due to the extreme impoverishment of the soil and the lack of humus in it. The checking of the oak was probably due to the time required by the young oak to provide its own humus. The point is worth investigating for oak (as also for beech and ash) because it bears on the conservation of humus

by regulating the size of felling areas, and at a later stage, on underplanting.

Thinning of young oak. A number of young plantations are now entering the thinning stage. After the obvious removal of wolves the degree of opening up requires careful consideration - too drastic action may spoil the crops, this can easily happen if a fetish is made of "free growth". In these forests there is a considerable amount of material available for studying the length of clear bole we are getting at various ages and the distribution of elite stems.

Ash

Extensive plantings of ash (Fineshade) have often given very poor results - the worst in European larch/ash mixtures. The older ash at Apethorpe, on the other hand, was in an interesting state with a good proportion of straight stems and clear boles.

At Salcey the early plantings despite lack of thinning had occasional stems which had had a fair growing space and showed pleasing development. It was as yet too early to consider the underplanting of young ash with beech until it is known just how ash responds to systematic thinnings.

Beech

On the whole beech has shown remarkable growth on the heavy clays, at any rate up to 30 years. In the underplanting done under oak and ash it grows without much forking and rapidly catches up on both oak and ash and, as at Hazelborough, had to be topped and stopped under young oak. An underplanting of ash done in 1914 showed very pleasing development.

At Salcey grey squirrels have done considerable damage and unless the pest can be controlled there is little future for beech except for soil protection.

Poplars

Very patchy results have been produced from the Black Italian plantings at Yardley and Fineshade, growth is exceptionally average but mostly poor. On the evidence poplar planting is an uncertain venture where there is competition from coppice, etc., the ground is not left clean for the next crop and the production of timber is very low. As a matter of policy we should not try to increase our stock of poplar timber at the expense of better hardwoods.

In this group of forests primarily suited for hardwoods production there was a poor beginning and a rather blind faith in ash and larch. Subsequently there was a lack of continuity of purpose and failure to build up improved methods based on local observation.

The first thing to do now is to gather up and analyse local data and second to define silvicultural methods, which should be followed except by special permission. To do this job properly means the full time employment of a competent officer for possibly a year and he should work in the closest association with Conservancy Officers. It would afford the Research Branch with a much needed opportunity of getting to know the important silvicultural problems of these hardwood areas.

APPENDIX II

HISTORICAL

HAZELBOROUGH

The Hazelborough area proper originally formed part of the Hazelborough Walk within the Ancient Royal Forest of Whittlewood. The Hazelborough Walk contained some 1,412 acres and was subject to the exercise of certain rights by the Duke of Grafton and Worcester College, Oxford, and to rights of common. This part of the forest was enclosed and allotted under the Act 5 Geo.IV "An act for the dividing and enclosing that portion of the forest of Whittlewood called Hazelborough Walk, etc." (21st June, 1824), and sections 24, 27 and 29 provided for allotments to become and remain the absolute property of His Majesty, His Heirs and Successors, freed,exonerated and forever discharged from all rights of the Duke of Grafton and of all other persons .... and from all rights of common of pasture, turbary, estovers, and all other rights whatsoever (saving the rights of the Duke of Grafton as Master of the Game).

The award under the Act was duly made and dated 29th June, 1826, and there was allotted to His Majesty in all 517 acres. Detached areas were later sold by the Crown in 1826. The rights of the Duke of Grafton as Master of the Game were purchased from the Duke by the Crown in 1858. The area was the property of the Office of Woods and Forests from the time of replanting after the Disafforestation Acts until it was transferred to the Forestry Commission under the Transfer of Woods Act, 1923.

SALCEY

This forest has been a Royal forest from very early times and the Norman Kings jealously guarded this area for hunting. In the 18th century the forest area was a favourite resort of highwaymen and the like.

From 1661 the office of warden or master forester was a hereditary one held by the Montague family of Horton. In 1781 timber for naval purposes was in much demand and shipwrights came from Deptford and converted the timber on the spot.

In 1790 the total acreage was 1847 acres, including Salcey Lawn. Over 300 acres were felled between 1790 and 1825 and the acreage was thereby gradually reduced to its present figure of 1279 acres.

Game was plentiful in the forest, over 1000 deer were present in 1825 and eight officials in various capacities were employed in protecting both deer and timber. By the Enclosure Award of 6th July 1825, certain land was given to the poor as allotments and the privilege of collecting firewood from the forest two days in the week was abolished, so were all hunting rights.

Of the allotments made to the Crown, 1258 acres were well drained and planted up with oak (probably with Scots pine nurses) during the period 1832-46. In accordance with the system in vogue at the time the woods were thinned every 5 years from about 1850 onwards.

Owing to the high price of tan bark and the ready sale of small wood, large returns were obtained from this source. The net returns per acre per annum for each of the 10-year periods from 1853 to 1903 were as follows:- 1853 - 63 5/-; 1863 - 73 7/-; 1873 - 83 5/-; 1883 - 93 17/-; 1893 - 1903 19/-.

Thinnings were continued regularly up to the year 1903 when clear felling and replanting was begun, the crop on the ground had by this time been reduced to some 40-50 broad-crowned oak per acre. Growth of thorn was encouraged as it was not cut down with the coppice. Rabbits were very numerous.

In the early days Salcey and Hazelborough were managed by a Deputy Surveyor but in 1912 the woods were being managed by a firm of Agents - Messrs. Cluttons - on behalf of the Office of Woods. In 1912 there was set up a Joint Forestry Branch of the Board of Agriculture and Office of Woods and that Branch managed the woods until the Forestry Commission was set up.

YARDLEY

At the time of the Doomsday Survey (1083-1086) Yardley Chase was held by one Hugh from the Countess Judith to whom it had been presented by her uncle William the Conqueror. Through her it descended to the Greys of Hastings and Ruthyn from whom it was purchased in 1512, together with other neighbouring property, by Sir William Crompton.

In 1287 a "Plea of Venery" presented before the King's Justices refers to the Chase at Yerdeli, being within the bounds of Salcey forest, and a survey of 1565 gives further details of Yardley Chase, seven miles in circumference and Yardley Park three miles in circumference.

ROCKINGHAM

The frequent presence of the Norman Kings at their castles of Rockingham and Northampton was one of the chief causes for the appropriation of such large tracts of this country for royal forest sport. Apart from parks of early formation the largest and chief forest tracts were (1) Rockingham, (2) Whittlebury and (3) Salcey. The Conquerer built Rockingham Castle and it is practically certain that he afforested the district around. The earliest known record of forest pleas pertain to this country and relate to pleas held at Northampton on 20th February, 1209.

Rockingham Forest in the time of Henry III was divided into the three divisions or bailiwicks of Rockingham, Brigstock and Cliff (Kingscliff) each of which had its own minister. This division lasted until the time of disafforesting, 1796.

The Keepership of the forest of Rockingham with Cliff, Geddington and Brigstock was conferred by Henry III on Hugh de Neville in June, 1219.

The orders for wood out of this forest in the time of Henry III and later were very scanty in comparison with other Royal forests, and hardly ever included grants to outsiders, this seems to indicate that well-grown timber was a rarity; the forest abounded with game for the provision of venison to various notables.

A perambulation of 1286 showed Rockingham forest to extend from the south bridge of Northampton to the bridge of Stamford with an average width of 7-8 miles.

An elaborate report was issued on Rockingham in 1792. The three bailiwicks were formerly under one warden, an office granted by James I in 1663 to Lord Burleigh. This office was dissolved in 1629 by Charles I. The Commission, in 1792, found that Mr. George Finch Hatton was warden of Rockingham, the Earl of Exeter of Westhay and the Earl of Westmorland of Morehay and Sulehay. The actual woodlands then included in the forest area were 9,482 acres but most of these were private. Upwards of 100 bucks and a large number of does were killed annually.

The Commission's recommendation that the area should be disafforested was carried into law by the Acts of 1795 and 1796, the whole of the forest then became absorbed in the estates of private landowners; The Earl of Westmorland acquired Apethorpe and the Marquess of Exeter parts of Fineshade.

HAZELBOROUGH

Cpt.	Species	P.Yr	Age	Geology and soil	a. Altitude b. Aspect c. Slope d. Exposure	Mean ht. of dominants	Mean annual ht. increment	Current annual ht. increments during last 5 yrs
1	Oak	31	20	Lower oolite	a. 450'	15'	9"	9"
	E.L.	33	18	clay-loam in S.W. portion becoming much lighter in N. portion	b.) Shallow c.) valley runs E-W thro' Cpt. otherwise flat. d. Slight	27'	18"	12" (?)
2	Oak	30	21	Lower oolite	a. 450'	16'	9"	10"
		29	22	mod. heavy clay, lighter in N. portion.	b. None c. Flat d. Slight			
3	Oak	30	21	do	a. 420' b. None c. Flat d. Not marked	17'	9½"	10"
4	Oak	1887	64	Lower oolite	a. 420'	28'	5½"	2"
	"	30	21	mod. heavy	b. Not marked	16'	9"	10"
	J.L.	31	20	clay becoming	c. Mainly flat	28'	17"	18"
	Oak	35	16	much lighter	d. Slight	12'	9"	11"
	J.L.	51		under 64 yr. oak				
5	Oak	38	13	Lower oolite	a. 450'	10'	9"	9"
		39	12	Moderate clay-loam	b. Not marked c. Flat d. Slight	8'	8"	8"
6	Oak	43	8	do.	a. 450'	3-4'	5"	9"
		44	7		b.) Slight slope c.) to S.E. d. Slight	"	"	"
7	Oak	1887	64	Lighter	a. 400'	28'	5½"	2"
		31	20	clay-loam	b.) Slight slope c.) to south d. Slight	16'	9½"	12"
8	J.L.	34	17	Lower oolite	a. 460'	20'	14"	20"
	Oak	35	16	mod. heavy	b.) Flat			
		36	15	clay	c.) d. Slight			
9	Oak	36	15	do.	a. 460'	12'	9½"	11"
					b.) Flat c.) d. Slight			
10	Oak	34	17	do.	a. 420'			
					b. N. & S. aspect on valley sides.	12'	8½"	10"
					c. Slightly rolling d. Slight			
11	D.F.	28	23	Lower oolite	a. 400'	35'	17"	15½"
	Oak	31	20	sandy loam	b. Not marked	14'	7"	8½"
	J.L.	34,35	17,16		c. Slightly rolling			
	Popl.	34	17					
	N.S.	50	1		d. Slight			
12	Oak	1887	64	Mod. heavy	a. 480'	25'	4½"	2½"
		34	17	clay	b.) Mainly			
	Oak(NS)	40	11		c.) flat	9'	9¾"	10"
	Oak	48	3		d. Not marked			

