

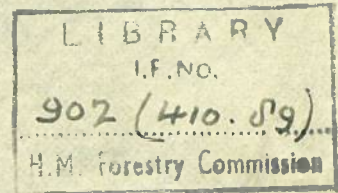
HISTORY

OF

BERE

FOREST

SE (E) CONSERVANCY



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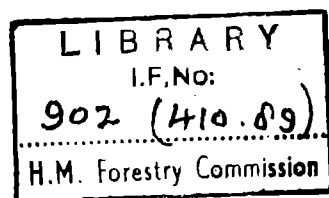
HISTORY

OF

BERE FOREST

TO 1951

SOUTH EAST (ENGLAND) CONSERVANCY



HISTORY OF BERE FOREST.

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HISTORY OF BERE FOREST

CHAIRMAN'S COMMENTS

Mr. Keen has compiled a very interesting and painstaking history.

The pre-1914 treatment of the forest was similar to that of Dean, New and the Crown Woods generally, viz. oak planting with conifer nurses followed by sporadic removal of nurses and heavy thinning of the oak up to about 1890 and then cessation of thinning, felling of parts of the poorer oak and replanting with conifers.

The forest was supervised by the Deputy Surveyor, New Forest, until 1932. Lascelles (retired 1914) did very little except some planting in Creech and oak underplanting. There was comparatively little felling in the 1914-18 war and shortly afterwards there were severe attacks by oak roller moth and oak mildew which weakened the oaks; honey fungus followed and there were many deaths among the less vigorous oaks. The same thing happened in New Forest, notably in Burley New Inclosure. A difficult management problem therefore arose. Lovegrove proposed clear felling about half the total area. To that I would not agree, it was a time for conserving not exploiting our resources and further it was not immediately apparent what proportion of the trees would in fact recover. I proposed instead that some 80 acres of the worst areas should be immediately "placed under regeneration" and the dead timber salvaged so far as economically possible. For the rest, a waiting policy was to be adopted and groups of oak were placed under observation to ascertain what was happening. In the event this procedure justified itself.

Generally silvicultural treatment can be lined up with the idiosyncracies of the Deputy Surveyors. The very dense

oak/silver fir underplanting was done by Lascelles under the influence of the German theory (strongly advocated by Hill in Dean Forest) that underplanting of oak was synonymous with good forestry. Leese also did some underplanting but spaced out his beech to 600-800 per acre. Osmaston was a light thinner (in accord with Continental practice) and as he insisted on doing all the marking himself very little got done and then only by insistence on my part. He also advocated oak/European larch mixtures in contrast with Leese who planted oak pure but densely with seedlings. It is worth noting that during the 1939-45 war some of the larch had to be removed and that the receipts barely covered costs of felling and extraction. Young was in charge for a bare 2 years and left little mark on the woods. Thereafter Bere was transferred from the Deputy Surveyor to the normal Forestry Commission Divisional (Conservancy) organisation.

I have always held the view that the greater part of Bere is admirably suited to oak production and should be so used, the exceptions being the lighter soils in Creech which are admirably suited to Corsican pine and Douglas fir. In our work more sessile oak could have been planted with advantage but the difficulty (as represented to me) has always been to secure supplies of good seed. The raising of oak crops, here, is a straightforward business presenting no particular difficulties. The Research Branch might well investigate and report on the various spaces (and especially the $4\frac{1}{2}$ ft. x $4\frac{1}{2}$ ft.) referred to on page 33 of the history.

The oldest oak underplantings are of great interest, not so much perhaps from the point of view of the effect of the beech on the growth of oak as from the handling of the beech in relation to the oak canopy and the straightness of beech when grown under reduced light conditions.

R.

Feb. 8th 1952.

HISTORY OF BERE FOREST

GENERAL DESCRIPTION of the FOREST

Situation.

Bere Forest, comprising three isolated blocks of land, is situated in the County of Hampshire about seven miles north of Portsmouth and five miles north of Fareham. The largest block, known as West Walk, adjoins the Gosport-Alton road, about one mile north of Wickham; Queen's Enclosure, the smallest and most easterly block, adjoins the London-Portsmouth road near Waterlooville; East or Creech Walk is situated midway between Queen's and West Walk and is intersected by a 'B' class road.

The Bere Woods are remnants of the ancient Forest of Bere which stretched from Wickham to the north of Havant; they were handed over to the Forestry Commission under the Transfer of Woods Act of 1924.

Area and Utilisation.

1450.443 acres were transferred under the Act of 1924 and the 1951 subdivisions remain as at the date of transfer as follows:

<u>West Walk</u>	Plantations	875.409	
	Nursery	2.5	
	(F.W.H. plus Forester's House and garden	4.0	
Leased out	{ West Lodge Lease	13.125	
	{ Railway Lease	<u>7.850</u>	
		<u>902.884</u>	902.884
<u>Creech</u>	Plantations	452.715	
Leased out	{ Creech Place Lease	3.337	
	{ Creech Lodge Lease	2.062	
	{ Other Leased Land	<u>3.750</u>	
		<u>461.864</u>	461.864
<u>Queen's Enclosure</u>	Plantation	85.395	
Leased out	Bulls Lodge (approx.)	<u>0.3</u>	<u>85.695</u>
		85.695	<u>1450.443</u>

The overall figures are:-

Plantation	1413.519
Nursery	2.5
Other	<u>34.424</u>
	<u>1450.443</u>

Physiography.

The woods lie in the centre of a wide depression which separates the two tongues of the western extremity of the South Downs: about 3 miles to the south is the ridge of Portsdown and the same distance northwards is the extensive stretch of the chalk hills dominated by Old Winchester Hill, Chidden Down, Butser Hill, Windmill Hill, etc. The terrain between these ridges is gently undulating and the woods vary in altitude from 100 ft. to 200 ft. above sea level.

Geology and Soil.

The underlying strata are of the Upper and Lower Eocene period, and show great diversity in structure, varying from heavy clays to loose, gravelly sands. Plateau gravel occurs in many places, especially on the higher ground. Generally speaking, West Walk is a clay or gravelly clay with localized outcrops of gravel. These gravel patches are more frequent in the eastern portion and on the higher ground.

Creech Walk is a clay or gravelly clay in the north west, while in the south and east a hard-packed sandy gravel predominates. Queens Enclosure is mainly a gravel in a matrix varying from clay loam to sand.

The natural drainage of the clay soils is poor and regular maintenance of the extensive drainage system is essential. With increased gravel-content natural drainage rapidly improves and certain areas of Creech Walk with sandy gravel show that podsolisation has occurred.

Vegetation.

Under natural conditions it is probable that an oak forest

would cover most of the area. Beech might also be expected to appear in some proportion, particularly on the lighter gravelly clays, while Scots pine and possibly other conifers might now maintain their position on the more sandy acid soils. Birch would be expected to colonise open areas together with ash on the heavier soils.

As regards the small trees and shrubs, hazel now occurs on almost all areas apart from the acid sands, and under beech canopy, holly and alder buckthorn also occur to a varying degree over the lighter gravels and gravelly clays. The ground vegetation varies considerably with soil and other factors such as drainage. On the acid sands, Molinia, Erica cinerea, Calluna vulgaris, etc., are present and become quite dense with sufficient light. Patches of dense bracken are also frequent. On the heavier clays and gravelly clays, bramble, bracken and various grasses become very dense with sufficient light. Juncus occurs sporadically over all areas and becomes quite dense in areas of particularly poor drainage.

Meteorology.

The forest occurs within a coastal climatic zone, but is sufficiently inland to avoid the effects of salt-laden winds.

(1) Rainfall

The average annual rainfall is in the region of 30 in. to 33 in., two-thirds falling between October and February.

(2) Temperature

The range of temperatures is limited by the coastal climate. Summer shade-temperatures rarely exceed 90° F. and then only for brief periods. Winters are usually mild. Frosts although frequent, are usually of short duration and limited severity. In the soil, the frosted zone is rarely other than superficial.

(3) Other Climatic Effects

The prevailing wind is westerly and gales of harmful

force infrequent. The South Downs and in particular Portsdown Hill have a sheltering effect on this region.

Snow fall is infrequent and usually light. The water supply is usually adequate with no tendency to flooding.

Risks.

(1) Rodents

(a) Squirrels

Without continuous and extensive repression, the grey squirrel population would be high and would cause great damage to beech, oak, sycamore and ash. Attacks on oak are usually limited to the pole stage (2 in. - 6 in. butt diameter), while on the other species mentioned damage may continue up to large timber size with gradually reduced effects. Damage is effected by the peeling of the young and succulent bark on the trunk, and also in the crown. A small number of squirrels can cause extensive local damage within 7-10 days and in that time almost ruin 2-3 acres of plantation. A less spectacular effect is the consumption of large numbers of the young cones of Scots pine, Corsican pine, etc. during the summer months. This must seriously prejudice the possibilities of successful natural regeneration.

(b) Rabbits

Although not very numerous, numbers have recently increased, particularly in Creech Walk.

(c) Mice and Voles

An intermittent, but not a serious risk to young plants these rodents are usually localised. Their consumption of oak and beech mast seriously reduces the seed available for natural regeneration.

(2) Insects

(i) Host - Coniferous species

(a) Hylobius abietis - The Pine Weevil

Felling and thinning in the older pine

plantations is likely to cause a considerable increase in the population of this weevil. The practice of trapping must be continued (in order to limit the damage to young adjacent plantations in all cases where planting of a coniferous species is scheduled after felling).

(b) Evetria buoliana - The Pine Shoot Moth

Damage by this moth has not as yet been serious. Scots pine suffers rather more than Corsican pine.

(c) Other insects such as the Myelophilus beetles, etc. although almost certainly present in the forest, have not as yet caused notable damage.

(ii) Host - Broadleaved species

Tortrix viridana - The Oak Leaf Roller Moth

Very serious and widespread damage to the mature and semi-mature oak occurred between 1920 and 1930, most damage being caused to pedunculate oak with quite minor damage to sessile. Prior to 1920, pedunculate oak had been regarded as a very suitable species for most of the area; subsequent Working Plans advocated "progressive" felling of the then devastated oak areas, with the intention of replacement by sessile oak (this matter is more fully dealt with in section on Silviculture).

(3) Birds

The bird population appears to have helped to keep harmful insects and small rodents under control, but its chief influence has probably been upon natural regeneration. Acorns and beech-mast are consumed in large quantities by pigeons and pheasants..

(4) Fungal Diseases

The records in existence do not indicate that fungal disease has at any time been the primary cause of serious damage,

although oak leaf mildew and honey fungus did assume secondary importance after severe and repeated defoliation of oak by the Tortrix moth.

(a) Fomes annosus is probably present in the area, but is not definitely known to have caused damage.

(b) Armillaria mellea (Honey Fungus)

Between 1920 and 1930 many of the oaks devastated by Tortrix viridana contracted this disease. It was considered at the time to be of secondary importance but the presence of this species will influence the choice of species in the replanting of felled hardwood areas.

(c) Microsphaera quercina (Oak Leaf Mildew) is present in the area and has assumed secondary importance after insect defoliation of oak.

(5) Fire

(i) Hazard

With the present distribution of species and age-classes the fire hazard of the area as a whole is relatively low. Hazard is greater in the unbrushed and recently planted areas and for this reason certain compartments of Creech Walk and the grass-covered strips of P.44 oak in West Walk are at present seasonally dangerous. The plateau gravels of Creech Walk are rapidly invaded by Molinia after felling and this increases hazard considerably. It is highest between February and May and rapidly decreases after the spring flush.

(ii) Risk

Risk in the area is generally low and, although certain compartments of West Walk adjoin the railway line, the standing crops are largely of mature oak which minimises the danger. The retention of fire belts will be advisable when these stands are felled. All the enclosures are strictly preserved and trespass is not serious.

Roads

(1) General

The region as a whole has been served by an excellent system of metalled roads for many years. All sections are conveniently placed with regard to these roads and the maximum ride-carry is approximately $\frac{1}{2}$ mile.

(2) Rights of Way

Relatively few rights exist in the enclosures. The precise definition of the rides over which rights exist will be subject to agreement with the County Council before 1954.

Labour

The labour position in the forest is satisfactory and a staff of 20 men is at present maintained. Local indications, however, are that it would be difficult to increase the labour strength beyond 25.

SILVICULTURE

The silvicultural treatment of the areas has differed considerably during the period of approximately 120 years over which the existing areas were planted and for convenience the silvicultural history may be broadly divided into:

- (a) Pre 1924 (The Transfer of Woods)
- (b) Post 1924 (Act 1924)

Of the present plantation acreage of 1410, approximately 900 are pre 1924 and the remaining 510 have been felled and planted since the areas came under the management of the Forestry Commission.

In the year 1920 a detailed set of compartment descriptions was made by Oliver in which he prescribed the treatment for each compartment and it would appear that from the choice of compartments for felling and subsequent planting after 1924 that a number of his prescriptions were carried out, at least

in principle. Despite the change of management consequent upon the 1924 Act, there has therefore been a certain continuity of policy in the area over a longer period.

A. Silvicultural History Prior to 1924

(1) Method and Species adopted

(a) General. The oldest oak plantations date from between 1815 and 1825. Prior to that period the land was part of a deer forest stretching from near Bishop's Waltham to the north of Havant, a forest which no doubt contained patches of oak with the usual glades and scrub areas. At that period the forest was apparently subject to much lopping by local inhabitants and to the browsing of animals. On selected areas the local inhabitants were bought out, the better oak was marked off and the remainder planted with locally-grown oak and conifer plants. The planting was in pits dug beforehand and the plants were pruned when lifted. Scots pine and larch were used as nurses, but the arrangement and spacing are not known.

In particular years the proportions used were as follows:-

1819 -	135,000 oak
	24,000 fir
1820 -	300,000 oak
	107,000 fir

During the preparation of the area for planting it is recorded that "flitters" (small logs), cordwood, "faggots" and bavins were sold in large quantities, the two latter to the brick kilns at Fareham.

The patches of better oak selected at the time of enclosure were felled in 1855 and replanted with oak and conifer mixtures; many of these plantations contain a good proportion of sessile oak.

A man concerned with this planting told Lovegrove in 1924 that the 1855 oak at Creech was planted as follows:-

Spacing about 4 ft.	{	x x x x x x
x - Larch (possibly Scots pine)	{	x o x o x o
o - Oak	{	x x x x x x
	{	o x o x o x

and that before planting the land was given out to the villagers for three years on which to grow potatoes. Scots pine were apparently used in beating-up and a few pure belts of this species made at the time of the main planting.

