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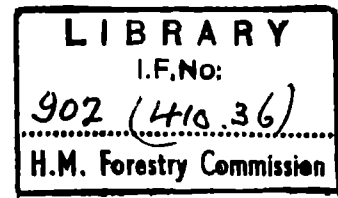
KIRROUGHTREE

FOREST

S(S) CONSERVANCY

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FORESTRY COMMISSION

HISTORY

of

KIRROUGHTREE FOREST

1930 - 1951

SOUTH (SCOTLAND) CONSERVANCY

History of Kirroughtree Forest

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HISTORY OF KIRROUGHTREE FOREST

CHAIRMAN'S COMMENTS

This is a well-written history to which I can add little as my visits of inspection have been rare and not thorough.

At my last visit (June 1952) I got a general view of the plantations. The difficulty of getting pure Sitka spruce away in the peaty depressions was obvious. If we had known at the time a mixture of pine would have been most helpful and on the worst sites I would not exclude the use of mountain pine with Sitka spruce.

It seemed to me that there is now enough evidence on the ground to show how the whole job could have been successfully accomplished and that a careful study of results would be useful here and elsewhere.

I think a few photographs of some of the checked areas would increase the value of the history for our successors.

R.

14th July, 1952.

COMMENTS BY CONSERVATOR (STATE FORESTS)

This history gives an excellent picture of the development of Kirroughtree Forest. I was particularly interested in Donald's observations on Choice of Species with particular reference to Sitka spruce in Calluna/Molinia sites. I am quite sure that he is on sound lines in suggesting that the answer is to ensure quick suppression of the heather by:

1. Increased drainage;
2. "Smothering" of the heather by ploughing broad furrows;
3. Phosphating and slagging of the Sitka spruce;
4. Use of pine/spruce mixture to get the maximum side shade from the pine at as early a stage as possible.

There is no doubt that in the war years more emphasis was laid on maintaining the nursery at Kirroughtree chiefly with women labour. I still think that policy was correct in as much that it allowed the nursery to increase in area very rapidly and thus supply plants for the greatly accelerated afforestation programme. At the same time the arrears of drainage were attended to in the immediate post-war years and, as Donald says, with very little signs of serious check on the whole.

(J. R. T.)

Edinburgh,

14th February, 1952.

HISTORY OF KIRROUGHTREE FOREST

GENERAL DESCRIPTION OF THE FOREST

Situation

The older part of the forest, comprising Kirroughtree and Dallash sections, lies within the Parish of Minnigaff in the County of Kirkcudbright, reaching within one mile of the town of Newton Stewart. It is bounded on the east by the Palmure Burn and on the north-west, for the most part, by the Old Edinburgh Road. The southern boundary is more broken and roughly parallel with the Newton Stewart-Gatehouse of Fleet main road somewhat north of its run down the left bank of the Cree estuary to Wigtown Bay, forming the base of this roughly triangular but elongated block. The apex of the block at the north-east is near Murray's Monument, adjacent to the Newton Stewart-New Galloway road which passes through several miles of the length of the forest.

The more recent acquisition, known as the Glenshalloch section, is in the same Parish and County and consists of the farms of Glenshalloch, Auchenleck, Risk and Glenhoise. Its south-east boundary marches to a large extent with the west boundary of the Dallash and Kirroughtree sections, while its east and west boundaries respectively climb by the Green Burn and Pulnee Burn and the Cumloden Deer Park and Moor of Drannadow to the summit of Lamachan at the northern apex. The Wood of Cree, acquired at the same time, is isolated from the Glenshalloch section proper; it lies on the left (east) bank of the River Cree and is bounded on the other sides by grazing lands of the farms of Cordorcan and Drannadow.

The name "Kirroughtree" in old gaelic signifies "House by the Marsh".

Area and Utilisation

Kirroughtree Section

The original acquisition included a mansion house, eight cottages and four farms and was mainly utilized for sporting and sheep farming. The mansion house and cottages, some arable land along with some standing timber, the sporting rights and some feus in the village of Minnigaff were re-sold in 1931 to Miss Armitage and Miss Southern. Parts were also sold to the tenants of Larg and Craignine Farms. Particulars of all disposals are:-

Date	Subject	Purchasers	Area (acres)
Whitsunday, 1931	Kirroughtree Mansion-House, policies, etc.	Misses Armitage and Southern	256
Whitsunday, 1932	Larg Farm	Mr. William Murdoch	264.
1934	Housing Site, Palmure	Kirkcudbright County Council	1.
Whitsunday, 1936	Craignine Farm	Mrs. Howatson	76.
1/4/48	Housing Site, Palmure	Kirkcudbright County Council	1.9
Whitsunday, 1949	Land at Penkiln Bridge	Messrs. R. & W. Callander	.3
			599.2

The hill sheep stocks on the remaining ground were taken over as land was required for planting at prices including acclimatisation value.