Cpt.	Species	P.Yr.	Age	Geology and soil	a. Altitude b. Aspect c. Slope d. Exposure	Mean ht. of dominants	Mean annual ht. increment	Current annual ht. increments during last 5 yrs.
13	E.L.	33	18	Mod. heavy	a. 470'	22'	14½"	19"
	Oak/NS	41	10	clay	b.)Mainly	7-9'	8½-11"	9-19"
	Oak	34	17		c.)flat	12'	8½"	12"
					d. Slight			
14	E.L.	38	13	do.	a. 460'	15'	13½"	15"
					b.)Slightly			
					c.)rolling			
					d. Slight			
[redacted]								
15	Oak	1887	64	do.	a. 420'	25'	4½"	2½"
	"	34	17		b. Mainly S.W.	12'	8½"	11"
	"	38	13		c. Slight slope	11'	10"	16"
	Ash	38	13		d. " only	10'	9"	10"
	L.C.	45	6					
16	Oak		64	do.	a. 420'			
	E.L.	32	19		b.)Flat with	18'	11"	13"
	Oak	34	17		c.)gentle slope	10'	7"	12"
	NS/Oak	41	10		to S. .in south	8-7'	9½-8½"	19-18"
	D.F.	50	1		d. Slight			
	Oak/J.L.	51						
17	Oak	28	23	Lower oolite mod. heavy clay	a. 480' b.)Mainly c.) flat d. Slight	21'	11"	10": (19" in FY! since removi NS Nurse)
18	E.L.	32	19	Mod. heavy	a. 470'	23'	14"	15"
	"	38	13	clay	b. S.W.	14'	13"	14"
	Oak	34	17		c. Gentle slope	12'	8½"	12"
	"	43	18		d. Slight			
19	Oak	42	9	do.	a. 420'			
		43	8		b. S.W.	6'	9"	10½"
					c. Gentle slope			
					d. Slight			
20	Oak	1887	64	do.	a. 400'	28'	5¼"	2½"
	"	37	14		b.)Not	12'	10"	11"
	Ash	37	14		c.)marked	"	"	10"
					d. Slight			
[redacted]								
21	Oak/NS	28	23	Mod. clay	a. 450'	22'/-		11"/-
	NS	28	23		b. N.W.	30'	15"	
	Oak		120		c. Slight slope	40'	4"	2-3"
	"	44	7		d. Slight			
	"	45	6			4½'	9"	10"
22	Oak		120	Mod. heavy	a. 450'	40'	4"	2"
	"	44	7	clay	b.)Mainly	5'	9"	11"
					c.)flat			
					d. Slight			
23	Oak		120	do.	a. 450'	35'	3½"	2"
	Oak/Ash	17	34		b.)Slightly	28'	9.8"	11"
	Red Oak	17	34		c.)rolling	30'	10"	"
	Oak	35	16		d. Slight	11'	8½"	"
	E.L.	24	27			38'	17"	15"
	Beech	35	16			15'	11"	19"
24	Oak	30	21	do.	a. 420'	20'	11"	11"
		45	6		b)Slightly	4½'	9"	10"
					c.)rolling			
					d. Slight			

Cpt.	Species	P.Yr.	Age	Geology and soil	a. Altitude b. Aspect c. Slope d. Exposure	Mean ht. of dominants	Mean annual ht. increment	Current annual ht. increments during last 5 yrs.
25	Oak	07	44	Mod. heavy clay	a. 400' b.)Slightly c.)rolling d. Not marked	32'	8½"	5"
26	Oak	1826	125	do.	a. 400'	40'	4"	2"
	Ash/Be	14	37		b.)Slightly	40'	13"	18"
	Oak	42	9		c.)rolling d. Not marked			
27	Oak	1826	120	do.	a. 450'			
	"	47	4		b.)Mainly			
	"	48	3		c.)flat d. Slight			
28	Oak	1826	125	do.	a. 450' b. None c. Flat d. Slight	48'	4½"	2"
29	Oak/Ash/EL	05	46	do.	a. 450'	40'/40'/-	10½"/10½"/-	9"/6"/-
	D.F.	05	46		b. None			
	Oak	1826	125		c. Flat	48'	4½"	2"
	Beech	41	10		d. Slight	10'	12"	19"
30	Oak	1826	125	do.	a. 450'	45'	4½"	2"
	"	46	5		b. None			
	"	47	4		c. Flat d. Slight			
31	Oak/EL	25	26	do.	a. 450'	-/40'	-/16"	-/16"
	Oak	44	7		b. S.E.	5'	9"	11"
					c. Slight slope d. Slight			
32	Oak/Ash	09	42	do.	a. 420' b. None c. Flat d. Slight	30'/-	9½"/-	5"/-
33	NS/Ash	05	46	Lower oolite	a. 450'	-/38'	-/10"	-/6"
	E.L.	14	37	Mod. heavy	b. None	48'	16"	12"
	Oak	05	46	clay	c. Flat	38"	10"	9"
	"	47			d. Slight			
34	Oak	1826	125	Mod. heavy	a. 480'	40'	3½"	3"
	EL/JL	46	5	clay	b. None	9'	21"	-
	Oak	47	4		c. Flat	18"	4½"	-
	E.L.	47	4		d. Slight			
35	Oak	10	41	do.	a. 450' b. None c. Flat d. Slight	40'	17"	12"
36	Oak	1826	125	do.	a. 450'	40'	3½"	3"
	"	47	4		b. None	18"	4½"	
					c. Flat d. Slight			
37	Oak	1826	125	do.	a. 450'	40'	3½"	3"
	"	44	7		b. None	5'	9"	11"
	Ash	44	7		c. Flat d. Slight			

Cpt.	Species	P.Yr.	Age	Geology and soil	a. Altitude b. Aspect c. Slope d. Exposure	Mean ht. of dominants.	Mean annual ht. increment	Current annual ht increments during last 5 yrs.
38	Oak	1826	125	Mod. heavy	a. 420'	40'	3½"	3"
		31	20	clay	b. None	14'	7"	8½"
		33	18		c. Flat	12'	8"	10"
		35	16		d. Slight	12'	9½"	11"
39	Oak	1826	125	do.	a. 460'	40'	3½"	3"
	"	47	4		b. None	13"	4½"	-
[redacted]					c. Flat			
					d. Slight			
40	Oak	11	40	do.	a. 460'	38'	11"	8"
	Ash				b. None	37'	"	-
	Few NS				c. Flat	39'	"	12"
					d. Slight			
41	Oak	1826	125	Lower oolite	a. 450'			
	"	34	17	Mod. heavy	b. None			
	Ash)			clay	c. Mainly flat			
	Lime)				d. Slight			
	Syc.)	47						
	Elm)							
	Beech)							
	Cherry)	48						
	Pop.)							
42	Oak	1826	105	Moderate	a. 420'	40'	3½"	3"
	S.P./EL	04	47	l.br. clay	b. None			
	Beech	40	11		c. Slight slope	12'	13"	14"
					d. Slight			
43	Oak	1826	125	Mod. heavy	a. 450'			
	Oak/EL	04	47	l.br. clay	b. None			
	Oak	47	4		c. Flat			
					d. Slight			
44	Oak	1826	125	Mod. l.br	a. 480'	43'	3½"	3"
	Ash	02	49	clay	b. None	40'	9"	6"
					c. Flat			
					d. Slight			
45	Oak	1826	125	do.	a. 450'			
[redacted]					b. None			
					c. Flat			
					d. Slight			
46	E.L.	03	48	Mod. heavy	a. 450'	55'	13 3/4"	11"
	Ash	03	48	l.br. clay	b. N.W.	48'	12"	6 1/4"
	Oak	03	48		c. Slight slope	45'	11 1/4"	8½"
					d. Slight			
47	Oak	1826	125	do.	a. 450'			
		17	34		b. N.W.	28'	10"	11"
		31	20		c. Slight slope	12'	7"	13"
					d. Slight			
48	Oak	1826	125	Lower oolite	a. 470'	44'	4½"	2"
				mod. l.br.	b. None			
				clay	c. Flat			
					d. Slight			
49	Oak	1826	125	Mod. l.br.	a. 460'	48'	4½"	2"-3"
				clay	b. None			
					c. Flat			
					d. Slight			

Cpt.	Species	P.Yr.	Age	Geology and soil	a. Altitude b. Aspect c. Slope d. Exposure	Mean ht. of dominants	Mean annual ht. increments	Current annual increme during last 5
50	Oak	1826	125	Mod. l.br clay	a. 450' b. None c. Mainly flat d. Slight	45'	4½"	2"
51	Oak	1826	125	do.	a. 450' b. None c. Mainly flat d. Slight	45'	4½"	2"
52	Oak E.L. Oak	1826 24 24	125 27 27	Mod. heavy l.br. clay becoming much lighter under EL/Oak	a. 450' b. None c. " d. Slight	48' 35' 24'	4½" 15½" 10½"	2" 15" 9"
53	NS/Oak E.L. Oak	37 37 37	14 14 14	Mod. heavy l.br. clay	a. 450' b.) Mainly flat c.) gentle W slope in W. portion d. Slight	14'	13"	14"
54	DF/NS Oak NS	26 26 30	25 25 21	do.	a. 450' b. None c. Flat d. Slight	24' 22' 20'	11" 10½" 12"	18"+ 11" 10"
55	NS "	26 30	25 21	do.	a. 450' b. None c. Flat d. Slight	24' 20'	11" "	19" 15"
56	NS "	26 30	25 21	Lower oolite Mod. heavy l.br. clay	a. 460' b. None c. Flat d. Slight	25' 20'	12" 11"	19" 16"
57	NS/Oak	20	31	Mod. heavy l.br. clay	a. 560' b. None c. Flat d. Slight	39'/-	15½"/-	14"/-
58	EL/JL E.L.	22 30	29 21	do.	a. 460' b. None c. Flat d. Slight	35'/- 28½'	14"/- 16"	14"/- 14"
59	NS SP	30 30	21 21	do.	a. 460' b. None c. Flat d. Slight	24' "	13½" "	14" "
60	NS(Ash) SP Oak	21 21 21	30 30 30	do.	a. 460' b. None c. Flat d. Slight	40' 42' 36'	15" 16" 14"	14" 13" 11"
61	EL(NS) NS Nat.oak	14 14 14	37 37 37	do.	a. 460' b. None c. Mainly flat d. Slight	48' " 45'	16" 16" 15"	19½" 19½" 9"
62	O/Ash/NS J.L. S.P.	21 21	30 30	do.	a. 460' b. None c. Mainly flat d. Slight	42'	16"	13"