Although no definite record exists, it is possible that the West Walk planting of 1855 also followed the same plan, as a scattering of larch and Scots pine certainly remains in many of these areas.

Underplanting began in West Walk in 1903 and continued until 1916. The spacing varied, but is said to have averaged out at about 3 ft. or 4 ft. A mixture of beech and silver fir was used at first and later pure beech.

In Creech Walk the planting of pure conifers began at about 1860 and between then and 1924 about 120 acres were planted. Species were chosen as follows:-

- 1860-70 Oak/larch (larch not strictly as a nurse)
- 1870-80 Scots pine
- 1880-90 Scots pine and Corsican pine in mixture
Scots pine pure
Corsican pine pure
- 1890-1900 European larch and Scots pine
European larch, Corsican pine, Scots pine
Scots pine, oak, Corsican pine
- 1900-10 European larch, Scots pine, Corsican pine,
Douglas fir
European larch, Japanese larch, Scots pine
European larch, Scots pine
Scots pine, European larch, Douglas fir

(Details from Lovegrove's Working Plan of 1920 and Oliver's compartment descriptions).

(b) Planting Methods. Pit planting at 4 ft. spacing, using pruned plants.

(c) Draining. Draining, especially on the heavy clays, was carried out on a very extensive scale and very many miles of drains were laid down at the time of planting; but whether these drains were subject to regular maintenance is not known.

(d) Establishment. There is every reason to believe, as Lovegrove says, that "the plantations were well cared for from the first, being beaten up and weeded as required, followed by the later removal of the nurse crop as necessary".

(e) Thinning and Felling. Analysis of stumps in 1924 indicated a ring congestion at intervals of (20-30) years in certain areas.

Towards the end of the 19th century, heavy thinnings were conducted for revenue purposes to such an extent that a Mr. Hill, inspecting in 1898, advised the cessation of thinning and the underplanting of beech and silver fir. This would appear to have been done, and exploitation then centred on conifer thinnings and the clear felling of certain oak areas at Creech. By 1924 the (remaining) conifers in the oak areas had been reduced to a very low proportion, singly and by small groups, and were considered to be of excellent quality.

(f) Underplanting. As a result of the inspection by Mr. Hill in 1898, 56 acres in West Walk were underplanted between 1903 and 1916, using to begin with a mixture of beech and silver fir and later pure beech.

(2) The General Condition of the Plantations in 1920

(a) Statement by area (Lovegrove's Working Plan page 4)

	<u>West Walk</u> <u>acres</u>	<u>Creech</u> <u>acres</u>	<u>Queens Wood</u> <u>acres</u>
100 year oak	568	303	52
65 " " underplanted	56	-	-
" " " not "	76	12	19
Oak various (i.e. 65-100)	83	-	-
Conifers	22	101	3
Mixed conifer and hardwoods	9	17	5
Various	8	-	-
Blanks	3	-	-
Rides	49	23	6
	<hr/> 874	<hr/> 456	<hr/> 85
Total =	<hr/> <u>1,415 acres</u> <hr/>		

(b) Oak plantations

(i) Planted about 1820. Oliver's compartment description of 1920 reveals that most of the older, '1820',

oak had been grossly overthinned, resulting in such a very inadequate stocking on the ground that it was considered that the conditions of a full-canopied crop would not again be obtained. Height and quality of the crop were considered to be very poor and clear-felling was prescribed even where canopy was reasonably complete; a weed growth of bramble, bracken, grass, gorse and hazel was heavy in almost all areas.

In connection with Oliver's work, sample plots were taken in several areas and indicate a stocking varying from 35-70 stems per acre; the description overthinned has been applied to many of the compartments with the quoted stocking of 60-70 stems per acre at 100 years, while certain areas with a much lower stocking of about 40 stems per acre were apparently more complete in canopy. This appears to indicate that the thinning policy had been very haphazard over at least the latter half of the 19th century. It may also be conjectured that the difficulties of controlling an oak/conifer mixture may have contributed to the 1920 condition. A stand of 40 stems per acre not considered grossly overthinned, for example, may be one in which conifers largely failed or were removed at a very early stage thus encouraging vigorous, albeit coarse, crown growth, while at the other end of the scale a stand of 100 year oak at 70 stems per acre described as not likely to complete canopy would indicate a very poor crown development caused by a spasmodic and quite inadequate thinning policy. Poor markets for oak thinnings and even mature oak may have been the main difficulty and it may be supposed that this economic aspect was perhaps the main factor in deciding the grade of thinning to be adopted, i.e. heavy and infrequent. This point is to some extent borne out in those compartments where this old oak is not described as overthinned by Oliver - since he refers in several instances to the presence of dead trees suggesting crown suppression.

The Roller Moth and Oak Mildew, which by 1924 had caused

such extensive damage to almost all the pedunculate oaks of the forest, are only mentioned by Oliver in a few compartments. The condition of the oak at this time, however, was such that they could offer but limited resistance to the insect and fungal attack which was then beginning.

(ii) Oak Planted 1850-1860. Oliver regarded most of these plantations as quite promising in stocking and quality although in certain compartments such as 9 B he considered them to be overthinned and prescribed clear-felling; 56 acres of this age-class had been underplanted with beech and silver fir between 1903 and 1916 and Oliver considered both oak and beech to be 'very nice' (beech were already suppressing the silver fir). In view of the fact that by 1920 the stocking in these areas was more or less satisfactory, it would appear that considerable recovery and crown development had occurred since Hill's instruction on underplanting in 1898.

(iii) Conifer Nurses in Oak Areas. In most areas it appears that the conifers still remaining in 1920 formed a very low proportion of the canopy, the larch still remaining by groups and singly being considered to be of high quality, while many of the Scots pine were apparently very coarse.

Compartments which retained an appreciable area of mixed plantations at this date were Compartment 15B (West Walk); Compartments 4B, 5 and 16B (Creech) and Compartment 2 (Queen's). The 60-year old mixtures were mainly oak/larch with the exception of the West Walk area where oak occurred with Scots and maritime pine. The oak and larch were apparently quite promising, while the oak/pine mixture was rather poor.

(c) Coniferous Plantations

(i) West Walk and Queen's. Small areas of pure conifers occurred in several of the oak areas and may have arisen as a result of beating-up, planting in gaps after failure perhaps some 20-30 years after the main plantation, and of the establishment of protection and amenity belts. Scots pine

and European larch occurred more or less intimately with oak, singly and by groups, while Scots pine and occasionally Norway spruce also occurred in belts.

(ii) Creech Walk.

General. At Creech Walk where the soils vary considerably from clay to silty gravel, 100 acres of conifer plantations were established between 1860 and 1920 - as follows:-

1860 - 1880	-	30	acres
1881 - 1900	-	30	"
1901 - 1920	-	40	"
		<u>100</u>	<u>acres</u>

Species with growth measurements. The species were mainly chosen as follows:-

- 1860 - 1880 { Scots pine pure
{ Scots pine and European larch in mixture
- 1881 - 1900 { A mixture of Scots and Corsican pines
{ Mixtures of Scots pine, Corsican pine and European larch
{ Mixtures of Scots pine and European larch
{ Pure Scots pine
{ Pure Corsican pine
{ Pure European larch
- 1901 - 1920 { Mixtures of Japanese larch and Scots pine
{ Mixtures of Douglas fir, Japanese larch and Corsican pine
{ European larch and Spanish chestnut
{ Pure Douglas fir
{ Pure European larch
{ Pure Japanese larch

Japanese larch was first introduced in 1904 and used quite extensively. Douglas fir was also used at about this time, although on a relatively small scale, and it was not until 1919 that the first pure Douglas fir plantation was established.

Definite records of the earlier plantings are not available and the spacing is not known.

Of the planting after 1900 Oliver gives the following data:-

Compartment 4A - Japanese larch/Scots pine

3 Japanese larch rows - 1 Scots pine
In 1920 1040 plants per acre; 38 ft.
(dominants presumably) and the larch well ahead over suppressed pine.

Compartment 9 - Japanese larch/Scots pine

Planted at 4 ft. x 4 ft. on a 50/50 alternate tree mixture. The larch well ahead by 1920.

Compartment 11 - European larch/Spanish chestnut

The chestnut interfered with the larch and were cut out.

Applications of Oliver's height measurements to the 1946 Yield Tables indicate the following Quality classes -

European larch -

Both 20 year and 50 year plantations Compartments 17B and 12B Creech Just under Quality Class I.

60 year - Queen's Quality Class III.

Scots pine -

29 year and 49 year plantations Compartments 13A and 14A. Quality Class I.

Japanese larch -

16 year plantations Compartment 14A. Quality Class I.

Oliver records that the drainage in the plantation area was quite satisfactory.

Thinning in relation to the 1920 Condition. In certain compartments Oliver records the thinning of certain 1880 - 1890 plantations as having been carried out in 1915, but makes no prescription for the next thinning in these plantations. His enumerations in Compartment 14A for 1891 Scots pine show a stocking of 891 stems per acre in 1920 and these figures suggest that the thinning cycle was at least five years, probably more, and that the grade of thinning was heavy. The European larch of Compartment 17B planted about 1860 had a stocking of 220 stems per acre; quarter girth of 10½ in. and a height of about 85 ft. in 1920 and these figures compare quite favourably with the yield tables for Quality Class I. larch. It may be supposed that on the whole the plantations were quite adequately thinned during the period 1860 - 1920.

(3) Condition in 1924 - Transfer of Woods Act.

The condition of the oak plantations deteriorated seriously

between 1920 and 1924, at which date Lovegrove produced a Report entitled, "The Dying Condition of the Bere Woods and their Future Working". His introductory description reads as follows:-

"The position, shortly, is that the oak planted between about 1815 and 1825, now about 100 years old, and that planted about 1855 etc., now about 65-70 years old, is dying to an alarming extent, and measures are called for to deal with it."

"The failure extends over all three of the Bere Forest Crown Inclosures and extends in varying degrees over neighbouring woods, especially on similar soils. The outside fringe of the big woods, often the whole of small copses, and the generally isolated hedge-row oak, have escaped to a considerable extent, though attacked by both the Tortrix and the mildew. On the chalk, no deaths have been seen and, but for a few cases of bad defoliation, the woods look better than those on the clays and gravels first referred to."

"Mr. Oliver described the woods in 1920 (July) and noticed a few deaths. Before that Mr. Tarrant, the then foreman, with difficulty could find dead trees for gate posts, etc. Since Mr. Oliver's visit trees of both ages have been dying and show signs of dying over the greater area. All three enclosures (West Walk, Creech and Queen's Wood) are affected. The first signs appeared about six years ago and the spread has rapidly increased within the last three years."

A large number of possible causes for this decline are discussed by Lovegrove, and, as mentioned by Lord Robinson in 1949, it would now appear that the following are the most likely secondary causes:-

1. Tortrix attack with oak mildew subsidiary
2. Honey fungus.

The primary cause would appear to be the thinning policy during the latter part of the 19th Century which brought the oak to a condition in which it was incapable of resisting attack.

The original planting of oak on the lighter sands and gravels may also have contributed by providing the initial centres from which the attack spread to other areas.

B. Silvicultural History 1924-51.

(1) Working Plans of the Period

1924 - By W.H. Lovegrove - Not accepted by Forestry Commission.

1928 - By G.B. Ryle - Not presented to Forestry Commission.

1931 - By W.P. Osmaston - No record of acceptance.

(a) General Description of each plan.

(i) Lovegrove's Plan.

General. Lovegrove's prescriptions, by a policy of widespread felling and replanting, were designed to make full use of the ground by establishing a new crop in place of the understocked and (then considered) largely dying oak; that he considered it necessary to make drastic prescriptions is indicated by the following quotation:-

"Generally very few of the compartments are likely to recover their full canopy condition."

The actual scale of felling proposed was approximately 800 acres in 12 years, in which were included the 1815 and the majority of the 1855 oak plantations with the exception of areas underplanted with beech and all plantations of sessile oak, the latter having been only slightly damaged by Tortrix and mildew.

Species Prescription. Lovegrove prescribed large scale replanting with conifers, (Corsican pine, Douglas fir, European larch, Japanese larch, Norway spruce) with at the same time the selection of about a quarter of the felled area for sessile oak with 20% beech.

Thinning Prescriptions.

Oak Areas. Owing presumably to the poor condition of the area, no schedule was drawn up except for a general statement covering areas of sessile oak and the underplanted areas, which were to be "thinned as required".

Conifer Areas, Creech. Lovegrove stated that many of the plantations required very urgent thinning and drew up a schedule to cover 93 acres in 6 years, the grade of thinning to be adjusted to a (5-8) year cycle.

(ii) Ryle's Plan of 1928.

General. The majority of the oak are still referred to as being in a dying or stag-headed condition and no direct comparison is made with the condition of 1924; an annual cut of 30 acres was prescribed over a 10-year period. The fellings were to be in 2-3 chain strips running north-west to south-east with intervening belts of standing timber of the same width. On this basis, an effort was made to select 600 acres from the poorer areas in which strips would be planted in this way.

After felling, it was intended to replant oak on all but the lighter soils and it was hoped that sessile oak could be used - it was largely for this reason that artificial and not natural regeneration was prescribed.

Thinning Prescriptions.

Conifers - A schedule was drawn up.

Oak - The poor condition of the crop did not presumably call for thinning treatment.

(iii) Osmaston's Plan (for the period 1929-1939)

Felling Prescription. The felling prescriptions of the previous plan were now somewhat reduced, 240 being the total for the 10-year period. This prescription was designed to regenerate the worst of the oak areas of West Walk and Creech Walk.

Thinning Prescription.

Oak Areas. The 100 acres prescribed by

compartments cover almost all the younger oak areas (now aged 100 years) in the three inclosures.

Conifer Areas. 74 acres were prescribed for thinning and, allowing for the number of thinnings prescribed for certain plantations, a total of 150 acres would have been covered in 10 years. Broadly speaking, the thinning cycles were:

Old Conifer	40-60 years old	10 years
Medium aged Conifer	30-40 " "	5 "
Young Conifer	15-30 " "	3-4 years

Underplanting. The oak areas prescribed for thinning were to be underplanted with beech.

(b) The Influence of the Working Plans on the Development of the Forest 1924 - 1940.

General. Although none of the Working Plans were officially recognised and adopted, the broad principles outlined therein were applied. The actual felling and planting, however, during the whole or any part of the period 1924-1940, fell well below the prescription of the plans.