Cpt.	Species	P.Yr.	Age	Geology and soil	a. Altitude b. Aspect c. Slope d. Exposure	Mean ht. of dominants	Mean annual ht. increment	Current annual ht. increments during last 5 yrs
63	Oak	21	30	Mod. heavy	a. 460'	29'	11½"	12"
	Ash	21	30	l.br. clay	b. None			
	N.S.	21	30		c. Flat d. Slight	40'	15"	14"
64	(Ash)/NS	30	21	Lower oolite	a. 460'	21'	12"	14"
	S.P.	30	21	mod. heavy l.br. clay with rusty mottling	b. None c. Flat d. Slight	25'	14"	18"
65	(Ash)/NS	30	21	Mod. heavy clay with some rusty mottling	a. 460' b. None c. Flat d. Slight	21'	12"	14"
66	(Ash)/NS	30	21	Mod. heavy clay with rusty mottlings	a. 460' b. None c. Flat d. Slight	21'	12"	14"
67	(Ash)/NS	30	21	do.	a. 500' b. None c. Flat d. Slight	21'	12"	14"
68	(Ash)/NS	30	21	do.	a. 500' b. None c. Flat d. Slight	21'	12"	14"
69	Oak		120	do.	a. 500'			
	N.S.	30	21		b. None	21'	12"	14"
	Oak	42	9		c. Flat	4'	5½"	10"
		44	7		d. Slight	3-4'	5"	9"
70	Oak	36	15	do.	a. 500'	12'	9½"	11"
	Oak/NS	39	12		b. None	10'/	10"/	15"/
	"	40	11		c. Flat	9'/	9¾"/	10"/
	"	41	10		d. Slight	7/9'	8½/11"	9/19"
71	N.S.	30	21	do.	a. 500' b. None c. Flat d. Slight	21'	12"	14"
72	Vacant							
73	SP/Oak	20	31	Lower oolite	a. 450'	38/35'	14½/14"	14/10½"
	Beech	40	11	mod. heavy l. br. clay with rusty mottling	b. None c. Mainly flat d. Moderate			
74	Oak	20	31	do.	a. 450'	35'	14"	10½"
	S.P.	20	31		b. None	39'	15"	14"
	N.S.	20	31		c. Flat d. Slight	39'	15½"	14"
75	E.L.)				a. 450'	58'	15½"	13"
	N.S.)				b. N.W.	54'	14⅓"	9"
	S.P.)	06	45	do.	c. Slight slope	–	–	–
	C.P.)				d. Slight	55'	15"	18"
	Oak)					45'	12"	8⅓"

Cpt.	Species	P.Yr.	Age	Geology and soil	a. Altitude b. Aspect c. Slope d. Exposure	Mean ht. of dominants	Mean annual ht. increment	Current annual ht. increments during last 5 yrs
76	N.S. Nat.Oak	23	28	Mod. heavy clay	a. 500' b. None c. Mainly flat d. Moderate	25' "	10½" "	19" 18"
77	N.S. Nat.Oak	23	28	Mod. heavy clay	a. 500' b. None c. Flat d. Slight	25' 25'	10½" 10½"	19" 18"
78	N.S. Nat.Oak	23	28	do.	a. 500' b. None c. Flat d. Slight	39' 33'	16½" 14"	17-26 10½"
79	N.S. Nat.Oak Ash	23	28	do.	a. 500' b. None c. Flat d. Slight	39' 33' 28'	16½" 14" 12"	22" 10½" 9½"
80	N.S. Nat.Oak Ash	23	28	do.	a. 500' b. None c. Flat d. Slight	39' 33' 28'	16½" 14" 12"	22" 10½" 9½"
81	N.S. Nat.Oak Ash	23	28	do.	a. 500' b. None c. Flat d. Slight	39' 33' 28'	16½" 14" 12"	26" 10½" 9½"
82	N.S. Nat.Oak	23	28	Lower oolite mod. heavy l.br. clay	a. 450' b. None c. Flat d. Moderate	34'	14½"	20"
83	N.S. Nat.Oak	23	28	do.	a. 450' b. None c. Flat d. Moderate	34'	14½"	20"
84	N.S. Nat.Oak	23	28	do.	a. 450' b. None c. Flat d. Moderate	34'	14½"	22"
85	N.S. Nat.Oak	23	28	do.	a. 450' b. None c. Flat d. Slight	39' 33'	16½" 14"	24" 10½"
86	N.S. Nat.Oak S.P.	23 " "	28 " "	do.	a. 450' b. None c. Flat d. Slight	39' 33"	16½" 14"	24" 10½"
87	N.S. Oak Ash S.P.	23	28	do.	a. 450' b. S.E. c. Slight slope d. Moderate	28' 19'	12" 8"	19" 8½"
88	N.S. Oak Ash S.P.	22 " " "	29 " " "	do.	a. 450' b. S.E. c. Slight slope d. Slight	29' 20' 22' 20'	12" 8" 8½" 8"	18" 8½" " 18"

Opt.	Species	P.Yr.	Age	Geology and soil	a. Altitude b. Aspect c. Slope d. Exposure	Mean ht. of dominants	Mean annual ht. increment	Current annual ht. increments during last 5 yrs.
89	D.F.	21	30	Lower oolite mod. heavy l.br. clay	a. 450' b. None c. Mainly flat d. Moderate	32'	13"	18"
90	D.F.	21	30	do.	a. 450'	32'	13"	18"
	C.P.	"	"		b. None	30'	12"	17"
	N.S.	"	"		c. Mainly flat d. Moderate	32'	13"	19"
[illegible]	C.P.	23	28	do.	a. 450'	40'	17"	18"
	S.S.	"	"		b. None			
	N.S.	"	"		c. Mainly flat d. Moderate	32'	18"	18"
92	C.P.	23	28	do.	a. 450'	40'	17"	18"
	N.S.				b. None	32'	18"	"
	S.S.				c. Flat d. Slight			
93	S.S.	23	28	do.	a. 450'			
	N.S.				b. None	32'	13"	19"
	D.F.				c. Flat	"	"	18"
	C.P.				d. Slight	30'	"	19"
94	S.S.	23	28	do.	a.450'			
	N.S.				b. None	32'	13"	19"
	D.F.				c. Flat	32'	"	18"
	C.P.				d. Slight	30'	"	19"

SALCEY

Cpt.	Species	P.Yr.	Age	Geology and soil	a. Altitude b. Aspect c. Slope d. Exposure	Mean ht. of dominants	Mean Annual ht. increment	Current annual ht. increments during last 5 yrs.
1	Oak	1820/30	120	Great oolite under boulder clay	a. 420'	25'		Nil
	Oak/N.S.	46	5		b. Flat c. None d. Slight	2'6"/2'6"	6"/6"	4" : 4"
2	Oak	1820/30	120	do	do	25'	-	-
3	Oak	"	"			25'	-	-
	Oak/N.S.	44	7	"	"	4'/6'	9"/12"	8" : 12"
4	Oak	1820/30	120	"	"	25'	-	-
	Oak/N.S.	44	7			4'/6'	9"/12"	8" : 12"
5	Oak	1820/30	120	"	"	25'	-	-
	Ash/Be.	15	36			30'/25'	6"/6"	6" : 6"
	Oak/N.S.	46	5			2'6"/2'6"	6"/6"	4" : 4"
	Lime	48	3			2'	4"	3" : 3"
6	Ash/Oak	01	50	"	"	30'/25'	6"/4"	6" : 5"
	Oak	1820/30	120			25'	-	-
7	Oak	-	-	"	"	-	-	-
	Oak/N.S.	46	5			2'6"/2'6"	6"/6"	4" : 4"
8	Oak	1820/30	120	"	"	25'	-	-
	Oak	15	36			20'	6"	6"
	Ash	17	34			30'	6"	7"
9	Ash/Oak	15	36	"	"	25'/20'	6"/6"	6" : 6"
	Oak/N.S.	44	7			4'/5'	6"/9"	7" : 7"
	D.F.	15	36			30'	6"	6"
	Ash/Be.	15	36			25'/20'	6"/6"	6" : 5"
10	Oak	1820/30	120	"	"	25'	-	-
	Oak/N.S.	43	8			5'/6'6"	6"/1'6"	6" : 7"
11	Oak	14	37	"	"	16'	9"	6"
	Beech	14	37			20'	6"	6"
	"	42	9			2'6"	3"	5"
	Oak	42	9			5'0"	6"	6"
	"	43	8			5'0"	6"	6"
12	Oak	1820/30	120	"	a. 400'	25'	-	-
	"	29	22		b. Flat	15'	12"	10"
	Larch	29	22		c. None	20'	18"	10"
	Oak	24	27		d. Slight	17'6"	12"	10"
13	Oak	1820/30	120	"	do.	25'	-	-
14	Oak	05	46	"	"	35'	12"	10"
	Ash	05	46			30'	12"	12"
	Ash/Be.	05	46			30'/6'	12"/6"	12" : 6"
15	Oak	1820/30	120	"	"	25'	-	-
	Ash	14	37			25'	12"	12"
	Oak	33	18			12'	12"	7"
	Beech	"	"			9'	9"	7"
	Ash	"	"			15'	"	7"
	Oak	28	23			12'	12"	7"
	"	14	37			15'	"	12"

Cpt.	Species	P.Yr.	Age	Geology and soil	a. Altitude b. Aspect c. Slope d. Exposure	Mean ht. of dominants	Mean Annual ht. increment	Current annual ht. increments during last 5 years.
16	Oak	1820/30	120	Great oolite	a. 400'	25'	-	-
	"	32	19	under	b. Flat	10'	9"	10"
	"	33	18	boulder clay	c. None	"	"	10"
	"	49	2		d. Slight	2'6"	6"	10"
	N.S.	50	1			1'3"	4"	10"
	Beech	50	1			2'0"	4"	10"
17	Oak	1820/30	120	do	do	25'	-	-
[illegible]	Oak/alder	38	13			12'/18'	6"/12"	6" : 12"
18	[illegible]sh	17	34	"	"	20'	6"	6"
	Oak	08	43			25'	9"	10"
	Pop.	"	"			30'	12"	10"
	Oak/N.S.	44	7			2'6"/2'0"	6"/3"	7" : 10"
19	Oak	1820/30	120	"	"	25'	-	-
	Oak/N.S.	45	6			3'0"	6"	6" : 6"
	Beech	14	37			20'	6"	6"
	Oak	30	21			12'	9"	10"
	Pop.	"	"			30'	18"	14"
20	Oak	1820/30	120	"	a. 370' b. Flat c. None d. Slight	25'	-	-
21) 22) 23)	Oak	"	"	"	do	"	-	-
23	Ash/Syc.	10	41	"	"	25'/25'	12"/12"	12" : 12"
	Oak	05	46			25'	18"	14"
24) 25)	Oak	1820/30	120	"	"	25'	-	-
26	Oak	15	36	"	a. 350'	30'	12"	12"
	"	34	17		b. Flat	12'	9"	10"
	Beech	"	"		c. None	15'	12"	10"
	Oak	35	16		d. Slight	12'	9"	7"
27	Oak	15	36	"	do	30'	12"	7"
	"	35	16			10'	9"	7"
	"	36	15			"	"	7"
[illegible]	Oak	15	36	"	"	30'	9"	7"
	"	34	17			10'	"	7"
	"	36	15			"	"	7"
	Beech	34	17			15'	12"	10"
29	Oak	1820/30	120	"	a. 400' b. Flat c. None d. Slight	25'	-	-
30	Oak	"	"	"	do	"	-	-
	N.Maple	48	3	"	"	4'	9"	5"
31	Oak	1820/30	120	"	"	25'	-	-
32	Oak	"	"	"	a. 420'	"	-	-
	"	36	15		b. Flat	12'	12"	12"
	"	37	14		c. None d. Slight	"	"	12"