(i) Lovegrove - 1924 (With Oliver's compartment description of 1920).

General. It cannot be said that this plan was followed to any great extent, although the P.26 planting of European larch and Douglas fir does follow his general prescription. These species were in fact planted in compartments scheduled by both Lovegrove and Oliver for immediate conifer planting owing to weed growth under very poor oak. Lovegrove's schedule for the general replanting of conifers was not followed after 1926.

Thinning Oak areas. (P.1850-1920). No definite prescriptions were made owing to the severe defoliation. Lovegrove does however advise that the under-planted oak areas be very carefully thinned together with the more promising patches in the areas of this age not underplanted. As remarked by R.H. Smith in his report on these areas in 1949, it is

doubtful whether any thinning was in fact carried out. The recorded outturn during the period 1923-1927 does, however, show a certain yield of oak timber from almost all compartments of West Walk. In most compartments the average volume per stem removed is between 10 and 15 cubic feet and this may indicate a removal of dead and dying stems in the older oak areas. A similar yield at Queen's may also be explained in this way.

Conifer areas. Although no definite records of the acreage thinned are available, the recorded outturn from Creech totalled 103,000 lineal feet of pitwood in the period 1923/27. This approximates to 8,000 cu. ft. which indicates that 20-30 acres were thinned during this 5-year period as against a total of 95 acres (over a 10-year period) scheduled by Lovegrove, at a time when he considered that many compartments needed urgent attention.

(ii) Ryle's Plan - 1928.

General. The north-west - south-east strip method of oak regeneration (planting) was first recorded in this plan and it was on this basis that the P.27 and P.28 oak in West Walk was established.

(iii) Osmaston's Plan - 1929/39.

General. Subsequent to this plan, the strip method of oak regeneration was largely replaced by the felling and planting of relatively small and scattered portions of the old oak where growth was exceptionally poor.

It was during this period that approximately 30 acres of conifers were established, the main species being Japanese larch. In the choice of site it would appear that areas of lighter soil were usually selected for the conifers, although certain plantations do occur on the heavy clay. It is likely that the density of weed growth was also taken into account.

Thinning Oak areas. (P.1850-1870). Osmaston's prescription for thinning 100 acres with subsequent underplanting

was not apparently carried out. A start was made however, in the thinning of these oak areas and between 1935 and 1940, a total of some 25 acres were thinned. It appears that most of this thinning was in the underplanted areas. In 1938 large quantities of the suppressed silver fir were sold as poles in London.

There is no record of the thinning carried out between 1930 and 1935, although it is believed that some thinning in the underplanted areas was completed during that period.

Conifer areas. A total of some 97 acres was thinned between 1935 and 1939 (inclusive) as against 164 acres prescribed for the period 1930-40. In view of the absence of records between 1930 and 1935, it may well be that this programme was completed.

(iv) Statement of Species planted 1924-1940 by P.Years.

<u>Felling and Planting</u>	<u>Acres</u>	
Oak (and small proportion Ash/Beech)	35	P. 30-40
Oak	<u>95</u>	P.27 -28
	150	
<u>Conifers</u>		
Japanese larch	23.7	} P. 30-40
European larch	4.25	
Corsican pine	2.0	
Sitka spruce	<u>0.75</u>	
	30.7	
Douglas fir	5.6	} P. 26-30
European larch	<u>41.8</u>	
	47.4	
Total Conifer	78.0	P. 26-40
Total Planting	228.0	P. 26-40

(2) The effect of Wartime Felling and Subsequent Replanting 1939-50.

A total of 192 acres was felled at Creech and West Walk during the period 1939-50, while a further 18 acres at West

Walk were damaged by fires caused by enemy action.

At no time did the replanting seriously fall behind felling and it was in fact completed in F.Y.49.

The species chosen were as follows:-

	<u>West Walk</u>	<u>Acres</u>
(Replanting of Fire damaged area)	Oak P.44	40
	Japanese larch P.46 & 47	20
	Corsican pine & Scots pine P.46 & P.42	<u>18</u>
		78
	<u>Creech Walk</u>	
	Douglas fir	36.5
	Japanese larch	75.5
	Corsican pine	4.75
	Hybrid larch	12.0
	Pinus insignis	1.5
	Cryptomeria japonica	<u>1.75</u>
		<u>132.00</u>
	Total - acreage planted	<u>210 acres</u>

A total acreage of approximately 202 acres was also thinned during this period, including 31.5 acres of underplanted oak areas; portions of the old conifers at Creech (P.70-P.19) and first thinning in P.26 Douglas fir and European larch, together with the removal of larch nurses over 45 acres of P.28 oak. Contemporary removal of larch nurses from other P.28 areas was probably considered as a cleaning and is not recorded; certainly by 1950 the European larch has been removed from all, but about 5 acres, of the 100 acres in this category.

C. General Review of Silvicultural Policy during period 1926-1950 in Relation to the present condition of the crops.

(1) Broadleaved Species

(a) Oak Planted approximately 1815 - Photographs 1-5. As has already been mentioned, most of the 1815 areas were described as grossly understocked in 1920 and were subsequently damaged by Tortrix and mildew during the period 1924-1930. In most cases it was doubted whether the full-canopy condition would ever again be reached. The position in 1951 is that, except in a few areas, full-canopy condition has on the whole been attained

and in many places certain stems are definitely suppressed and dying and should have been removed some years ago. Although it must be remembered that the most seriously damaged areas were selected for felling and replanting during the period 1924-1940, it would appear that the oak (which in 1920 was 100 years old), showed far greater powers of recovery from severe defoliation than was considered possible at the time. The serious and widespread nature of the damage is indicated by borings made recently in the oak of all enclosures; in almost every case, a constriction of 4-7 rings within about one to four inches (or less) occurred during the period 1924-1930, followed by a sudden recovery to about 10 rings per inch or more and, subsequently, a more gradual recovery to a growth rate of 7-10 rings per inch (more or less comparable with previous growth).

The proportion of stag-headed trees in these old oak areas is no greater than that commonly found in other oak areas of this age. The low timber heights and coarse crown growth were apparent to Lovegrove in 1920 and must certainly have been encouraged by the thinning policy prior to that date. The fairly frequent occurrence of dead branches on the lower crown may possibly be attributed to the defoliation of 1924/1928.

(b) Oak Planted 1850-1860. Apart from the division into underplanted and not underplanted, the latter may be divided into sessile and pedunculate types. The precise acreages of sessile oak are not recorded, but the figure of 25 acres has been estimated from a general survey.

We have therefore:

Sessile oak	<u>25 acres</u>	} Oliver' 65 yr. and 70 yr. classes.
Pedunculate oak underplanted	56 approx.	
" not underplanted	41	

A further 20 acres were classed by Oliver as of various ages (1820-1850).

In contrast to Oliver's description of 1920, it may be said that most of these areas in 1951 are very much overstocked, with

consequent loss of vigour, formation of epicormic branches, low stem volume and dead branches. It would appear that this situation arose as an indirect result of the serious defoliation of 1924-30, as a result of which it was considered that the oak over almost the whole forest was dying and that the main problem was to clear fell and regenerate. The recovery of almost all areas to such a condition of relative vigour that thinning would be required was not anticipated. Poor markets for smaller oak thinnings and even large oak timber may also have contributed to the position.

Foreman R. Lawes, who has been at the forest since 1928, confirms that very little thinning work was carried out in the oak areas with the exception of Compartments 3 and 5 and some of the oak/beech areas. This choice of compartments giving easy access to roads would appear to substantiate that marketing at an economic price may have been a serious consideration.

The 25 acres of sessile oak (100 years - Photographs 6 and 7) is made up of a number of plantations in all enclosures, each plantation varying from about 1 to 10 acres and situated within what are mainly 130-year pedunculate plantations. In all cases the quality and condition of the sessile is far superior to that of pedunculate oak of comparable age in the forest. Stocking varies considerably over the forest from between 180-200 stems per acre in Compartment 5 Creech, to 80-100 stems per acre in Compartment 9 A, West Walk. The condition and vigour of the trees naturally varies with stocking although the crowns are seriously restricted in all areas. Two sample plots taken in Compartment 5 (Creech) and Compartment 9A (West Walk) give volumes per acre of approximately 3000 cu.ft. and 4000 cu.ft. over bark (respectively) of which about 800-1000 cu.ft. is on more or less suppressed stems which will shortly be removed in thinning. Compartment 9A with its lower stocking has the greatest volume.

There is no record of any thinning in sessile oak during the period 1924-1950, although it may be that a few of the dead

and dying were removed during the defoliation period 1925-30. Pressler borings certainly suggest this and indicate that some at least, of the sessile oak were affected during that period. Borings on 1 stem show:-

<u>Growth rate</u>		
(Approximately)	1900-1910	Age 50-60 years 4-5 rings/inch.
	1915-1920	(immediately preceding defoliation) 13 rings/inch.
	1930	(immediately after defoliation) change 8 rings/inch.
	1931-1951.	Slow change from 8 rings to 13 rings/inch.

As with the sessile oak, the 41 acres of pedunculate oak, 95 years old, not underplanted, (Photograph 10) are scattered over all three enclosures; all plantations show the effect of past underthinning and the stocking varies mainly from 150 to 200 trees per acre. The complete range appears to be 100 to 250 trees per acre. Most of these plantations are now in a poor condition with narrow crowns and many epicormic branches. Height growth is frequently quite good at 60 ft.-70 ft. with a timber height of 50 ft. on some of the dominants.

Appendix III shows an assessment of the areas of pedunculate oak underplanted (Photographs 8 and 9) from the report by R.H. Smith in 1949.

Before the recent thinning began in 1950, a stocking of about 110 oak per acre over 400-750 beech was quite typical; the oak canopy was complete and growth negligible; several of the most vigorous beech were beginning to enter the live crowns of the oak and thus to assume a dominant role with consequent increase of their own vigour and suppression of the oak. The beech are mainly of excellent form but vary considerably in size from 2 in.-6 in. diameter at breast height, a variation due, it is suggested, to the local variation in intensity of the 1934/38 thinning, which on the whole would appear to have been too light to give appreciable and lasting encouragement to oak of this age, while at the same time giving little relief

to the majority of suppressed and whippy beech. In 1938/39 experimental thinning in the beech was also carried out in Compartments 2 and 3 West Walk, conducted on the principle of retaining an oak crop, three grades of thinning being adopted.

- (a) Cutting out all dominant beech.
- (b) Removing dominant beech which threatened oak.
- (c) Normal thinning.

The following comments were made in the Inspection report of 4.7.42. covering the Chairman's visit:-

- (a) Too extreme in removal of beech.
- (b) Moderately successful.
- (c) No object achieved.

Although no precise record now remains of the exact location of areas subjected to these three treatments, some comparison has been made after rough location by staff still remaining. The cutting of all dominant beech as in type (a) has left a rather whippy undercanopy with few stems neither showing much vigour nor interfering with the oak - sufficient beech remain however to form a crop. Distinction between the boundaries of types (b) and (c) is difficult, but, assuming that the supposed boundaries are correct, type (b) has resulted in an undercanopy with fairly large beech spaced more or less between the oak and now interfering with them while in type (c) there is a general tendency to a stocking of very large beech (interfering seriously with the oak). To sum up, the object in 1939 being to retain an oak crop indefinitely, it would now appear that type (a) was the most successful. Unfortunately, the oak have had insufficient room in their own canopy with the result that there has been self-suppression quite apart from the effects of the beech - dead branches being frequent in all areas.

- (c) Oak Planted P.27-P.30.

Between 1927 and 1930, 94.6 acres of old 1815 oak were felled and replanted in strips running approximately north-west

to south-east. Almost invariably the remaining strips of 1815 oak were approximately 2 chains in width, while the felled strips varied from 2 chains to 6 chains. All planting was in mixture with larch:-

either	{	o o o o oak		or	{	o o o o
	{	o o o o oak			{	x o x o
	{	x x x x larch			{	o o o o
	{	o o o o oak			{	o o o o
	{	o o o o oak			{	o o o o

All plants were inserted at $4\frac{1}{2}$ ft. x $4\frac{1}{2}$ ft. and heavy weeding was carried out for two years, after which financial stringencies prevented anything more than localised weeding over the following 5-5 years. In 1935 these plantations were very much overgrown with birch, ash, thorn, etc. Between 1940-50 a very heavy cleaning was carried out together with the removal of larch nurses, which were often 5 ft. to 10 ft. above the oak. The very adequate stocking of whippy oak which then remained in almost all areas has now attained a very satisfactory condition.

Local information suggests that the adequate stocking remaining after years of enforced neglect between about 1931 and 1940 owes something to the natural regeneration which occurred from the adjacent shelterbelts of old 1815 oak, evidence of which is still present in many parts. During F.Y.50 and F.Y.51 the most advanced areas have been selected for pruning of 100 stems per acre and the subsequent thinning of the crop as a whole (with particular attention to selected trees). It is proposed to continue this work at the rate of 20 acres per year and so cover the whole acreage in five years.

In some of the 1930 planting, beech groups were introduced, the groups being spaced about 33 yards apart with 49 stems per group spaced at $4\frac{1}{2}$ ft. x $4\frac{1}{2}$ ft. The dominant beech are now 2 ft. to 10 ft. above the oak and usually coarse, while a few of the inner stems are usually of satisfactory form.

(d) Oak P.31-40. (Photograph 20).

During the period 1931-1940, 55.3 acres of oak were planted

in relatively small groups, after the felling of particularly poor patches of old oak which were largely dead or dying. In 1932, oak seedlings were planted pure at a spacing of $4\frac{1}{2}$ ft. x 2 ft. with two rows of beech around each distinct 'block'. It is believed that after hand weeding for two years these plantations were left until cleaning was required in 1943/49.

In 1934, 9.5 acres in 2-3 chain strips and also a small group were sown with acorns at the rate of 500-600 lbs. per acre. Although no definite records remain, local reports indicate that no soil working was carried out and that weed growth was quite heavy after the felling of the old 1815 oak. The result was poor and the whole area was replanted in 1938, when certain of the P.32 areas were also replanted.

The R.I. Forms indicate that the planting of 1937 was at a spacing giving 3000 to the acre, while the planting and replanting of 1938 were at $4\frac{1}{2}$ ft. x $4\frac{1}{2}$ ft. It is believed that these plantations were weeded hard for 3-4 years and have subsequently required little attention, but a cleaning in certain parts will soon be necessary. Almost all the oak plantations of this period (1931-40), are now in a very satisfactory condition.

(e) Oak P.44 - Photographs 23 and 24. The 2-chain belts of 1815 oak were felled during the early war-years and the whole acreage replanted with oak in 1944 at a spacing of $4\frac{1}{2}$ ft x 2 ft. At the time of planting the weed growth was quite heavy and, following the removal of the previous 1815 oak, drainage conditions have deteriorated. Hard weeding was carried out until 1950 but the present crop is very patchy and generally poor although on the higher parts of the area growth and stocking are more satisfactory. The main trouble appears to be drainage and to some extent frost and rabbit damage.

(2) Conifer Plantations.

(a) Old Conifer P.1860-1900 - Photographs 12 and 13. The areas chosen for the 1860-1900 planting of Scots pine and

Corsican pine have produced rapid growth in both species. Oliver's measurements of 1920; the Research Department Sample Plot and also measurements from recent thinnings indicate Quality Class I. sites on which the average stem volumes are quite comparable with the 1946 Yield Tables. The crowns are, however, very small in relation to height and borings now indicate poor increment. In fact, the general appearance of most of the remaining areas is that of an underthinned plantation despite the favourable comparison with Yield Table data. The reason for this may be that, although the past thinning treatment was probably adequate in the light of the general policy for coniferous plantations in the country as a whole (and on which the yield tables were necessarily based), it erred on the light side and would probably not compare with the usual grade and frequency of thinning applied today.

(b) Japanese larch, Scots pine and Douglas fir Plantations P.1900-1919.

(i) Japanese larch P.06, P.08. The only two remaining plantations of these ages are in Creech Walk, Compartments 6 and 13, both being originally planted with Scots pine and Corsican pine respectively. The pines were rapidly suppressed to judge from Oliver's descriptions of 1920. It would appear that thinning did not adequately allow for the rate of growth of the larch, with the result that the present crops are overstocked. The plantation in Compartment 6 does not look as though it will recover any degree of vigour and many trees are dying, the stand in Compartment 13 is, however, in a much better condition with dominants 80 ft.-90 ft. in height, but the crowns are very restricted and the quarter girth averages approximately 7 in.

(ii) Douglas fir, Japanese larch and European larch/ Scots pine P.19. Photographs 14 and 15. The plantations are in a good condition, although for their age, stocking is high.

(c) Douglas fir and European larch P.26. Photographs 16, 17 and 18. The plantations of this year were established subsequent to the felling of some of the worst 1815 oak areas. Although weed growth was very heavy, and according to local reports, the European larch plants very poor, no weeding was apparently carried out after the first year owing to financial stringencies and it was not until 1936/1937 that a cleaning could be carried out to relieve the remaining trees. The larch suffered badly as a result of this treatment and many became cankered and had little vigour. The first thinning was carried out in 1948/49 together with a cleaning. This relatively heavy thinning has encouraged crown development and it would appear that the plantations as a whole show indications that they will ultimately overcome their initial setbacks. Poor drainage conditions may be partially responsible for the poor growth of the larch on the heavier clay soils.

The P.26 Douglas fir has overcome the enforced neglect of the 1930/36 period to greater effect than the larch and is now in a satisfactory condition.

(d) Conifers P.36-P.49. Photographs 22, 25, 26, 27, 28. After 1926, it was not until 1936 that conifers were again planted on an extensive scale. These later plantations were weeded as required and most of the plantation area is now in a satisfactory condition. In West Walk several parts of the P.36 Japanese larch will very soon require thinning and in Creech P.40 Japanese larch will soon be in a similar state. The exceptions to the generally satisfactory condition may be accounted for by locally bad drainage and possibly to rabbit damage.

D. Silvicultural Methods.

(1) Preparation of Ground.

Replanting of the war-time felling area was completed in F.Y.49, very little cover of any sort remained after felling, and all species were planted on open ground. Results show that

before the replanting of felled areas on the heavier soils, it is essential that the drainage system should be brought to an efficient condition.

Fencing against rabbits is now necessary on account of the influx from neighbouring areas.

(2) Choice of Species.

The choice of species is governed by conditions of soil, drainage, existing vegetation and relative exposure to frost, etc. Various species are considered below, mainly in relation to soil conditions and to drainage.

(a) Oak.

(i) Pedunculate oak. With suitable treatment and adequate drainage this species can be expected to give quite satisfactory growth on the predominantly clay soils; individual stems in the '1815' and '1860' areas being of good quality and the P.28-P.40 plantations growing well.

(ii) Sessile oak. This species appears to give a relatively high yield, as compared with pedunculate oak on the better drained clays of West Walk, Creech and Queen's where it now occurs. It should also be more suited to the lighter gravelly clays and sandy clays than pedunculate.

(b) Beech. Beech is quite suitable for the better drained parts of gravelly and sandy clays.

(c) Ash. Individual stems in the old oak areas are often of good quality and vigorous growth; but the very small groups planted in the years 1930-1950 have in general produced poor growth.

(d) The Larches. Although European larch has produced satisfactory timber it is considered that Japanese larch is preferable on account of its more rapid growth and consequent suppression of weeds, its immunity to canker, and greater powers of recovery from occasional frosting. Japanese larch plantations of the period 1930-1950 have shown vigorous growth on soils ranging from clays to sandy loams on gravel. It does

not appear to be suited to the peaty sands and gravels.

(e) Douglas fir. This species has given satisfactory growth on clays, gravelly clays and sandy loams over gravel; but as usual it is most susceptible to bad drainage conditions.

(f) Corsican pine. This pine is most suited to the peaty sands and gravels of Creech Walk where very satisfactory growth up to timber size has been attained. In West Walk occasional large specimens in the old oak areas on clay have grown well and small plantations of P.36 and P.38, on loamy or sandy clay are growing well.

(g) Scots pine. On any particular area at least one alternative species will usually be equally well adapted to the site conditions and at the same time produce a greater yield.

(3) Planting.

(a) Spacing. The spacings adopted during the period 1926/51 are as follows:-

(i) <u>Oak</u>	<u>Type</u>	<u>Spacing</u>
P.28	Not known	4½ ft. x 4½ ft.
P.32	Seedlings 2 yr.	4½ ft. x 2 ft.
P.37	Transplants 2 + 1) 2 + 2)	3000/acre 4½ ft. x 3 ft. or 4 ft. x 4 ft.
P.38	Transplants 2 + 1	4½ ft. x 4½ ft.
P.44	Seedlings 3 year	4½ ft. x 2 ft.

Although without a detailed analysis it is not practicable to give a definite opinion, the present condition of the various plantations does not suggest that the closer spacings have given any silvicultural advantage. Financial comparisons of establishment costs are not possible.

(ii) <u>European larch</u>	<u>Type</u>	<u>Spacing</u>
P.26	2 + 2	6 ft. x 6 ft. (On account of heavy weed growth a closer spacing would have been preferable)
P.35	2 + 2	2000/acre (4½ ft. x 4½ ft.)

(iii) <u>Japanese larch</u>	<u>Type</u>	<u>Spacing</u>
P.36	2 + 1 + 1	6 ft. x 6 ft.
P.40	1 + 1 + 1 2 + 1	2000/acre shown by RI's
P.41	2 + 1	6 ft. x 6 ft.

Japanese larch and Hybrid larch

P.46	1 + 1 + 1	6 ft. x 6 ft.
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Japanese larch

P.47	1 + 2	5½ ft. x 5½ ft.
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(iv) Corsican pine

Very variable from 1 + 1, 2 + 1 to 1 + 1 + 2 and 1 + 1 + 1 + 1	4½ ft. x 4½ ft. & 4 ft. x 4 ft.
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(v) Douglas fir

Variable usually 1 + 1 or 1 + 1 + 1	6 ft. x 6 ft.
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(b) Methods of Planting.

(i) Gravels and gravelly clays - Mattock pitting.

(ii) Clays and soils with little gravel - Notch

planting with Schlich spade, screefing has also been the practice in areas with a mat of dense grass and also where a few inches of light fibrous peat lies over the mineral soil.

(4) Beating up.

Analysis of the R.I. records (after 1932), reveals considerable variations in the period over which beating-up has been carried out for any given species. It is apparent that in various years losses have been high and it is probable that (apart from weather conditions) changes in the rabbit population were to some extent the cause of this variation, with the additional factor of bad drainage in certain areas. In any given year the age and type of plant used for beating-up has usually been the same as that used concurrently for the initial planting in other areas.

The only cases of note where the species has been changed

are in Japanese larch P.41 and Japanese larch P.47 where Corsican pine was used on a scale which amounts to replanting; the chief cause of this failure in 1947 was an unexpected increase of rabbit population, the replanting of 1941 Japanese larch may have been due to the same cause.

(5) Weeding.

The climatic conditions and fertile soils necessitate weeding of all species for 3 years, with up to 5 and even 7 years in the case of oak. In exceptional cases of heavy beating up, the weeding period is correspondingly increased.

(6) Mixture of Species.

The various mixtures adopted during the various planting periods have been discussed previously.

Research - Note by Research Branch.

Permanent Sample Plot E.83.

A permanent sample plot was established in this forest in 1924 in Compartment 15A, Creech Walk. (National Grid Reference 41/651111.) The plot was situated at approximately 150 ft. above sea level on a moderately exposed, uniform slope of 20-30°, with a south-west aspect.

The tree crop was planted as a mixture of Corsican pine and European larch, with some Scots pine and beech. The pines had grown rapidly and only a few of the larch, and none of the beech, remained at the establishment of the plot, when the crop was 37 years old. The larch were badly cankered and mostly excluded from the upper canopy, and they were removed in the first two thinnings. The Corsican pine were badly crowded, drawn and lanky, with narrow, asymmetrical crowns and numerous forks occurring high in the stems.

At the time of establishment, the ground vegetation was scanty, mainly Pteris at the edges of the stand, and elsewhere patches of Oxalis and Galium, with Thuidium mosses. The layers

of raw humus were excessive, but scattered seedlings of pine, oak, chestnut, holly, and yew were found in the plot. The soil beneath this accumulation of humus was a leached sandy loam, over loose flinty gravel and coarse yellow sand. The geological origin of the soil was the Bagshot Beds of the Eocene.

The crop was thinned to a standard B grade, (light-low thinning) at establishment and subsequently, all larch being removed within two thinnings.

Some wind-damage occurred in the late 20's, but rapid growth continued. The vegetation also increased until in 1934 there was a complete covering of Rubus, Pteris, Digitalis, Lastreae and Galium, with occasional Thuidium, and Brachythecium mosses. A summary of the periodical measurements is given in the attached table.

At the last measurement, in 1950, the crop had reached a top height of 101 ft. and a mean girth of $43\frac{1}{2}$ in. Further wind-damage has occurred in recent years, but rapid uniform height growth has been maintained. Under the light thinning regime, the trees have remained crowded, and the crowns are still small and badly flattened. The branching is light but persistent, and the stems whippy and badly forked, though most of the forks are too high to affect the value of the timber.

J.N.R. Jeffers.

February 1952.

Record of periodical measurements per acre.

Grade "3"

Sample Plot No. E 83

Corsican Pine

Area = 0.376 acres.

Year of measurement.	Age of crop. Years.	Number of trees per acre.	Height		Form Factor.	Girth at 4' 3" Inches.	Basal area per acre. Sq. ft.	Volume per acre (under bark). Cub. ft.	Crown %	Bark %	INTERMEDIATE YIELD FROM THINNINGS.					TOTAL CROP.		INCREMENT OF MAIN CROP.					
			Average of largest trees. Ft.	Average of crop. Ft.							Number of trees.	Average height. Feet.	Girth at 4' 3" Inches.	Basal area per acre. Sq. ft.	Volume per acre (under bark). Cub. ft.	Basal area. Sq. ft.	Volume (under bark). Cub. ft.	Periodic. Basal area. Sq. ft.	Volume Cub. ft.	Basal area. Sq. ft.	Volume Cub. ft.	Periodic mean annual. Volume. Cub. ft.	
6/1924	37	465	66½	65	.418	28½	164.6	4470	19		101	58½	20	17.7	365	182.3	4835	-	-	-	-	-	-
4/1929	42	375	74½	72	.427	32	165.7	5092	19		90	67	23½	21.8	569	205.2	6026	22.9	1191	4.6	238		
6/1934	47	348	81½	75	.417	34½	179.6	5915	35	17	27	69½	25	7.3	176	226.4	7025	21.2	999	4.2	200		
3/1939	52	324	85½	84	.408	37	191.5	6597	21½	17½	24	76	29½	9.0	262	247.3	7939	20.9	914	4.2	183		
2/1944	57	295	95½	93½	.396	39	196.8	7281	24		29	82½	31	12.0	368	264.6	9021	17.3	1082	3.5	216		
10/1947	61	237						Thinnings			58	89	33½	28.2	973								
2/1950	63	216	101	99½	.377	43½	177.7	6687	34½	17	21	93	36	11.9	421	285.6	9821	21.0	800	3.5	133		

Conclusion.

The establishment of forest crops over the period 1815-1951 has been successful. In many cases, however, subsequent maintenance work and treatment of these plantations has not realised the full potentialities of the site.

E.A. Keen.

District Officer.

October, 1951.

A very great deal of work has been put into the preparation of this comprehensive report and history and there is really little to be added by me at this stage.

R.H. Smith.

31.10.51.

HISTORY OF BERE FOREST.

APPENDIX I

Notes from Selected Inspection Reports.

26/27.2.20. Technical Commissioner (Mr. R.L. Robinson).

A general inspection of the woods was made, and the following points noted:-

West Walk

- (1) The good growth of beech and the comparative failure of silver fir in the 60 year old woods which have been underplanted. The underplanting is far too dense.
- (2) Good growth generally of the older oak.

Probably the whole of this Walk should be devoted to hardwoods (oak on the better soil and beech on the small area near the top of the hill).

East Walk

- (1) Excellent growth of conifers and particularly Corsican pine, Japanese and European larch.
- (2) The better growth of oak in the western part of the Walk.

Probably the whole of this Walk with the exception of the better oak should be devoted to conifers.

23.10.24. Technical Commissioner on the Report on Bere Woods.

The first part of the report confirms our tentative conclusion (so far as a definite confirmation is possible) that the death of oak is due to the combined attacks of Tortrix and mildew, assisted perhaps by the abnormal drought of 1921.

Restocking with suitable species.

Choice of species. I have always regarded Bere (West Walk) as one of our areas most suitable for oak.