Cpt.	Species	P.Yr.	Age	Geology and soil	a. Altitude b. Aspect c. Slope d. Exposure	Mean ht. of dominants	Mean Annual ht. increment	Current annual ht. increments during last 5 years
33	Oak	1820/30	120	Gt.oolite	a. 420'	25'	-	-
	"	37	14	under	b. Flat	12'	12'	12"
				boulder	c. None			
				clay	d. Slight			
34	Oak/Ash	18	33	do	do	16'	6"	7"
	O/ash/pop.					20/25/30'	6/12/18"	7" : 7": 12"
	S.P.	70	81	"	"	30'	-	-
35	Ash	14	37	"	"	20'	6"	6"
	Pop.	"	"			30'	12"	7"
	Oak	"	"			20'	6"	8"
	S.P.	"	"			25'	"	6"
35	Ash							
	Pop.	10	41	"	"	do	do	do
	Oak							
	S.P.							
36	Oak	1820/30	120	"	"	25'	-	-
	"	36	15			12'	12"	12"
	Ash	14	37			20'	6"	6"
	Pop.	"	"			None	-	-
	Oak	"	"			20'	6"	6"
	S.P.	"	"			25'	"	6"
37	Oak	1820/30	120	"	"	25'	-	-
	"	37	14			12'	9"	12"
	"	47	4			2'	4"	-
38	Oak	1820/30	120	"	a. 400'	25'	-	-
					b. Flat			
					c. None			
					d. Slight			
39	Oak	"	"	"	do	25'	-	-
	"	06	45			25'	12"	14"
	"	31	14			12'	"	12"
40	Ash	07	44	"	"	25'	9"	8"
	Oak	32	19			"	12"	12"
	"	47	4			1'6"	3"	2"
41	Oak	1820/30	120	"	"	25'	-	-
	Ash	10	41			"	9"	10"
42	Oak	1820/30	120			25'	-	-
43	Oak	"	"	"	"	"	-	-
	Oak/N.S.	45	6			5'/6'	12"/12"	7" : 10"
44	Oak	1820/30	120	"	"	25'	-	-
	"	37	14			10'	12"	10"
	"	47	4			1'6"	3"	10"
45	Oak	1820/30	120	"	"	25'	-	-
	"	31	20			12'	12"	10"
	"	46	5			2'6"	3"	4"
46	Oak	1820/30	120	"	"	25'	-	-
	Ash	32	19			15'	9"	8"
	Oak	47	4			1'6"	3"	2"
47	Oak	47	4	"	"	1'6"	3"	2"
	Ash	32	19			15'	9"	8"
	Oak	1820/30	120			25'	-	-

Cpt.	Species	P.Yr.	Age	Geology and soil	a. Altitude b. Aspect c. Slope d. Exposure	Mean ht. of dominants	Mean Annual ht. increment	Current annual ht. increments during last 5 years
48	Oak Ash	1820/30 32	120 19	Gt.oolite under boulder clay	a. 400' b. Flat c. None d. Slight	25' 15'	- 9"	- 8"
49	Oak Ash/N.S.	04 08	47 43	do	do	25' 25'/25'	12" 12"/12"	12" 12"/14"
50) 51) 52)	Oak	1820/30	120	"	"	25'	-	-
52	Ash/Be.	10	41	"	"	20'/15'	DB*/12"	- : 6"
53	Oak " N.S.	1820/30 47 "	120 4 "	"	"	25' 2'6" 1'6"	- 6" 3"	- 4" 2"
54) 55) 56)	Oak	1820/30	120	"	"	25'	-	-
56	N.Ash/Be. Oak/N.S.	11 45	40 6	"	"	20'/15' 3'/4'	DB*/6" 8"/12"	- : 6" 6": 6"
57	Oak "	41 1820/30	10 120	"	"	3'6" 25'	9" -	5" -
58) 59)	Oak	"	"	"	"	25'	-	-
59	Oak "	20 46	31 5	"	"	20' 2'6"	9" 6"	6" 4"
60) 61)	Oak	1820/30	120	"	a. 350' b. Flat c. None d. Slight	25'	-	-
61	Pop. Beech	34 39	17 12	"	do	40' 10'	12" 9"	14" 7"

* Dying back

YARDLEY

Cpt.	Species	P.Yr.	Age	Geology and soil	a. Altitude b. Aspect c. Slope d. Exposure	Mean ht. of dominants	Mean annual ht. increment	Current annual ht. increments during last 5 yrs.
1	Pop.	37 45		Oolite Heavy clay	a. 300' b. Not marked	Not taken " "		
	EL/SP	37	14		c. Mainly flat	18'	15"	17"
	Oak	"	"		d. Not severe	12'	10'	10½"
2	EL/SP	37	14	do	a. 300'	18'	15"	17"
	Oak	"	"		b. Not marked c. Flat d. Slight	12'	10"	10½"
3	[illegible]op.	37 45		"	a. 300' b. Not marked	Not taken " "		
	EL/SP	37	14		c. Flat	18'	15"	17"
		"	"		d. Slight	12'	10"	10½"
4	Oak	34	17	"	a. 300' b. None c. Flat d. Slight	10'	6½"	11"
5	Oak	34	17	"	a. 300'	10'	6½"	11"
	Pop.	"	"		b. None c. Flat d. Moderate	30'	21"	36"
6	Oak	34	17	"	As Cpt. 5	10'	6½"	11"
7	Oak	34	17	"	"	"	"	"
8	Oak	43	8	"	"	5'	7½"	9½"
9	Oak/NS	43	8	"	"	"	"	"
10	Oak/NS	43	8	"	"	"	"	"
11	Oak/NS	43	8	"	"	"	"	"
18	EL, SP					20'	12"	15"
	DF, Ash	32	19	"	"	24'	14"	14"
	Pop.					30'	18"	26"
19	EL/DF	21	30	"	a. 350'	32'/35'	12½"/14"	13"/14"
	Oak	32	19		b. None	12'	7"	8"
	Oak/NS	"	"		c. Flat	12'/19'	7"/12"	10"/14"
	Pop.	"	"		d. Moderate	32'	20"	30"
[illegible]	Oak/NS	39	12			5½'	5½"	8"
20	Pop.	27	24	"	a. 350'	40'	20"	27"
		32	19		b. None	30'	18"	26"
	EL	"	"		c. "	20'	12"	15"
	Ash	"	"		d. Slight	"	"	18"
21	EL	32	19	"	As Cpt. 20	18'	11"	13"
22	Oak	35	16	"	"	11'	8"	11"
23	Oak/Ald.	34	17	"	"	12'	8"	11"
28	EL/SP	28	23	"	"	25'/27'	13"/14"	14"/13"
	EL/Ash	32	19			18'/20'	11"/12"	13"/18"
	Oak	40	11			5½'	6"	8"
29	Oak/NS	41	10	"	"	5½'/6½'	6½"/8"	8"/9½"
31	Pop.	24	27	"	"	35'	17"	26"
	Oak	40	11			6'	6½"	8"

Cpt.	Species	P.Yr.	Age	Geology and soil	a. Altitude b. Aspect c. Slope d. Exposure	Mean ht. of dominants	Mean annual ht. increment	Current annual ht. increments during last 5 yrs.
32	Oak/NS	42	9	Oolite heavy clay	a. 350' b. None c. " d. Slight	5'/6'	6½"/8"	8"/9"
33	Oak	40	11	do	As Cpt. 32	6'	6½"	8"
34	EL	23	28	"	"	35'	15"	16"
	Oak/NS	41	10			5½'/6½'	6½"/8"	8"/9½"
		44	7			3'/4'	5"/7"	6"/8"
36	Oak/NS	44	7	"	a. 350' b. None c. Mainly flat d. Slight	3'/4'	5"/7"	6"/8"
		46	5					
37	Oak/NS	41	10	"	a. 350' b. None c. Flat d. Slight	5½'/6½'	6½"/8"	8"/9½"
		42	9			5'/6'	"	"
38	Pop.	22	29	"	a. 300'	55'	22"	30"
	DF.O.Ash	26	25		b. None	25'	12"	15"
	Oak/NS	41	10		c. Flat	6'/6½'	6"	1½"/18"
		42	9		d. Slight	5½'/6'	5½"	"
39	Ash	22	29	"	As Cpt. 38	30'	12"	13"
	EL	22	29			35'	14"	16"
	Oak/NS	42	9			5'/6'	-	8"/9"
40	EL	32	19	Oolite, med. loamy-clay	"	14'-20'	8½"-12"	12"-14"
	Ash	"	"			13'	8"	10"
	Pop.	"	"			22'-36'	13"-22"	18"-24"
41	DF	22	29	"	"	35'	14"	12"
	SS	"	"			25'(occ'l)	10"	10"
	Ash	"	"			29'	12"	12"
	Pop.	25	26			48'	19"	27"
42	Beech	34	17	"	"	12'	8½"	13"
43	NS	27	24	"	"	25'	12½"	13"
	SS	"	"			26'	13"	"
	Oak	"	"			19'	9½"	10"
	SS	33	18			12'	8"	14"
	EL	"	"			14'	9"	"
	Ash	"	"			"	9"	9"
44	DF	22	29	"	"	30'	12"	12"
	EL	33	18			18'	"	14"
	Ash	"	"			"	"	8"
45	EL	33	18	"	a. 300'	18'	12"	14"
	Oak	"	"		b. None	15'	10"	12"
	SP	"	"		c. Flat	18'	12"	15"
	SS	"	"		d. Moderate	12'	8"	14"
	NS	"	"			18'	12"	15"
	Ash	"	"			"	"	8"
	Pop.	-	19			35'	21"	24"
46	EL	33	18	"	As Cpt. 45	18'	12"	14"
	Oak	"	"			15'	10"	12"
	Ash	"	"			16'	"	8"
	Pop.	-	19			35'	21"	24"