Providing that we propose to grow as much oak as we can grow successfully the questions are first whether sessile oak will be more successful in resisting attack by Tortrix and mildew. This is a point on which we require more information and Dr. Munro should investigate it thoroughly., In any event the

first plantations cannot be made with sessile oak owing to absence of plants.

As regards conifers we have to guard in particular against honey fungus which will be very prevalent. This suggests very limited use of pines and Sitka spruce. Silver fir is ruled out on account of Chermes. We should therefore for large scale operations be left with Douglas fir, larches and common spruce which will in practice meet all the conditions at Bere.

4.11.24. Technical Commissioner.

Note: There is a reasonable hope that the attack of Tortrix is over and that although trees will continue to die the deaths will not be wholesale. I am therefore strongly opposed to wholesale clear fellings.

29.10.32. Chairman.

West Walk. Compartment 3c was seen, which is 60-80 year oak, underplanted P,06 with beech, a good many of the oak are dead. As an experiment, the Chairman said we might thin the oak, then thin the underwood (beech, silver fir, chestnut, etc.) favouring the good beech all the time.

Chairman's minute:-

The oak should be thinned to favour the good trees and the underplanting to favour the good beech which are getting very whippy.

28.7.36. Chairman.

There are also some tall chestnut in the crop. Some of the chestnut are up and competing with the crowns of the oak. Instructions were given to have them out. We were also told by Sir Roy to see that the beech is kept under the oak. The oak crowns must not be allowed to get any smaller. Some of the larger beech must be taken out next winter and the smaller beech will come on and take their place. A selection of oak stems must be made and these trees must be looked after even if we only get a final crop of 40 to 50 per acre.

4.7.42. Chairman.

West Walks. Compartment 2 and 3 Upperford Copse old oak underplanted with beech and silver fir between P.00 and P.10. The beech has been experimentally thinned in 1938/39 by (a) cutting out all the dominant beech (b) removing such dominate beech as were threatening to overtake the oak (c) normal thinning. It was noted that treatment (a) had overdone it and (c) had achieved no useful purpose but that (b) was more successful. These and the similar, but slightly younger beech underplantings Compartments 6 and 7 are very interesting and unique of their kind and must at all costs be retained. The silver fir have almost all died out and it is noticeable that far too dense a stocking of beech was planted and the same result might have been achieved at much reduced expense in establishment and subsequent treatment by a very much more open planting of beech. The history of these areas should be recorded for subsequent information.

Future treatment should be to thin the oak lightly where more crown space is needed and to remove any beech which threaten to interfere with the development of the oak. Thinning in the ordinary sense of the word of the beech is unnecessary and should not be done unless it can be done at a profit.

GENERAL. Information to date suggests that pure oak planting followed by hard weeding for the early years will give the best results and plantations can be established in five to eight years. The merits of 1 yr. and 2 yr. seedlings and of transplants were discussed and it is probable that the best results at reasonable cost can be obtained by using strong 1 yr. and 2 yr. seedlings, the cheapness of which allows for closer spacing.

11/12.5.50. Chairman.

Bere. Oak/Beech.

The oak with beech underplanting led to much discussion. It was generally agreed that oak is not too well suited to the

gravelly soil. The killing off by vigorous beech of large branches in the lower parts of the crowns of the oak is an undesirable result of the system and may lead to serious attack by the stem-rot, Stereum. The need for thinning was accepted, but the future handling of the crop was a matter for divergent opinion.

One view is that having spent 90 years on growing oak on the site we should continue to do so and ruthlessly cut out any beech interfering with final crop trees. Another view is that since some of the beech are very good and some of the oak are poor, it would be better to abandon the policy of having a pure oak crop and to thin in the interests of the best tree whether oak or beech. Such an intimate mixture of the species cannot be maintained in view of the fact that the vigorous beech will suppress the oak. The crop, however, has resolved itself into groups in which thinning with the intention of keeping a good oak, if it exists, will be practised. If the choice lies between a medium or poor oak on the one hand and a good beech on the other, then the beech will be favoured. Such treatment will accentuate grouping in the immediate future, but ultimately will lead to individual trees of both species forming the crop.

P.28 oak.

22 year old oak originally planted at $4\frac{1}{2}$ ft. x 3 ft. with a 1 in 3 mixture of larch in every alternate row show that there is no justification for closer planting of these species. The larch were removed two years ago and there is no evidence that they had been of silvicultural value in raising the oak crop. The pruning of selected, vigorous dominants showed that if we prune we can often retain in the crop trees which in former practice we should have cut out as "wolves". There is of course still need for wolfing of very rough trees.

Chairman's minute:-

The 90 year old Oak underplanted with beech.

An interesting point was the absence of forking in the beech, many of which if now given light will develop rapidly into first-class stems. This throws useful light on raising beech crops. However, it is impossible both to give the oak room to expand their crowns and at the same time fill up the room with beech. If, as in this case, we want a final oak crop, there is only exceptionally a place for beech in the upper canopy, i.e. there will be no beech timber. The experience gained with these compartments and similar underplantings elsewhere calls into question the purpose of underplanting. If it is soil protection plus suppression of epicormic branches on the oak, then comparatively few plants need be put under the oak, none of them will ever be admitted into the upper canopy and there will be no beech timber. If, on the other hand, beech timber is an object of management, it must be at the expense of oak production. My own view is that, having set out to grow oak, we should persist in that objective. I think too that underplanting was at one time something of a fetish and overdone, particularly on heavy soils.

Some of the young oak plantations are disappointing, due presumably to neglect.

Creech Walk.

Corsican pine seems easily the best tree on the lighter soils.

HISTORY OF BERE FOREST.

APPENDIX II

Supervisory Staff

<u>Deputy Surveyors</u>	1924 - 1925	V.F. Leese
	1925 - 1931	L.S. Osmaston
	1931 - 1932	D.W. Young
<u>Divisional Officers</u>	1932 - 1939	A.L. Felton
	1939 - 1946	F.C. Best
<u>Conservators</u>	1946 - 1947	F.C. Best
	1947 - 1949	A.L. Felton
	1949 to date	R.H. Smith
<u>State Forest Officers</u>	1947 - 1948	R.H. Smith
	1948 to date	J.M. Ross
<u>District Officers</u>	1924 - 1932	L.E. McIver
	1932	R.G. Forbes
	1932 - 1939	G. Lowe
	- 1939	C.A.J. Barrington
	- 1945	T. Clear
	1945 - 1946	C.A.J. Barrington
	1946 - 1947	J. Goodwin
	1947 - 1951	J. White
	1950 - 1951	E.A. Keen
	1951 to date	E.S.V. Burton
<u>Foresters</u>	1924 - 1933	S. Aston
	1933 - 1940	S. Hyett
	1940 - 1949	R. Lawes
	1949 - 1950	S. Hyett
	1950 to date	F.C. Watts

HISTORY OF BERE FOREST.

APPENDIX III.

(a) Statistical description of Oak underplanted with Beech
(by compartments) - West Walks - Bere.

Compts.	Acres	Age	Heights of Dominants (feet)	Average Height (feet)	B.H. Diameter T.O.B. (ins.)	Mean Q.G. T.O.B. (ins.)	Date of last thinning (F.Y.)	Present number of stems per acre	Volume per acre after thinning (T.O.B.)	Intermediate Yield (where known) (T.O.B.)	Known Total Yield (T.O.B.)
2A	6	90/100	68	60	13	8	50	75	1275	990	2265
2B	7.5	80/90	65	58	12	7½	50	90	1350	330	1680
3B	9.5	80/90	66	58	13	8	38	90	1630	-	1630
3C	14	80/100	68	60	13	8	Part 38 Part 50	85	1700	720	2420
6	5	80/100	65	61	13½	8	Part 38 Part 50	100	1550	1100	2650
7A	6	80/100	70	62	13	8	34	110	2090	-	2090
7B & 8	8	80/100	68	61	12	7½	34	115	1680	-	1680
Average:			67	60	12¾	8		95	1610	785	2059

HISTORY OF BERE FOREST.

APPENDIX III. (Contd.)

(b) Statistical description of Beech (by compartments)

Compt.	Area	Date of Underplanting	Height of Oak when Underplanted (feet)	Date of last thinning of crop F.Y.	Average number of Beech per acre	Mean total height of Beech (feet)	Mean diameter of Beech (B.H.T.O.B.)	Approximate Volume of Beech per acre T.O.B.
2A	6	P.07	46	50	620	40	3½"	310
2B	7.5	P.03	36	50	460	45	4"	307
3B	9.5	P.06 (Part P.10)	48	38	540	40	3½"	270
3C	14	P.08 (Part P.09)	46	Part 38 Part 50	500	43	4½"	400
6	5	P.11	48	Part 38 Part 50	745	47	3½"	670
7A	6	P.16	46	34	725	45	3½"	650
7B & 8	8	P.16	46	34	700	45	3½"	630

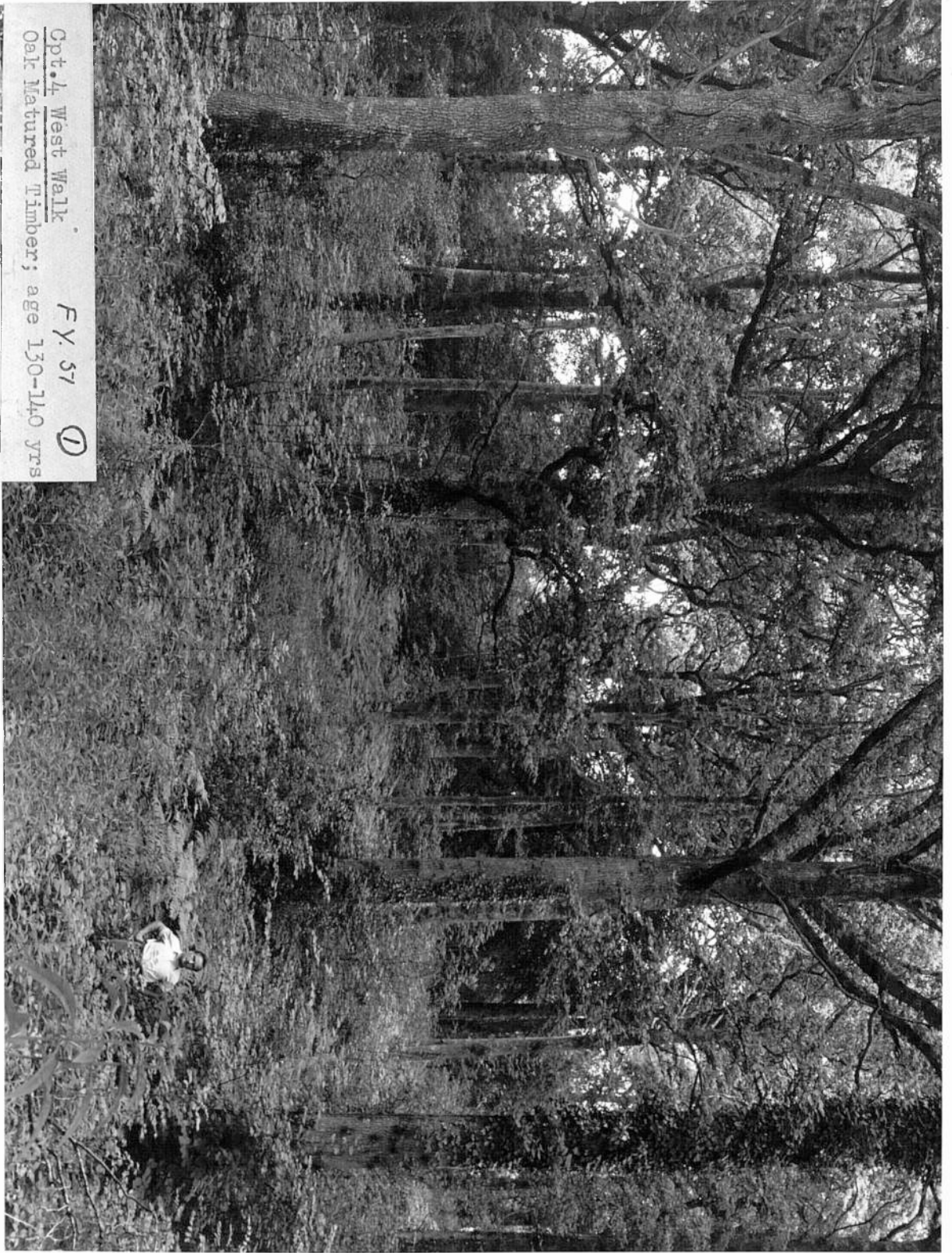
HISTORY OF BERE FOREST.

APPENDIX III. (Contd.)

(c) Summary of Yields.

Compt.	Area (acres)	Oak (per acre)			Beech (per acre)		Total crop yield per acre (Oak & Beech) under Bark	Current mean annual increment assuming Oak to be 90 years (cubic feet under bark)
		Intermediate yield (where known) T.O.B.	Assumed yield from heavy thinnings about 50 years ago (cubic feet) T.O.B.	Present Volume T.O.B.	Total Yield T.O.B.	Present Volume T.O.B.		
2A	6	990	500	1275	2765	310	2768	30
2B	7.5	330	500	1350	2180	307	2239	24
3B	9.5	-	500	1630	2130	270	2160	24
3C	14	720	500	1700	2920	400	2735	30
6	5	1100	500	1550	3150	670	3438	38
7A	6	-	500	2090	2590	650	2916	32
7B & 8	8	-	500	1680	2180	630	2529	28
Average per acre		785	500	1610	2559	462	2683	30





Cpt. 4 West Walk
Oak Matured Timber; age 130-140 yrs

F. Y. 57

①

Cpt. 4 West Walk
Oak Matured Timber; age 130-140 yrs.

F. Y. 51.

①



Cpt. 4 Creech F. Y. 51
Old Oak 130-140 yrs.

②



Cpt. 4 Greech F.Y. 51 (3)
Old Oak (130-140 years)

Cpt. 4 Greech F.Y. 51

Old Oak (130-140 years)



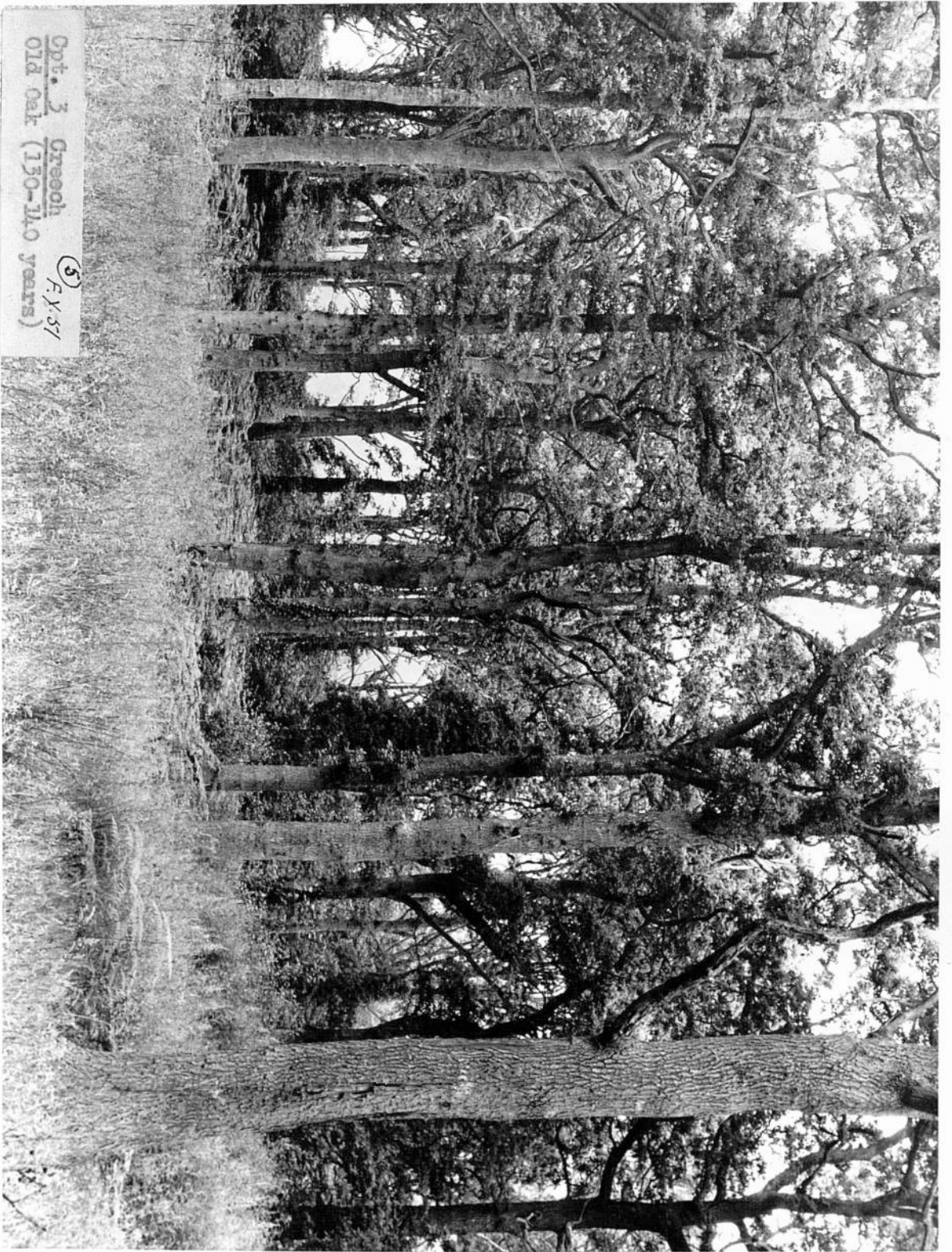
Cpt. 3 Creech
Old Oak (130-140 years)

Cpt. 3 Creech

F.Y. 51

Old Oak (130-140 years)

④



Opt. 3 Greesh (5)
F.Y. 51
Old Oak (130-140 years)

Opt. 3. Greesh

F.Y. 51

Old Oak (130-140 years)



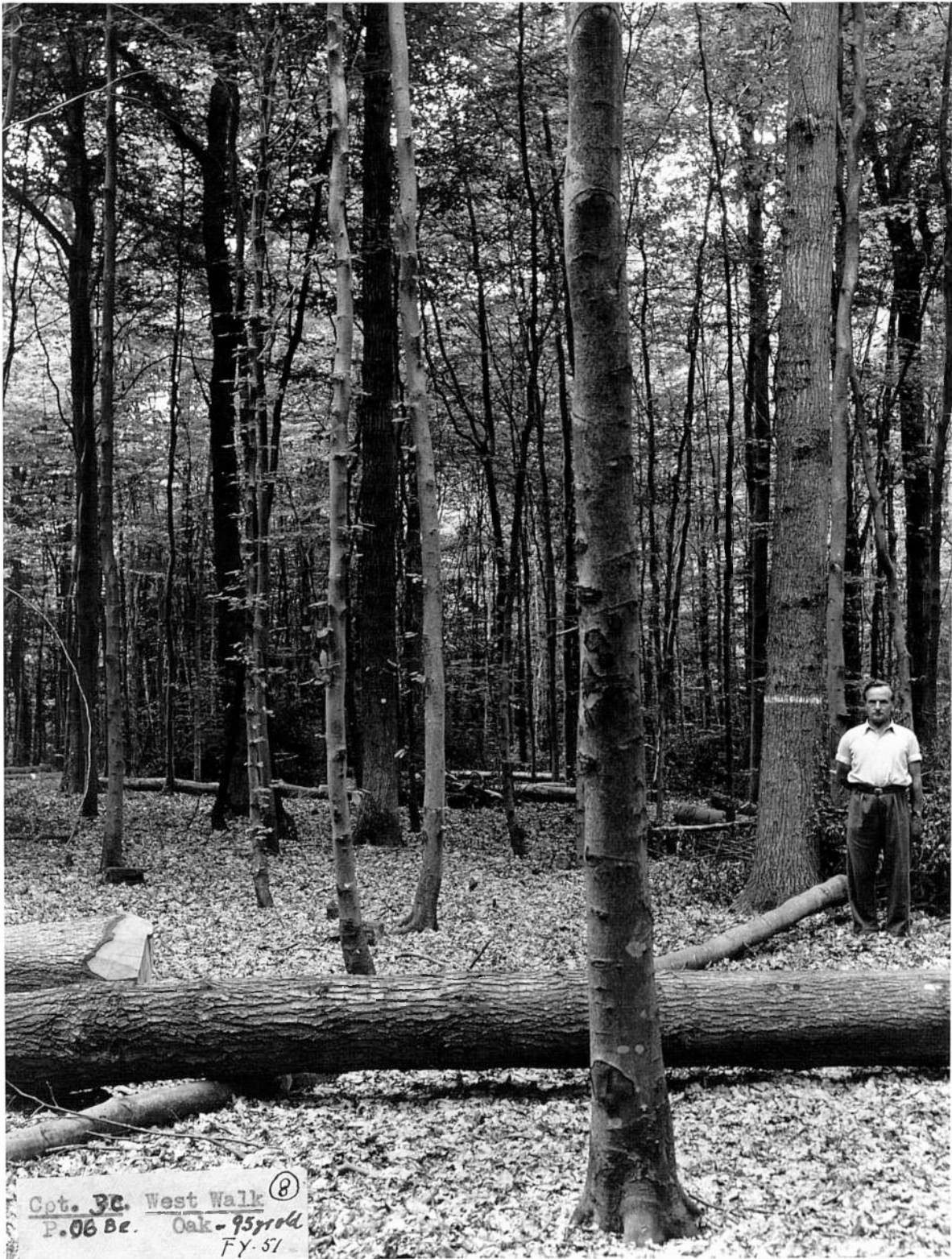


⑥
Cpt. 9B West Walk F.Y. 57
Oak. Sessile - 100 years

Cpt. 9B West Walk

Oak. Sessile - 100 years.

⑥



Cpt. 3C. West Walk (8)
P.06 Be. Oak - 95yrs old
FY-51

Cpt. 3C. West Walk

P.06 Be. Oak - 95 years. old.

(8)



Cpt. 30 West Walk F.Y. 51 (9)
Oak - 95 years; U/P Be 45 years

Cpt. 30 West Walk.

Oak - 95 years; U/P be 45 years

(9)

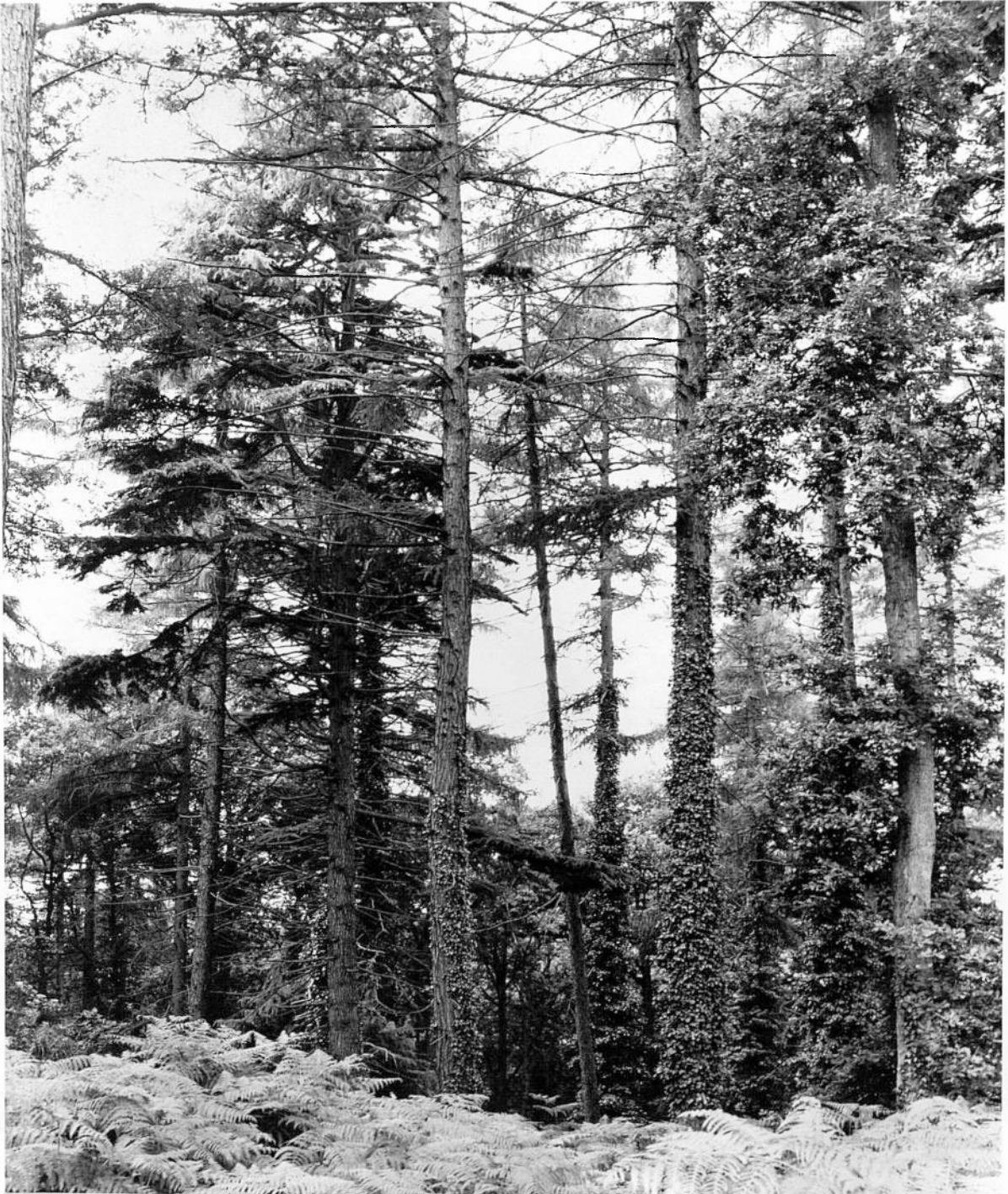


Cpt. 2 Queens (10)
Oak 90 years
FY.57

Cpt. 30 West Walk.

Oak - 95 years; U/P Be 45 years.

(10)



Cpt. 4 Creech
 E.L. (approx 90 years) FY.51 (11)
 Cedrus Deodar (aged approx 90 years)
 Oak " " " "

Cpt. 4 Creech

E.L. (approx. 90 years) Cedrus Deodar (aged approx 90 years)
 Oak (" " " ")

(11)



Cpt. 14B Creech (12)
C.P. & S.P. P.82
FY.57

Cpt. 14B Creech

C.P. & S.P. P.82

(12)



Opt. 15 Greech
P. 41 Cryptomeria
P. 82 S.P.
FY. 57

(13)

Opt. 15 Greech.

P. 41 Cryptomeria P. 82 S.P.

(13)



Cpt. 16 Creech.

J.L. P.19

(14)



Cpt. 18 West Walk (16)
P.26 D.F. (Interior view) FY.51

Cpt. 18. West Walk.