Cpt.	Species	P.Yr.	Age	Geology and soil	a. Altitude b. Aspect c. Slope d. Exposure	Mean ht. of dominants	Mean annual ht. increment	Current annual ht. increments during last 5 yrs.
47	SS	24	27	Oolite, med.	a. 300'	20'	9"	10"
	EL	33	18	loamy-clay	b. None	15'	10"	13"
	Oak	"	"		c. Flat	10'	7"	9"
					d. Moderate			
48	EL	35	16	Clay-loam	a. 300'	15'	11"	12"
	SP	"	"		b. None	12'	9"	15"
	NS	"	"		c. Mainly flat	"	"	19"
	Ash	"	"		d. Moderate	11'	8"	9"
49	EL	35	16	"	As Cpt. 48	15'	11"	12"
	SP	"	"			12'	9"	15"
	Ash	"	"			11'	8"	9"
50	EL	35	16	"	a. 300'	18'	13"	14"
	SP	"	"		b) Mainly flat	"	"	16"
					c) with gentle E slope to E of Cpt.			
					d. Moderate			
51	NS	31	20	Oolite clay-loam	a. 300'	24'	14"	15"
					b. None			
					c. Flat			
					d. Moderate			
52	NS	31	20	"	As Cpt. 51	22'	13"	15"
	KNOTTING FOX							
1	Oak	36	15	Oolite l.br.clay	a. 300'	14'	11½"	18"
					b. Not marked			
					c. None			
					d. Slight			
2	Oak	36	15	"	As Cpt. 1	14'	11½"	18"
		37	14			11'	9½"	"
3	Oak	37	14	"	"	14'	12"	13"
	SP	"	"			20'	17"	18"
4	Oak	37	14	"	"	14'	12"	13"
	SP	"	"			20'	17"	18"
5	Oak	36	15	"	"	15'	12"	13"
	SP	37	14			20'	17"	18"
6	Oak	37	14	"	"	14'	12"	13"
7	Oak	37	14	"	"	14'	12"	13"

Opt	Species	P.Yr.	Age	Geology and soil	a. Altitude b. Aspect c. Slope d. Exposure	Mean ht. of dominants	Mean annual ht. increment	Current annual ht. increments during last 5 yrs.
1	Ash	20	31	Old pasture	a. 175'	35'	13"	12"
	S.P.	"	"	land. Heavy	b. North	42'	16	18"
	E.L.	"	"	clay	c. Gently	40'	"	17"
	[redacted]S.	"	"		d. Little or	"	"	19"
	Oak	48	3		none	3'	12"	12"
2	Oak	20	31	do.	a. 175'-200'	35'	13"	16"
	Ash	"	"		b. North	"	"	13"
	S.P.	"	"		c. Gentle	40'	16"	16"
	E.L.	"	"		d. Little or	"	"	17"
	N.S.	"	"		none	"	"	18"
3	Oak	20	31	do.	a. 175'	25'	10"	12"
	Ash	"	"		b. North	35'	13"	13"
	S.P.	"	"		c. Gentle	"	"	17"
	E.L.	"	"		d. Little	38'	14"	18"
	N.S.	"	"			40'	16"	"
4	Oak	45	6	do.	a. 175'	3'	6"	6"
	N.S.	23	28		b. N.W.	30'	13"	16"
	"	28	23		c. Moderate	25'	12"	17"
					d. Little			
5	Oak	28	23	do.	a. 175'-200'	15'	7"	10"
	N.S.	"	"		b. North	25'	13"	16"
	SP(BLUE)	31	20		c. Gentle	15'	9"	14"
					d. Moderate			
6	Oak	28	23	do.	a. 150'-175'	10'	6"	7"
	N.S.	"	"		b. North	25'	13"	16"
					c. Gentle			
					d. Moderate			
7	Oak	28	23	do.	a. 150'-175'	18'	12"	12"
	N.S.	"	"		b. North	25'	13"	14"
	[redacted]				c. Gentle			
					d. Moderate			
8	Ash	23	28	do.	a. 200'	40'	17"	18"
	N.S.	"	"		b. N.W.	35'	14"	16"
	J.L.	"	"		c. Mod. flat	"	"	"
					d. Nil			
9	Ash	23	28	do.	a. 175'-200'	35'	14"	18"
	N.S.	"	"		b. N.W.	"	"	16"
	J.L.	"	"		c. Mod. flat	"	"	14"
					d. Nil			
0	Oak	24	27	do.	a. 175'-200'	33'	14"	18"
	N.S.	"	"		b. N.	35'	16"	"
					c. Mod. flat			
					d. Little			
1	Ash	25	26	do.	a. 175'-200'	35'	17"	18"
	J.L.	"	"		b. N.E.	40'	18"	22"
	E.L.	"	"		c. Gentle	35'	17"	18"
	N.S.	"	"		d. Mod.	30'	14"	"

Cpt	Species	P.Yr.	Age	Geology and soil	a. Altitude b. Aspect c. Slope d. Exposure	Mean ht. of dominants	Mean annual ht. increments	Current annual ht increments during last 5 yrs
12	Ash E.L.	25 "	26 "	Old pasture land. Heavy clay	a. 200' b. N.E. c. Mod. flat d. Little	35' "	17" "	18" 19"
13	Ash J.L. [illegible]S. Ash E.L. N.S.	24 " " 26 " "	27 " " 25 " "	do.	As Cpt. 12	30' " " 28' 30' "	13" " " " 14" "	14" 16" " 14" 16" "
14	D.F. Nat.elm	22 "	29 "	Old woodland heavy clay	a. 175'-200' b. N.W. c. Gentle d. Moderate	54' 30'	18" 12"	20" 12"
15	D.F. Nat.elm	22 "	29 "	do.	a. 175' b. N.E. c. Gentle d. Moderate	55' 30'	18" 12"	20" 12"
16	Oak Ash E.L. N.S.	27 " " "	24 " " "	As for Cpt. 12	a. 150'-175' b. N.E. c. Moderate d. "	22' 30' 35' 28'	11" 14" 18" 13"	11" 16" 18" 14"
17	Oak N.S.	27 "	24 "	do.	a. 150' b. S.E. c. Gentle d. Moderate	25' 28'	12" 13"	12" 14"
18	D.F. Nat.ash	22 "	29 "	do.	As for Cpt. 17	55' 35'	18" 14"	22" 16"
19	Oak	28	23	As for Cpt. 14	a. 175'-200' b. S.-S.E. c. Moderate d. "	20'	10"	11"
20	[illegible]k Ash E.L. N.S.	26 " " "	25 " " "	As for Cpt. 12	a. 200' b. South c. Mod. flat d. Little or none	20' 28' 30' "	10" 13" 14" "	11" 14" " 18"
21	Oak D.F.	23 "	28 "	do.	a. 150' b. N.W.-W. c. Mod. flat d. Little	25' 30'	11" 12"	12" 14"
22	Oak	23	28	do.	a. 175' b. East c. Flat d. Nil	25'	12"	12"
23	Oak "	21 24	30 27	do.	a. 175' b. East c. Flat d. Little	35' "	14" 16"	16" "
24A	Oak	21	30	do.	a. 175' b. S.W.-S. c. Mod. Flat d Moderate	35'	14"	16"

Cpt	Species	P.Yr.	Age	Geology and soil	a. Altitude b. Aspect c. Slope d. Exposure	Mean ht. of dominants	Mean annual ht. increment	Current annual ht. increments during last 5 yrs.
24B	Oak N.S.	21 "	30 "	Old pasture land. Heavy clay	a. 150'-175' b. S.W. c. Gentle d. Little	30' 35'	12" 14"	14" 16"
25	Oak	21	30	do.	a. 175' b. South c. Flat d. Nil	30'	12"	16"
26	Oak N.S.	21 "	30 "	do.	a. 175' b. N.E. c. Gentle d. Little	35' 50'	14" 20"	18" 23"
27	Oak N.S.	25 "	26 "	do.	a. 175' b. North c. Gentle d. Little	20' 25'	10" 12"	11" 16"
28	Oak N.S.	25 "	26 "	do.	a. 175'-200' b. North c. Moderate d. Little	20' 25'	10" 12"	11" 16"
29	Oak N.S. Oak N.S.	25 26 31 "	26 25 20 "	do.	a. 200' b. S.E. c. Mod. flat d. Moderate	20' 30' 25' "	10" 14" " "	11" 14" 16" 18"
30	D.F. Ash Pop.	26 " "	25 " "	Old woodland heavy clays	a. 175'-200' b. South c. Gentle d. Moderate	40' 35' 50'	19" 17" 24"	19" 18" 30"
31	D.F. Ash	26 "	25 "	do.	As Cpt. 30	33' 30'	17" 14"	18" "
32	D.F. Ash	27 "	24 "	do.	a. 175' b. South c. Gentle d. Moderate	30' "	16" "	18" "
33	D.F. Ash	27 "	24 "	do.	a. 175'-200' b. South c. Moderate d. "	35' 30'	17" 16"	19" 18"
34	S.S.	31	20	do.	As for Cpt. 30	25'	14"	18"
35	S.S. N.S.	31 "	20 "	do.	a. 175' b. South c. Mod. flat d. Moderate	20' "	12" "	18" 16"
36	N.S.	30	21	Old pasture heavy clays	a. 175'-200' b. East c. Gentle d. Moderate	25'	14"	17"
37	Oak N.S.	29 "	22 "	do.	a. 175'-200' b. N.E. c. Gentle d. Moderate	30' 25'	17" 13"	18" 14"

Cpt	Species	P.Yr.	Age	Geology and soil	a. Altitude b. Aspect c. Slope d. Exposure	Mean ht. of dominants	Mean annual ht. increments	Current annual ht. increment during last 5 y
38	Oak	29	22	Old pasture heavy clays	a. 175'-200' b. North c. Gentle d. Moderate	33' 35'	18" 19"	18" 19"
39	N.S. Nat.elm	29 "	22 "	Old woodland heavy clays	a. 175' b. North c. Gentle d. Moderate	35' 30'	18" 16"	18" 17"
40	[redacted] planted				a. 175' b. N.E. c. Gentle d. Little			
					<u>Oundle Wood</u>			
1a	Ash(cop)	31 acc	33	Old woodland heavy clays	a. 150'-200'	50'	18"	10"
b	"	"	"		b. Moderate	45'	16"	"
c	Ash	"	20		c. North	40'	24"	12"
	E.L.	"	"		d. Little	50'	30"	"
2	Ash	31	20	do.	a. 150'-200'	30'	18"	12"
	Ash(cop)	31 acc	33		b. North	45'	16"	10"
	Beech	30	21		c. Moderate	15'	6"	6"
	S.P.	31	20		d. Little	20'	12"	18"
3	Ash	29	22	do.	a. 150'-200'	20'	10"	6"
	Nat.elm	"	"		b. North	40'	17"	12"
	S.P.	31	20		c. Moderate d. Little or nil.	"	24"	18"
4	Ash	29	22	do.	a. 150'-"00'	20'	10"	6"
	Nat.elm	"	"		b. N.E.	40'	17"	12"
	S.P.	"	"		c. Mod. flat d. Nil.	35'	18"	18"
5	Ash	30	21	do.	As for Cpt. 4	25'	14"	18"
	Beech	"	"			15'	8"	6"
	S.P.	"	"			35'	20"	18"
6	[redacted]sh	30	21	do.	As for Cpt. 4	25'	14"	9"
	[redacted]eech	"	"			15'	8"	6"
	Elm(cop)	29	22			30'	14"	14"
	S.P.	30	21			35'	20"	18"