P.26. D.F. (Interior view)

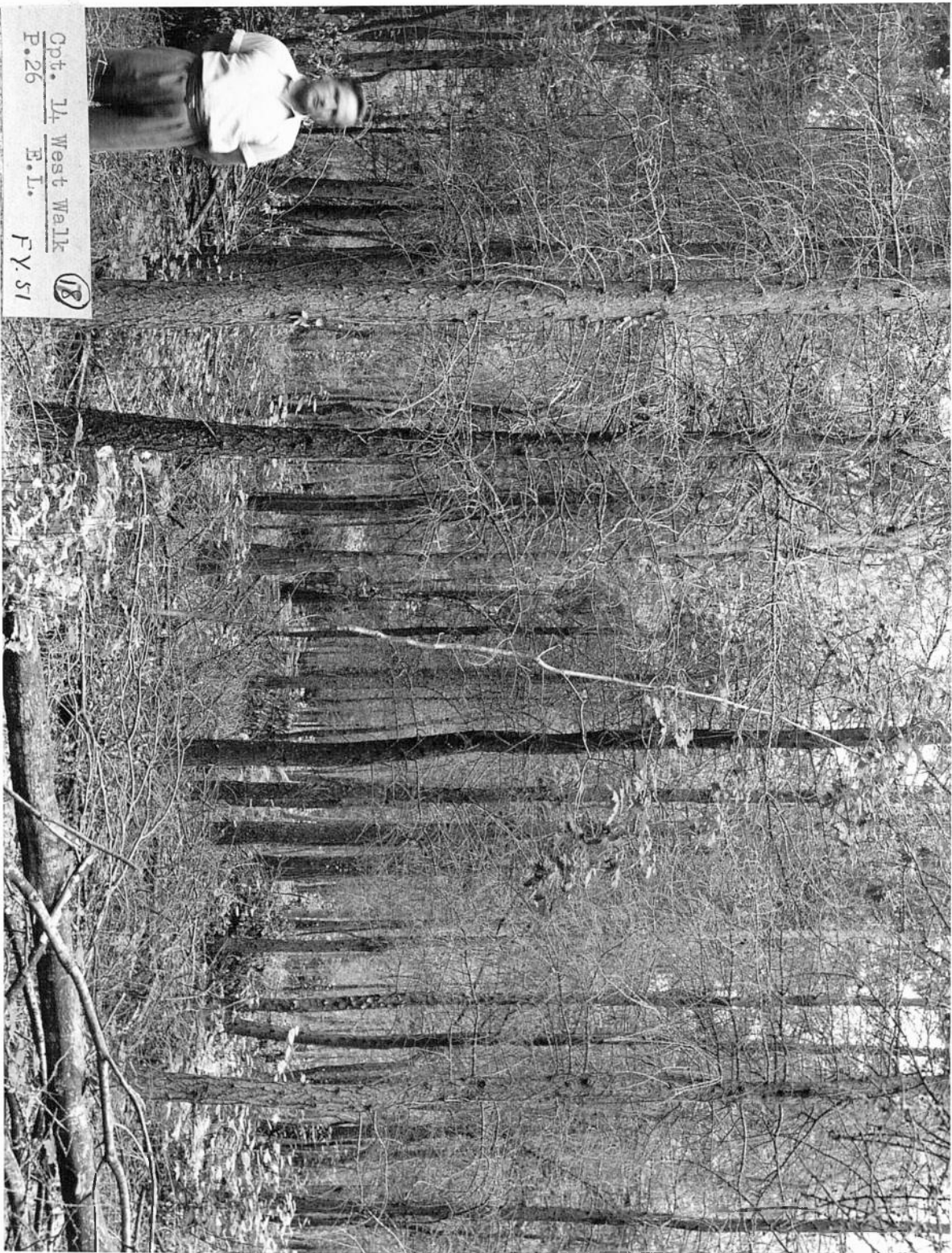
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Cpt. 18. West Walk.

P.26 D.F.

(16)



Cpt. 14 West Walk
P. 26 E. L.
F. Y. 51

(18)

Cpt. 14 West Walk - P. 26. E. L.

(17)



Cpt. 13 West Walk (19)
P. 28 Oak FY 57

Cpt. 13. West Walk.

P.28. Oak.

(19)



Cpt. 9B. West Walk ⁽²⁰⁾
P. 32 Oak ⁽¹⁹⁾
F. Y. 51

Cpt. 9B. West Walk.

P. 32. Oak

(19)



Cpt. 15 Creech (21)
P. 31 E.L. FY. 51

Cpt. 15. Creech.

P.31. E.L.

(20)



Cpt. 8 Creech
P.40 J.L.

F.Y. 51
①②

Cpt. 8 Creech. P.40 J.L.

①



Cpt. 22. West Walk (22)
P. 44. Oak
F.Y. 51

Cpt. 22. West Walk. P. 44. Oak.

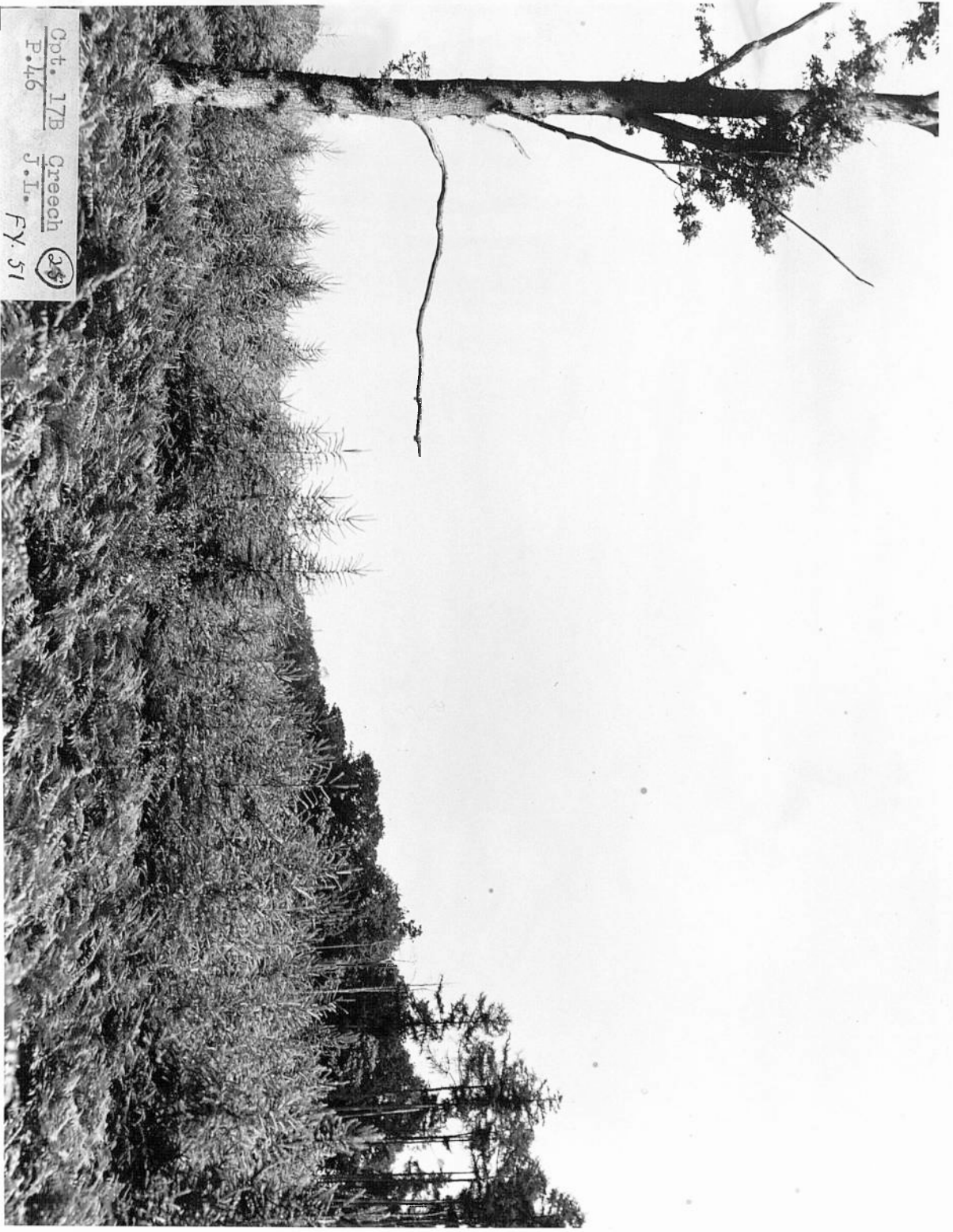
Cpt. 22 West Walk
P. 44 Oak; P. 28 Oak (back) F.Y. 51

(24) (23)



Cpt. 22. West Walk. P. 44 Oak; P. 28 Oak (back)

(23)



Cpt. 17B
P.46

Creech
J.L.
FY. 51

(25)

Cpt. 17B. Creech. P.46 J.L.

Opt. 12 Creech
S.P. - 8 Years; B.U. C.P. F.Y. 57

(26)



Opt. 12 Creech. S.P. - 8 years; B.U. C.P.

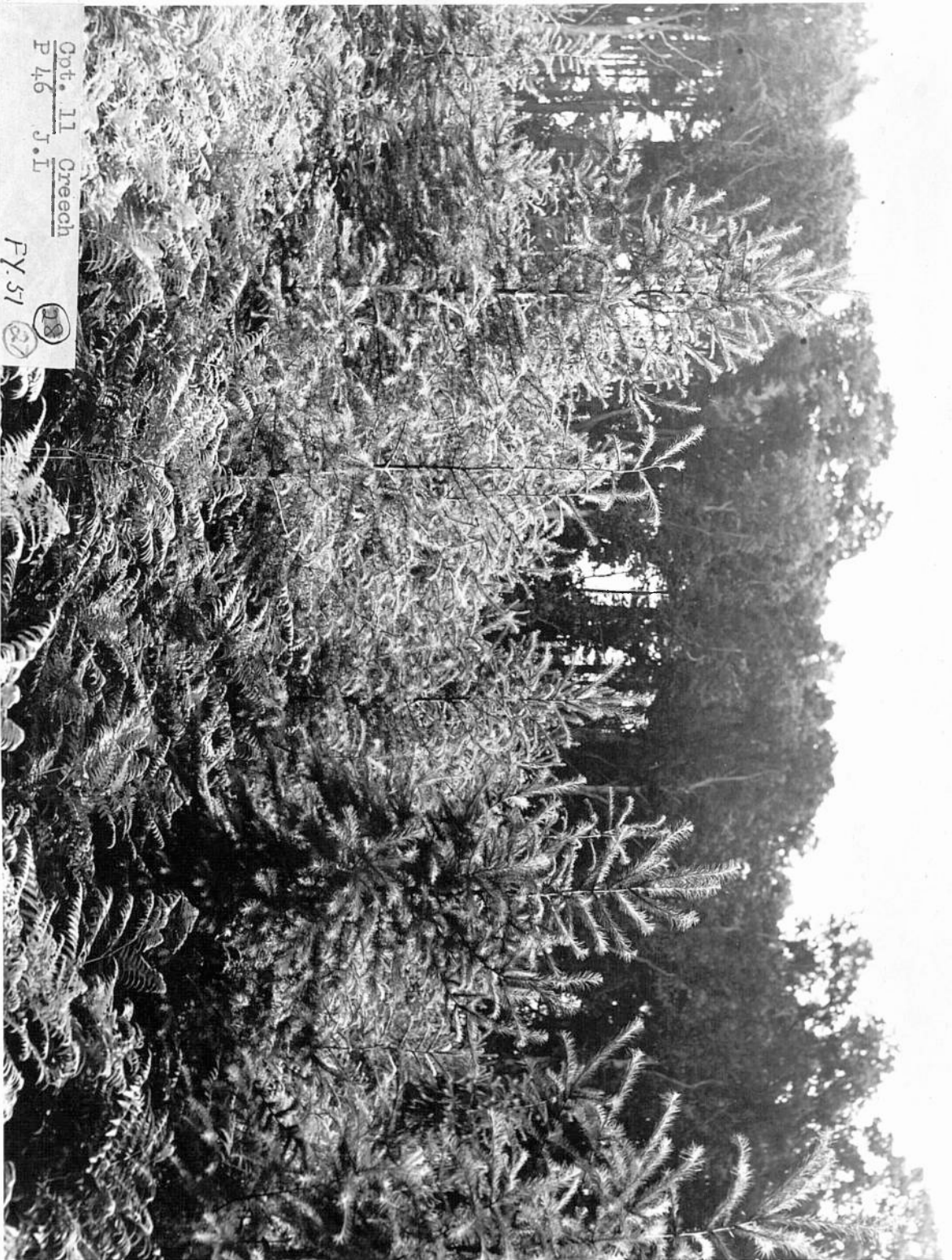
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Cpt. 5 Greech.
P.46 D.F. Old Oak in background

F.Y. 51 (24)

Cpt. 5 Greech. P.46 D.F. Old Oak in background.



Cpt. 11. Creech
P. 46 J. L.

FY. 51
18
27

Cpt. 11. Creech. P. 46 J. L.

BERE FOREST

1

Capt. 4 West Walk F.Y.51
Oak Matured Timber; age 130-140 yrs.

2

Capt. 4 Creech F.Y.51
Old oak 130-140 yrs.

3

Capt. 4 Creech F.Y.51
Old Oak 130-140 yrs

4

Capt. 3 Creech F.Y.51
Old oak 130-140 years

5

Capt. 3. Creech F.Y.51
Old Oak (130-140 years)

6

Capt. 9B West Walk
Oak. Sessile – 100 years

7

Cpt. 9b. West Walk
Oak – Sessile; 100 years

8

Cpt. 3C West Walk
P.06 Be. Oak – 95 years. old.

9

Cpt. 3C West Walk.
Oak – 95 years; U/P be 45 years

10

Cpt. 2 Queens
Oak 90 years
Cpt. 3C West Walk.
Oak – 95 years; U/P Be 45 years.

11

Cpt. 4 Creech
E.L. (approx. 90 years)
Cedrus Deodar (aged approx 90 years)
Oak (“ “ “ “)

12

Cpt. 14B Creech
C.P. & S.P. P.82

13

Cpt. 15 Creech.
P.41 Cryptomeria
P.82 S.P

14

Cpt. 16 Creech.
J.L. P.19

15

Cpt. 18. West Walk.
P.26. D.F. (Interior View)

16

Cpt. 18. West Walk
P.26 D.F

17

Cpt. 14 West Walk
P.26. E.L.

18

Cpt. 13. West Walk.
P.28. Oak.

19

Cpt. 9B. West Walk.
P.32. Oak

20

Cpt. 15. Creech
P.31. E.L

21

Cpt. 8 Creech
P.40 J.L

22

Cpt. 22. West Walk
P.44 Oak

23

Cpt. 22. West Walk
P44 Oak; P.28 Oak (back)

24

Cpt. 17B. Creech.
P.46 J.L.