BEDFORD PURLIEUS

Cpt.	Species	P.Yr.	Age	Geology and soil	a. Altitude b. Aspect c. Slope d. Exposure	Mean ht. of dominants	Mean annual ht. increment	Current annual ht. increments during last 5 years
1	Not planted			Sandy loam weathered oolite	a. 200' b. N & S c. Slight fall to centre d. Moderate			
2) 3)	As for Compartment 1 except soil from sandy loam to clay							
4	Oak	36	15	Sandy loam to boulder clay outcrop of pure sand	a. 200' b. N c. Gentle d. Nil sheltered	12'9"	10"	12"
[redacted]	Oak	35	16	Boulder clay over oolite	a. 200' b. N c. Gentle d. Sheltered	13'4"	10"	13"
6	Oak	35	16	Boulder clay	a. 200' b. N & S c. Gentle d. Sheltered	15'	11"	12"
7	Oak	35	16	Boulder clay & sandy loam	do	15'1"	11"	12"
8	Oak	36	15	Sandy loam to heavy clay	do	10'8"	8½"	10"
9	Oak	36	15	Clay	a. 200' b. South c. Gentle d. Sheltered	12'8"	10"	11"
10	Oak	36	15	Boulder clay	a. 200' b. South c. Moderate d. Sheltered	10'8"	8½"	10"
11	Oak	40	11	Boulder clay to sandy loam	a. 200'-180' b. South c. Medium d. Sheltered	8'9"	9½"	8½"
12	Oak	40	11	do with oolitic limestone	a. 200' b. South c. Moderate d. Sheltered	8'10"	10"	11"
[redacted] 12	SP	40	11	Sandy loam to oolite on surface	do	8'7"	9½"	12½"
13	Oak	40	11	Boulder clay to sandy loam with oolite	do	7'8"	8½"	9"
13	SP	40	11	Sandy loam to oolite on surface	do	11'4"	12½"	17"
14	Oak	40	11	Heavy clay	a. 200' b. North c. Sharp d. Sheltered	9'11"	11"	10"
15	Oak	40	11	Sandy loam to clay	a. 200' b. North c. Moderate d. Sheltered	8'11"	9½"	10½"

Cpt.	Species	P.Yr.	Age	Geology and soil	a. Altitude b. Aspect c. Slope d. Exposure	Mean ht. of dominants	Mean annual ht. increments	Current annual ht increment during last 5 yrs
16	Beech SP	40 40	11 11	Sandy loam with oolite	a. 200' b. South c. Gentle d. Sheltered	7'1" 8'5"	7½" 10"	8" 12"
17	Oak	43	8	Heavy clay	a. 200' b. NE c. Hardly noticeable d. High degree	7'1"	10½"	8"
18	Oak	43	8	do	do	6'11"	10½"	8½"
19	Oak	43	9	do	a. 200' b. North c. Very slight d. Sheltered	7'10"	10½"	10½"
20	Oak NS	41 "	10 "	Clay to oolite outcrop of pure sand	a. 200' b. East c. Moderate d. Slight	10'3" 11'1"	12½" 13½"	12½" 12½"
21	Oak	42	9	Heavy clay	a. 200' b. South c. Very slight d. Moderate	7'9"	10½"	9"
22	Oak	42	9	do	a. 200' b. SE c. Very slight d. Moderate	6'6"	8½"	8"
23	Oak	42	9	do	a. 200' b. SE & W c. Very slight d. Sheltered	7'8"	10"	[illegible]
24	Oak	43	8	do	a. 210-200' b. South c. 10' slope d. Sheltered	Crop not weeded since planting, accepting NR. In thicket stages.		
25	Oak	43	8	Heavy clay	a. 200' b. South c. Slight slope d. Sheltered	7'10"	11½"	10½"
26	Occupied by main domestic site ex Kings Cliffe R.A.F. Station. Retained by Air Ministry and at present used as a hostel.							
27	Oak	41	10	Clay to sandy loam with oolite close to surface	a. 200' b. South c. Slight d. Sheltered	11'3"	13½"	11½"
27	SP	41	10	Oolite limestone with sandy loam	a. 200' b. South c. Hardly noticeable d. Sheltered	5'2"	6"	9½"
28	Oak NS	41 "	10 "	Clay to sandy loam with weathered oolite outcrop of pure sand	a. 200' b. E & S c. Very slight d. Sheltered	9'4" 11'6"	11" 14"	10" 15"

FERMYN

Cpt.	Species	P.Yr.	Age	Geology and soil	a. Altitude b. Aspect c. Slope d. Exposure	Mean ht. of dominants	Mean annual ht. increment	Current annual ht. increments during last 5 years.
1	Oak NS	30 30	21 21	12-16"l.br. med. heavy clay, overlying a blue-grey clay with med. stone content.	a. 300' b. Not marked c. Mainly flat d. Slight	19' 26'	11" 15"	11½" 15½"
2	Oak NS	30	21	do	a. 300' b. None c. None d. Slight	19' 24'	11" 13"	11½" 14"
3	NS	30	21	do	a. 300' b. None c. None d. Slight	22'	12"	14"
4	Oak NS SP	30 " 46	21 " 5	do	a. 300' b. None c. None d. Slight	18' 22'	11" 12"	12" 14"
5	NS SP	30 38	21 13	do	a. 300' b. None c. None d. Slight	26'	14½"	15"
6	NS Oak	30 44	21 7	do	a. 300' b. None c. None d. Slight	26' 4'	14½" 7"	16" 9"
7	NS Oak "	42 43 42 43	9 8 9 8	do	a. 300' b. None c. None d. Slight	6½' 5' 6' 4½'	8½" 7½" 8" 7½"	10" 9" " "
8	Oak	31	20	do	a. 300' b. None c. None d. Slight	15'	9"	8"
9	NS Oak Ash	31 " "	20 " "	do	a. 300' b. None c. None d. Slight	28' 15' 28'	17" 9" 17"	19" 10" 12"
10	Oak NS EL Oak "	31 " " " 45	20 " " " 6	do	a. 300' b. None c. None d. Slight	15' 20' 23' 20' 6½'	9" 12" 16½" 12" 13"	10" 14" 16' 12" 9"
11	Oak	45	6	do	a. 300' b. None c. None d. Slight	4'	8"	9"
12	Oak	48	3	do	a. 300' b. None c. None d. Slight	3'	12"	8"
13	Oak [illegible]	47 48	4 3	do	a. 300' b. None c. None d. Slight	3½' 3'	10½" 12"	

Cpt.	Species	P.yr.	Age	Geology and soil	a. Altitude b. Aspect c. Slope d. Exposure	Mean ht. of dominants	Mean annual ht. increment	Current annual ht. increments during last 5 years.
14	Oak "	43 44	8 7	As Cpt. 1	a. 300' b. None c. Slightly rolling d. Slight	4½' 4'	7½" 7"	9" "
16	Oak	44	7	do	a. 300' b. None c. Slightly rolling d. Slight	4'	7"	9"
17	Acc.Copp. Beech	50 "	- 1	do	a. 300' b. None c. Slightly rolling d. Slight			
18				do	a. 300' b. None c. Mainly flat d. Slight			
19	SS Ash Syc.	32 " "	19 " "	Med.heavy clay	a. 300' b. Not marked c. Mainly flat d. Slight	14'(6'-16') 24' 32'	8½" 15" 20"	9½" 11" 15"
20	SS Ash	32 "	19 "	do	a. 300' b. None c. Mainly flat d. Slight	14'(6'-16') 24'	8½" 15"	10" 11"
21	SS	34	17	do	a. 300' b. Not marked c. Mainly flat SW slope in W portion d. Slight	14'	10"	13"
22	Oak	34	17	do	a. 300' b. Not marked c. Mainly flat becoming rolling in SW Portion d. Slight	11'	8"	10"
23	Oak	35	16	do	As Cpt. 22	6'	4½"	9"
24	Oak	36	15	do	a. 300' b. Not marked c. Mainly flat d. Slight	12'	9½"	10"
25	Oak	36	15	do	As Cpt. 24	12'	9½"	10"
26	Oak	39	12	do	As Cpt. 24	9'	9"	9½"
27	Acc.Copp.	51	-	do	a. 300' b. None c. Flat d. Slight			
28) 29) 30)	Blank			do	As Cpt. 27			
31	Oak	30	21	do Old farm land	a. 300' b. Not marked c. Slightly rolling d. Slight	18'	11"	9"

Cpt.	Species	P.Yr.	Age	Geology and soil	a. Altitude b. Aspect c. Slope d. Exposure	Mean ht. of dominants	Mean annual ht. increment	Current annual ht. increments during las 5 years.
32	Oak	30	21	Med. heavy	a. 300'	13'-15'	7½"	8"
	SP	"	"	clay, old	b. None	29'	16½"	26"
				farm land	c. Flat			
					d. Slight			
33	Oak	30	21	do	As Cpt. 32	22'	12"	13"
	Thuya	"	"			28'	16"	-
34	SP	33	18	do	a. 300'	24'	16"	24"
	Oak	"	"		b. Not marked	20'	13"	12"
	NS	"	"		c. Slightly undulating	22'	14"	14"
					d. Slight			
35	EL	33	18	Med. heavy	a. 300'	24'	16"	14"
	Ash	"	"	clay	b. None	20'	13"	15"
					c. None			
					d. Slight			
36	SP	31	20	Med. heavy	a. 300'	30'	18"	24"
	EL	32,33	21,22	clay, old	b. None	"	18½"	13"
	Oak	31	20	farm land	c. None	12'	7"	12"
	NS	"	"		d. Slight	25'	15"	24"
37	NS	31	20	do	As Cpt. 36	25'	15"	24"
	Oak	"	"			12'	7"	12"
38	Oak	38	13	Med. heavy clay	do	14'	13"	14"
39	Oak	31	20	As Cpt. 36	do	16'	9½"	14½"
	NS	"	"			26'	15½"	24"
40	Oak	36	15	Med. heavy	a. 300'	14'	11"	11"
	"	31	20	clay	b. Not marked	8'-12'	5"-7"	10"-11"
	NS	"	"		c. Slightly rolling	10'-20'	6"-12"	13"-24"
					d. Slight			
41	Oak	36	15	do	As Cpt. 40	12'	9½"	11"
	NS	"	"					
42-46 Agricultural land								
47	Oak	35	16	do	a. 250'	12'	9"	9"
	EL	"	"		b. Mainly SW	28'	21"	12"
					c. Undulating			
					d. Slight			
48	Oak	34	17	do	As Cpt. 47	12'	8"	8"
49	Oak	39	12	do	a. 250'	12'	12"	18"
	"	40	11		b. None			
	Beech	"	"		c. Flat	9'	10"	14"
					d. Slight			
50	NS	32	19	do	a. 250'	12'	7½"	12"
	Oak	38	13	old farm land	b. None	2'-5'	2"-4½"	5"-7"
					c. None			
					d. Slight			
51	EL	33	18	As Cpt.50	As Cpt.50	28'	18"	14"
	Oak	"	"			3'-12'	2"-8"	4½"-12"
52	NS	32	19	do	do			
	Oak	"	"					
	EL	33	18			20'-28'	13"-18"	14"
	Oak	"	"			5'-15'	3"-10"	5"-14"