25

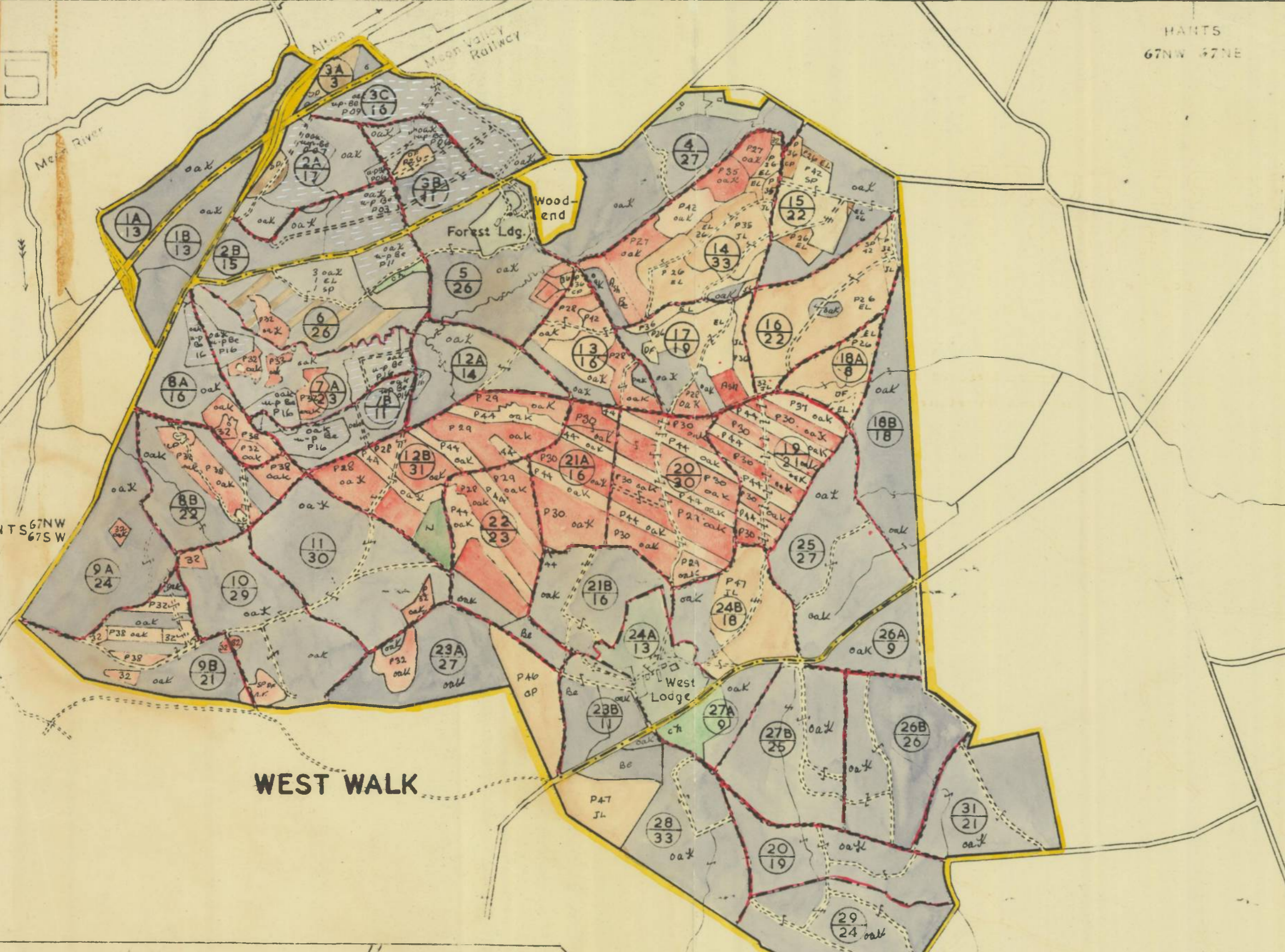
Cpt. 12 Creech
S.P. – 8 years; B.U. C.P.

26

Cpt. 5 Creech.
P.46 D.F. Old Oak in background

27

Cpt. 11. Creech.
P.46 J.L.



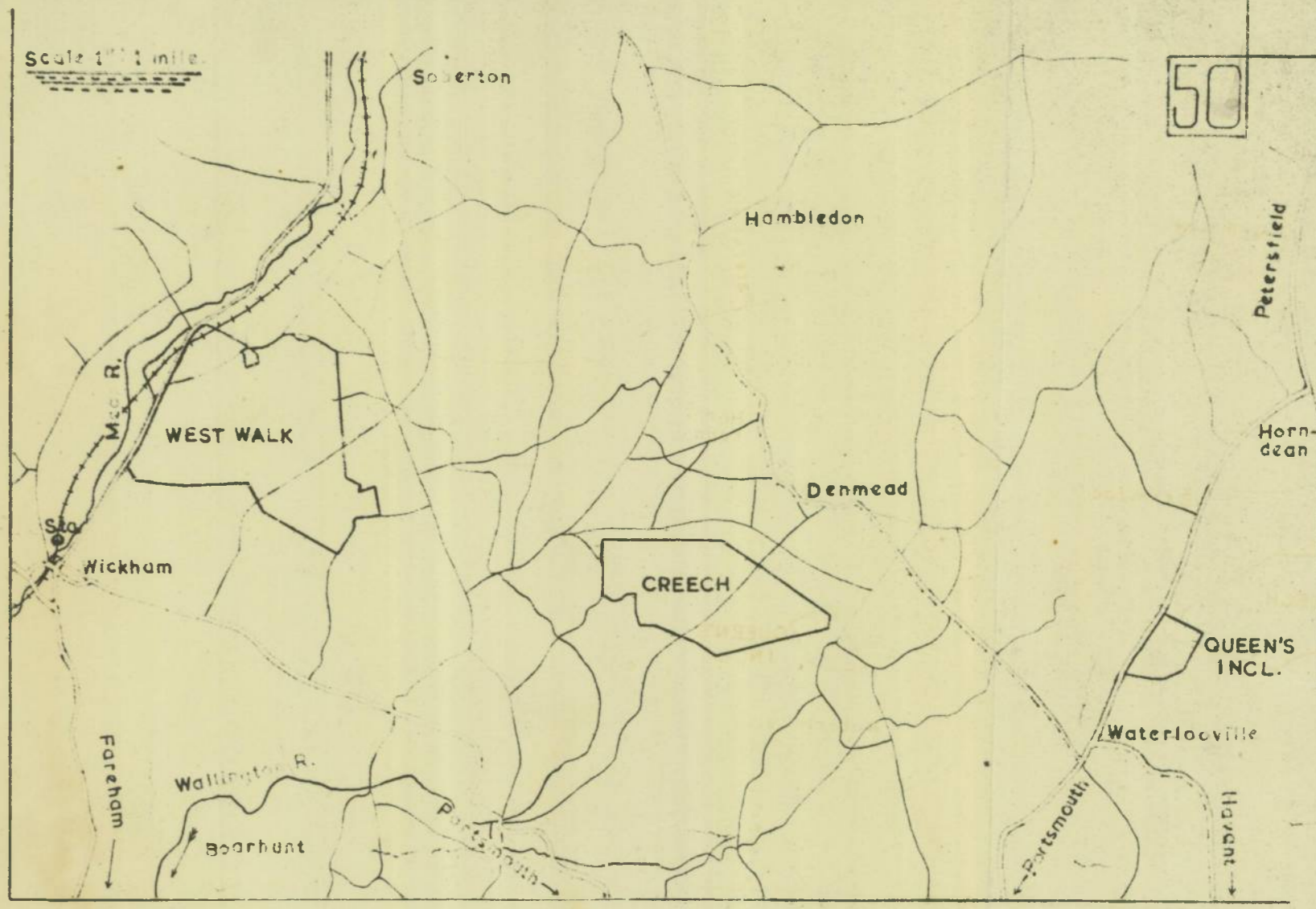
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BERE FOREST F.Y. 1949.

Scale: 6" to 1 mile.

- FC's area boundary
- - - Compartment
- Plantation
- - - species
- ==== Metalled roads
- Unmetalled

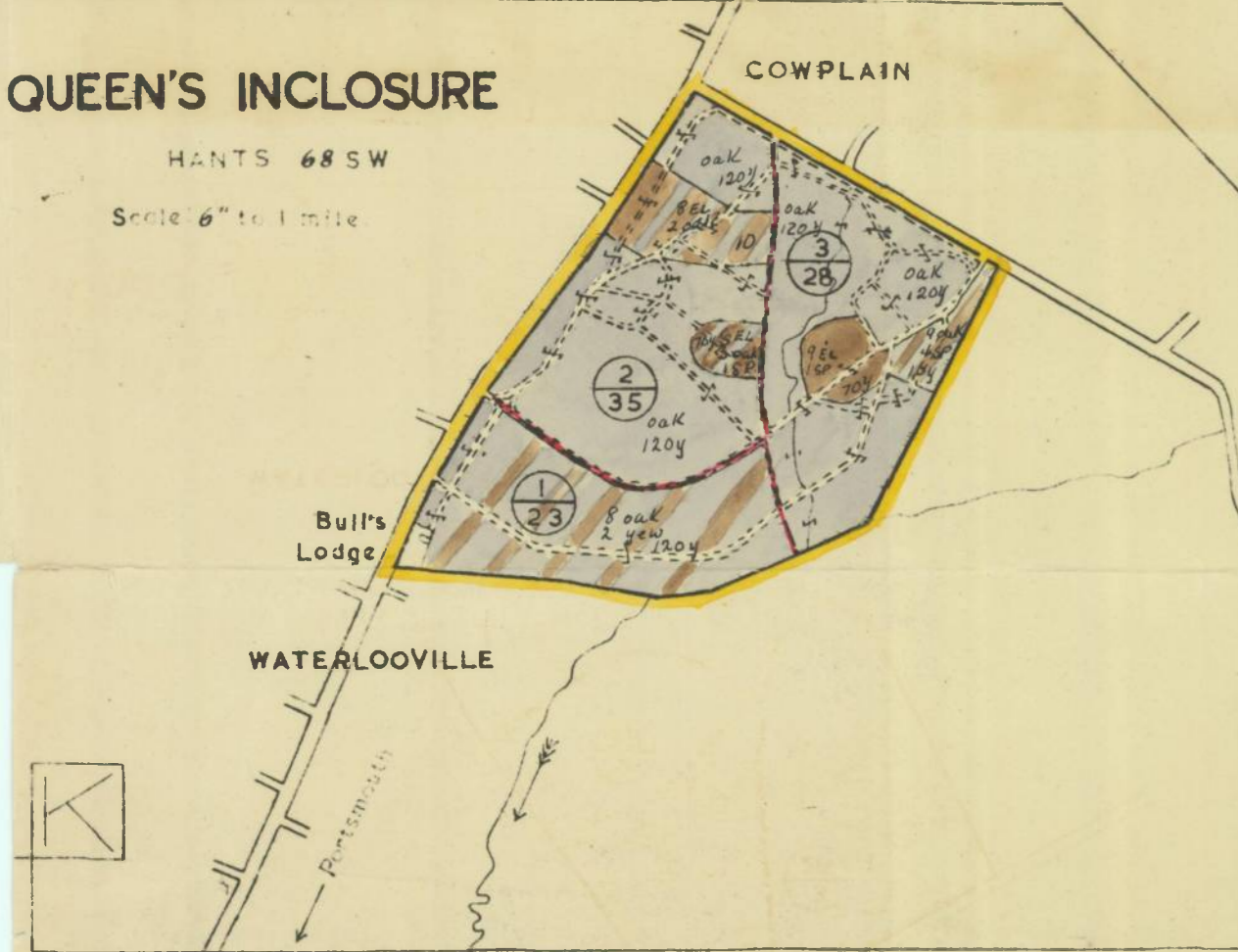


WEST WALK

QUEEN'S INCLOSURE

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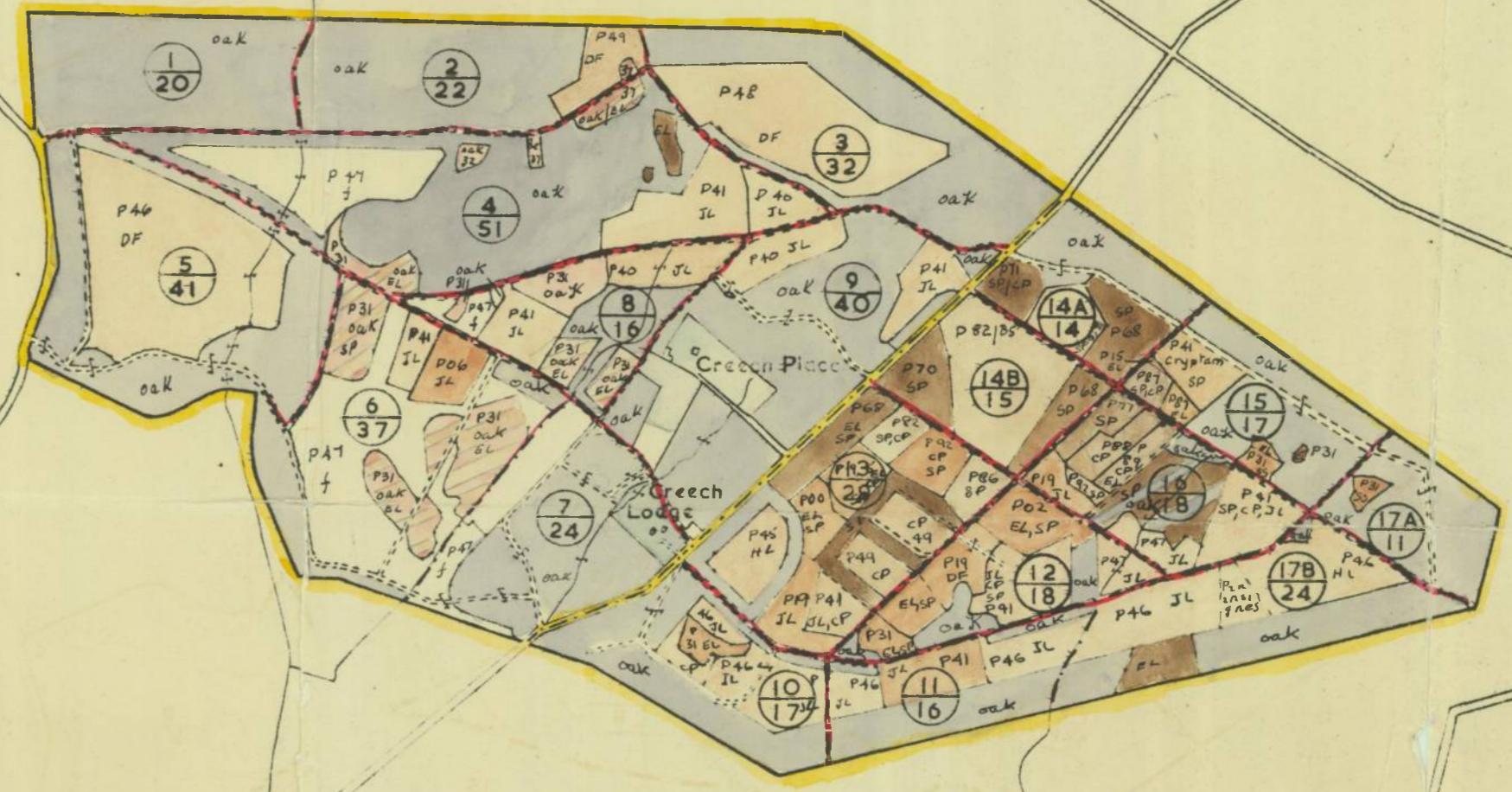
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CREECH OR EAST WALK



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