Cpt.	Species	P.Yr.	Age	Geology and soil	a. Altitude b. Aspect c. Slope d. Exposure	Mean ht. of dominants	Mean annual ht. increment	Current annual ht. increments during last 5 years
53	Oak	42	8	Med. heavy clay	a. 250' b. None c. None d. Slight	11'	16"	15"
54	Agricultural land							
55	Oak	34	17	do	As Cpt. 53	14'	10"	10"
	EL	"	"			28'	20"	12"
	NS	41	10			10'	12"	22"
Nursery								
	NS	44	7			$4\frac{1}{2}$"	8"	9"
	"	46	5			$2\frac{1}{2}$"	6"	

FINNSHADE

Cpt.	Species	P.Yr.	Age	Geology and soil	a. Altitude b. Aspect c. Slope d. Exposure	Mean ht. of dominants	Mean annual ht. increment	Current annual ht. increments during last 5 years.
1	Pop.[1]/ Ash/ Coppice	23	28	Estuarine clays over thick bed of blue clay at 2-6' deep. A few stony (Cornbrash) areas on shoulders	a. 200'-250' b. South c. V. slight d. Moderate	40-45' 30-40' do	16" 14" "	19-29" 12-19" "
2	Pop.[2]/ Coppice	23	28	As Cpt. 1	As Cpt. 1	40-45' 30-40'	16" 14"	19-29" 12-19"
3	Pop./ Ash, etc)[3]	25	26	do but has more nat. drainage	"	30-70' 25-50'	12-30" 10-20"	24-48" 12-24"
4	Pop.[4]/ Ash, etc.	25	26	As Cpt. 1	"	30-40' 25-30'	15-20" 12-14"	14-24" 10-19"
5	Pop./ Ash, etc.	27	24	do	a. 250'-300' b.) c.) None d. Mod. to severe	30-35' 25'	13-14" 12"	14-19" 12"
6	Pop./ Coppice Ash[5] SP	27 38	24 13	" (3 groups)	a. 300' b.) c.) None d. Mod. to severe	35-60' 20-45' 30-40' 20-25'	18-30" 9-10" ? 3" 22"	24-36" 10-14" 5" 29"
7	Pop.[6]/ Coppice	28	23	As Cpt.1	As Cpt. 5	40' 25'	16" 12"	22-31" 12"
8	Pop./ Coppice	30	21	do	do. but some slight nat. drainage	15-35' 15-25'	12" 8"	19-29" 7-14"
9	Pop./ Coppice	30	21	"	As Cpt. 5	20-25' 15'	12-15" 9"	17-24" 24"
10	Pop./ Coppice	30	21	"	do	20' 15'	10" 8"	12-14" 10"
[illegible]	Pop./ Coppice	31	20	"	"	25-35' 20'	15-20" 12"	17-24" 11"
12	Oak/ EL b.u. with NS/ SP Ash crop	33 (37)	18 14	"	a. 300' b. SE c. Slight d. "	15' 15-20' 6' 8' 15'	10" 15" 6" 10" 12"	7-14" 10-[illegible]" 12" 14" 22"

[1] Very few pop. left on area.
[2] do. some are P. trichocarpa.
[3] The better growth is near the stream
[4] Pop. very few and irregular.
[5] Old coppice, about 3 ac. in south.
[6] Some P. trichocarpa have canker.

Cpt.	Species	P.Yr.	Age	Geology and soil	a. Altitude b. Aspect c. Slope d. Exposure	Mean ht. of dominants	Mean annual ht. increment	Current annual ht. increments during last 5 yrs.
13	Oak/ Coppice strips	35	16	As Cpt. 1	a. 250' b. SE c. V. slight d. Mod.easterly			
14) 15)	Not planted - mixed coppice 15'							
16-19	Do not exist							
20	Pop./ Coppice	30	21	As Cpt. 1	a. 250'-200' b. South c. V. slight d. Mod. SW.	20-30' 20-25'	12" 9"	17-24" 10"
[redacted]	DF	28	23	do. but is on the edge of the blue clay subsoil	a. 250' b. West c. Mod.slight d. V. mod.	30-40'	15-20"	14-24"
	EL/ Ash with NS/ SP.b.u's & SS/ DF	28	23	do	As for DF above	25-35' 15-25' 25-35' 15- 25-35'	12-15" 6-12" 12-15" ? 12-15"	10-14" 7-10" 10-19" 14-19" 10-24"
21	Ash/ EL/ NS	28	23	As Cpt.1	a. 300' b.) None c.) d. V. slight	25' " 20'	12" 14" 15"	12-14" 12-19" 12-22"
	O strips in thorn	39	12	do		5-8' 4-10'	6"	24-29"
	NS	50	1			9"		
	NS	51				9"		
22	EL/ Ash/ Beech	26	25	do.but on old farm-land	As Cpt. 1	20-35' 20-30'	12" 10"	12-17" "
23	EL/ Ash/ Beech	26	25	As Cpt. 1	do	20-30' 20-25' 5-25' (v.few)	12" 10" "	12-19" 7-12" 7-19"
[redacted]	Ash	26	25	Old woodland		15-20'	10"	7-12"
	NS					20-25'	12"	12-19"
24	EL/ Ash/ NS	27	24	As Cpt. 1 but some loose limestone appears	a. 250' b. NW c. Slight d. Mod.	25-30' 20-25' 25-30'	14" 10" 14"	12-22" 7-12" 12-22"
25	EL/ Ash NS Pop. NS Ash scrub	27 ?27 " "	24 ?	As Cpt. 24	As Cpt. 24	25-45' 20-25' 25-40' 10-15' 20' "	12-20" 10-12" 12-15" 9" 12" "	12-22" 12-14" 12-22" 5" 12-19" 7-12"

[1] Some of the SS have long shoots of 36"

Cpt.	Species	P.Yr.	Age	Geology and soil	a. Altitude b. Aspect c. Slope d. Exposure	Mean ht. of dominants	Mean annual ht. increment	Current annual ht. increments during last 5 years.
26	Ash scrub		?25	Cornbrash	a. 200' b. NW c. Good d. Mod. N	15-20'		
	NS/SP)[1]	27	24	"	do	20-25'	12"	12-17"
						do	"	"
	Pop.[2]	31	20		a. 150'	40'	24"	24-36"
27	Ash, b.u.	29	P[3]	"	a. 200'			
	SP/	32	19		b. West	20'	12"	7-14"
	EL/				c. Slight	-	-	-
	Ash				d. None	15-25'	10"	5-10"
	Ash/scrub	29	22			15-20'	"	7"
28	Oak/	35	16	"	As Cpt.27	10-15'	12"	5-12"
	Scrub					do	"	12"
29	Oak/	41	10	"	a. 200'	0. 5-6'	6"	5-7"
	NS v.few				b. NW	5-8'	6-7"	10"
	Syc./				c. Slight	5-15'	12"	12-17"
	Maple	41	10		d. Nil	do	"	"
	(Syc./		41			40-50'	"	"
	(Maple		(approx)			do	"	NIL
	(U.P.Be.	49						
30	Ash	10	"	"	As Cpt. 29	20'	6"	NIL
	U.P.Be.	50/51						
	Pop.	41	10			10-15'	12-15"	12"
	EL	41	10			do	do	19"
	SP	41	10			5-8'	6-9"	12"
	NS/	41	10			5-7'	6-7"	7-12"
	Oak					5'	6"	5"
	CP	49	3			-1'		
31	Ash/	32	19	"	a. 200'	6-8'	5"	5-10"
	EL				b. North	20'	12"	10-19"
	Ash	00[3]	40		c. Slight	35'	10"	5-7"
	Oak	43	8		d. Nil	5'	7"	7"
32	SS	32	19	"	As Cpt. 31	15'	9"	7-10"
	EL/	32	19			10-15'	8"	10-17"
	Ash					6-8'	4-6"	5-10"
	Ash	00[3]	40			30'	10"	5-7"
33	(Ash/	33	18	"	do	10-15'	10"	7-10"
	(EL					-	-	-
	(bu.SS		?			10-15'	10"	5-12"
	Oak	-	18			20-25'	12-15"	10-19"
34	Ash	33	18	"	"	20'	12"	12"
	Ash/	33	18			6-10'	4"	5"
	EL					15-20'	12"	10-14"
35	Oak	42	9	"	a. 250'-300'	6-8'	10"	7-10"
	Beech	"	"		b. North c. Slight d. Slight, NW	7-8'	10"	10-14"
36	Oak	49	3		a. 300' b.) None c.) d. Slight	10"	-	-
37	Ash	12	39	"	As Cpt. 36	25'	8"	-
	Oak	43	8			5-6'	"	10"

[1] The SP are mostly on the higher and dry land and the NS on the lower land.
[2] Near stream
[3] Old coppice

Cpt.	Species	P.Yr.	Age	Geology and soil	a. Altitude b. Aspect c. Slope d. Exposure	Mean hts. of dominants	Mean annual ht. increment	Current annual ht. increments during last 5 years
38	Oak/ SP/ NS/ Ash	30	21	As Cpt.26	As Cpt. 36	15-20' 20' 20-25' 15'	10" " 12" 9"	10" 12-17" 14-17" 10-14"
39	Blank	52						
40	Oak/ NS	31	20	do	a. 200-250' b. Open c. Slight d. Open, mod.	20-25' do	12-14" do	10-14" 12-18"
41	Oak/ NS	31	20	"	As Cpt. 40	20-25' 25-30'	12-14" 15-20"	10-14" 14-24"
[illegible]	[illegible]p.	31	20			35-40'	21-24"	24-36"
	WAKERLEY							
1	Ash/) Maple/) Birch)	Not yet handed over				30'		
2	SS/ SP/ NS	29	22	Well-drained clay loam: cornbrash	a. 200-250' b. SE c. Slight d. None	10-15' do 15-25'	6" " 9-12"	5-12" 10-19" 10-24"
3	SS/b.u. NS/ SS b.u. SP	29 31 37	22 20 14	As Cpt. 2 but more stone	As Cpt. 2	10-15' 10-20' 15'	6" 6-12" 12-15"	5-12" 10-19" 12-19"
4	SS/ NS b.u. SP	30	31	As Cpt. 2 but better soil	As Cpt. 2 but S.aspect	15-25' do 10-12'	9-12" do 12"	5-12" 7-22" 12"
5	SS EL (Hwd.cop. (Oak (Ash (Bi.	31 31 49	20 20 20	do	do	10' 25-30' 25' " 25-30'	6" 15-18" 15" " 15-18"	5-10" 12-29" 12" " "
6	EL/ Beech Oak/ NS b.u.SP	32 32 40?	19 19 ?	"	a. 250-300' b.) c.)As above d.)	25-30' - 15-20' 15-25' 15'	15-18" 9-12" 10-15"	12-24" 7-14" 10-17" 12-19"
7	O groups in scrub O complete) replant)	34 35	17	"	a. 300' b.) c.)As above d.)	8-10' 20-25'	8-9" 14-15"	7-14" 7-19"
8	SS b.u. SP EL Ash grps in scrub	31 40? 31 31	20 20 20	"	As Cpt. 7	15-20' 15' 20-25' 15-20' 20'	9-12" 12" 12-15" 9-12" 12"	5-12" 10-19" 14-22" 7-12" 12"
9	SS) NS) b.u.SP b.u.syc.	31 40? 38?	20 11? 13?	"	do	15-20' 15-25' 15' 10-15'	9-12" 9-15" 12"	5-12" 7-22" 10-19" 10-14"

Cpt.	Species	P.yr.	Age	Geology and soil	a. Altitude b. Aspect c. Slope d. Exposure	Mean hts. of dominants	Mean annual ht. increment	Current annual ht. increments during last 5 years
10	Hwd.copp.	46[1]	25?	As Cpt. 2	As Cpt. 7	30-35'	12-15"	14-22"
11	do	47[1]	20	do	do	30'	18"	14"
	DF/replanted	47	4			5-6'	12"	
	SP					4'	15"	
	Th/LC	47	4			3'	9"	
	Oak	47	4			1.5'	poor	
	"	48	3			2-3'	good	
12	Taken over entirely by Air Ministry							
13 pt.	Oak/ Coppice	35	16	Loamy clay	a. 300' b. Open c. None d. Open	15' 15-20'	12" 12-15"	14-19" 14-22"
14	Oak/	29	22	do	do	20-25'	12"	10-14"
	NS					25'	"	12-17"
	Nat.ash	29	22			25-30'	14-16"	12"
	NS[2]	38	13			15'	12"	17"
15	O/ash cop	29	30	"	"	35-40'	12"	12-14"
	DF/	29	22			30-35'	18-20"	10-24"
	NS/					30-40'	18-22"	"
	EL					do	do	"
	NS/oak[3]	29	22			20-25'	12"	12"
16	Tenanted			"	"			
17	Oak/	40	11	"	"	4-6'	6"	10"
	NS					4-8'	"	"
	Oak/	41	10			4-6'	"	"
	NS					4-7'	"	"
	SP/	41	10			4-6'	"	7-12"
	Beech					5-7'	"	5-14"
18	Oak/	39	12	"	"	6-10'	6-9"	7-14"
	Birch					15-20'	12-20"	12-19"
	SP/	40	11			5-6'	5-6"	10-12"
	Beech					5-7'	"	7-14"
	Oak	40	11			5-6'	"	7-10"
19	O/ash/copp.	29	30	"	"	30-35'	12"	12"
	NS/	29	22			25'	"	10-19"
	EL					25-30'	15"	12-22"
	Oak/	29	22			15-20'	10"	5-14"
	NS					"	"	5-17"
	Oak	29	22			4-8'		5-10"
	Scrub					irregular		10-48"
	b.u.pop.							
20	Oak	29	22	"	"	15'	10"	10"
	b.u. Be.					-	-	-
	O/A cop.	29	30			30-35'	12"	12"
	NS/oak	39	12			4-6'	6"	?
	b.u.SP		?			"	"	?

[1]Thinned
[2]Replanted after fire
[3]NS removed 51.

Cpt.	Species	P.Yr.	Age	Geology and soil	a. Altitude b. Aspect c. Slope d. Exposure	Mean ht. of dominants	Mean annual ht. increment	Current annual ht. increments during last 5 yrs.
21	Oak[1]	30	21	Clay loam	a. 300'	15'	9"	5"-12"
	Oak	39	12	old woodland	b. South	5-6'	6"	7"-10"
	Oak/	39	12		c. Fair	6'	"	10"-12"
	Bi.				d. None	12-15'	12"	14"-22"
22	O.copp.	22	29	As Cpt. 21	As Cpt. 21	30'	12"	12"
	Oak	30	21			20'	"	12-14"
	Oak/	39	12			5-7'	6-9"	12"
	Bi.					15'	12"	17"
	Oak/	40	11			5'	5"	10"
	NS/					6'	6"	12"
	Be.					5'	5"	10"
23	Oak/ NS/ Be.	40	11	do	do	As Cpt. 22 above		
	Hwd.cop.	22?	29			30'	12"	12"
	Bi, etc.	?	30[2]			30-35'	12-18"	14"
24	Oak/ NS	40	11	Clay loam but old grassland	"	1-3' None		

[1]Oak b.u. 36 after Dg. failed

[2]Thinned 50.

TABLE I

From	By	Date	Plantations acquired	Plantable excluding Col(4)	Nurseries	Agricultural	F.W.H.	Unplantable	Other land	Total
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10-13)	(14)
HAZELBOROUGH										
A. Adams	Purchase	22.10.20		91.5		1.5				93.0
Earl of Ellesmere	Purchase	18. 1.21	25.3	434.7	10	58				528
Magdalen College, Oxford	Purchase	22. 5.25		165		10				175
Transfer of Crown lands	Order in Council	1924	492277							492.277
Messrs. Otter & Williams & Nat. Prov. Bank	Purchase	4.1027		661			90			751
Jesus College, Oxford	Lease	6. 5.47		165						165
[illegible]y of Merchant Venturers	Lease	24. 6.49	1.5	245						246.5
										2450.777
SALCEY										
Transfer of Crown Lands	Order in Council	1924	No figures available							1279.145
YARDLEY										
Compton Estates Co. & Marquess of N'hampton	Lease	25.3.31	133	1674		98				1905
F.F. Parsons	Gift	28.3.34		207						207
Compton Estates Co. & Marquess of N'hampton	Purchase	6.3.50					2.3			2.3
										2114.3
ROCKINGHAM (APETHORPE)										
C.H. Brassey	Lease	4.4.28		128						128.0
C.H. Brassey	Lease	31.12.19		803			23			826.0
Messrs Godley, Golding & Oates	Purchase	14.3.33		525			1			526.0
Mrs. Watts Russell	Lease	15.6.28		143.2						143.2
										1623.2
ROCKINGHAM (FERMYN)										
R. Davidson	Purchase	17.12.28		818.521						818.521
Stopford-Sackville	Purchase	22.7.27		593.208		229130	22.609			844.947
[redacted]										1663.468
ROCKINGHAM (FINESHADE)										
G.E. Monckton	Purchase	31.3.25) 25.3.27)		277.212			69.168			345.680
C. Miles	Purchase	31.12.27		253.643						253.643
Marquess of Exeter	Lease	13.4.27		416.985						416.985
do.	Lease	23.4.28		457.942						457.942
Goddard Jackson	Purchase	23.8.29		309.832		60.6				370.432
Countess of Bandon	Purchase	13.7.28		17						17.0
										1861.682

TABLE II

EXISTING UTILISATION

HAZELBOROUGH

		Acres	Acres
(a)	Plantations		
	Acquired	349.0	
	Formed by Forestry Commission	1555.05	1904.05
(b)	Land in hand awaiting planting		
	Blank after felling	178.52	178.52
			2082.57
(c)	Nurseries	8.26	
(d)	Agriculture		
	Ministry of Agriculture	296.929	
	Other	6.421	
(e)	F.W.H. Number: 10	57.461	
(f)	Unplantable land in hand - Nil		
(g)	Other land: Forester's house	1.0	370.071
			2452.641

SALCEY

(a)	Plantations		
	Acquired	823.75	
	Formed by Forestry Commission	371.35	1195.10
(b)	In hand awaiting planting		
	Blank after felling	53.7	53.7
			1248.8
(c)	Nurseries (abandoned)	2.8	2.8
(d)	Agriculture		
(e)	F.W.H. Number: 2	16.679	16.679
(f) and (g)	R.A.F. Huts		10.8
			1279.079

YARDLEY

(a)	Plantations		
	Acquired	99.2	
	Formed by Forestry Commission	1314.8	1414.0
(b)	In hand awaiting planting		
	Blank after felling	5.0	
	Other Cottages	0.5	5.5
			1419.5

TABLE II

	Acres	Acres
YARDLEY (contd.)		
(c) Nurseries	-	1419.5
(d) Agriculture: estate land	127.107	127.107
(e) F.W.H.	24.638	24.638
(f) and (g) M.O.S. Depot	542.4	542.4
		2113.645
APPLETHORPE		
(a) Plantations		
Acquired	2.5	
Formed by Forestry Commission	890.4	892.9
(b) In hand awaiting planting		
Blank after felling	34.1	34.1
		927.0
(c) and (d) Nil		
(e) F.W.H. Number: 2	26.895	26.895
(f) Unplantable land in hand (Spring)	0.2	0.2
(g) Other land		
		954.095
OUNDLE WOOD		
(a) Plantations		
Acquired		
Formed by Forestry Commission	143.2	143.2
(b) In hand awaiting planting - Nil		
(c) to (g) Nil		
		143.2
BEDFORD PURLIEUS		
(a) Plantations		
Acquired	13.4	
Formed by Forestry Commission	473.4	486.8
(b) In hand awaiting planting		
Other land	(2.1 (36.2	38.3
		525.1
(c) to (f) Nil		
(g) Other land - forester's house	0.573	0.573

FERMYN

		Acres	Acres
(a)	Plantations		
	Acquired - Nil		
	Formed by Forestry Commission	1231.67	1231.67
(b)	In hand awaiting planting		
	Blanks after felling	92.3	92.3
			1323.97
(c)	Nil		
(d)	Agriculture: No. of tenancies; 1	198.751	198.751
(e)	F.W.H. Number: 7	140.301	140.301
(f)	Nil		
(g)	Other land: forester's houses	0.45	0.45
			1663.472

FINESHADE

(a)	Plantations		
	Acquired		
	Formed by Forestry Commission	1465.6	1465.6
(b)	In hand awaiting planting		
	Blank after felling	158.6	
	Blank after fire	11.0	
	Tenanted pending planting	29.2	
	Other - Agricultural	12.9	
		3.2	214.9
			1680.5
(c), (f) and (g)	Nil		
(d)	Agricultural: estate land	62.708	62.708
(e)	F.W.H.	44.504	44.504
(g)	R.A.F. aerodrome	74.9	74.9
			1862.612

FORESTRY COMMISSION

NORTHANTS - FOREST UNITS