Dallash Section

(a) Dallash

This was mainly poor grazing land when acquired. The house and adjoining land were formed into a forest worker's holding. This land is said to have been used by the late Duchess of Bedford as a breeding ground for goats.

A small plantation of Scots pine has a large percentage of trees with damaged leaders. The late Duke of Bedford is reputed to have had many of the leaders shot away with the object of increasing buds for the feeding of black game.

(b) Barncaughla

This area was formerly under sheep grazing but no liability attached to the Commission for clearing the stock.

(c) Talnotrie

This land was not being utilised at the time of acquisition other than for a little shooting.

Glenshalloch Section

Part of Cumloden Estate

The plantable land is being grazed by sheep and there is provision for resumption as required for planting.

4427 acres of agricultural land were permanently transferred to the Department of Agriculture for Scotland in February, 1951.

There is little more to say on this section for the present, and the remainder of this history will therefore deal with the earlier acquisitions only.

TABLE I

From (1)	By (2)	Date (3)	Pltns. Acqrd. (4)	Plant- able excl. Col. 4 (5)	Nurs- eries (6)	Agric. (7)	F. W. H. (8)	Unplant- able excl. Col. 4. (9)	Other Land			TOTAL (14)	
									Land Permanently Transferred Description (10)	Acreage (11)	Land Temporarily Transferred Description (12)		Acreage (13)
Arthur Galrow Armltage (Kirroughtree)	Purchase	March '50	-	1597	58	470.55	2.25	114.	By Sale (Agric. Land & Policies)	599.2	-	-	284.1
Duke of Bedford (Dallash)	"	31/3/33	37	585	-	2	14.	15.	-	-	-	-	653
Alex. Allan (Barncaughla)	"	31/3/34	-	115	-	-	-	-	-	-	-	-	115
Sir Keith Stewart (Talmotrie)	"	31/3/34	-	625	-	-	-	91	-	-	-	-	716
Earl of Galloway (Cumloiden, pt.)	"	March '50	190	5177	-	-	-	1862	To D.O.A.S. Larg & Cordoran Farms (Agricul- tural Purposes Appropriation Order, 1951)	4427	To D.O.A.S. pending final allocation (incl. in Cols. 5 and 9).	6102.7	11656
Totals			227	8099	58	472.55	16.25	2082	-	5026.2	-	6102.7	15981

Disposals	5026.2
Balance with F.C.	10954.8

Area and Utilisation (continued)

TABLE II

(a) Plantations -			
Acquired	227		
Formed by Commission	<u>2858</u>	3085	acres
(b) In hand, awaiting planting -			
Blanks after felling	-		
Burnt areas	-		
Other land	<u>905.3</u>	905.3	acres
(c) Nurseries -			
Daltamie		58	acres
Dallash (Disposed)		{ 2	acres
(d) Agriculture -			
Number of tenancies - 3: Area		{ 470.55	acres
(e) F.W.H. -			
Number - 5; Area		16.25	acres
(f) Unplatable land in hand		315	acres
(g) Other land -			
Agricultural, unplatable and plantable let			
and/or managed by Department of Agriculture			
for Scotland			
		<u>6102.7</u>	acres
	Total	<u>10954.8</u>	

Physiography

The aspect is largely easterly but in this irregularly broken country varies through all points, and elevation varies from 100 ft. to 1175 ft. Exposure is severe on the higher ground and slight in the valley of the Palmure Burn. Slopes are generally moderate but are very steep in some parts, especially in the north of the forest. In general the hills are lower and more rounded in the south and higher, more precipitous and broken in the north.

Geology and Soils

The geology of the area is somewhat complex. In the south the rock is of lower Silurian origin which, in the south-east has been well weathered and gives a generally fairly deep, reddish loam. In the south-west there has been considerably less weathering and the soil is usually shallower resting on coarsely broken rock. The lower lying arable is formed in part of alluvium and of raised beach. Towards the north of the forest the ground lies within the aureole of metamorphism surrounding the intrusive granite mass of the Cairnsmore of Fleet. The rocks of the Llandeilo series of the lower Ordovician have been cleaved and broken making the region one of pronounced topography. The Hartfell and Glenkiln black shales of the Caradoc and Llandeilo series are brought to the surface within an anticline of the lower Silurian shales, and Greywackes.

Drainage in the generally good loams in the south is easily effected, whilst in the north the soils are lighter, with considerable areas of scree on the steep slopes. Peat occurs mainly in the centre and north, being 3 ft. to 20 ft. deep in hollows and higher elevations, and 6 in. to 1 ft. on some slopes.

Vegetation

At the time of planting there was very dense bracken over most of the south and central portions, while here and there were bracken-Agrostis associations. In the small wetter areas or "mosses" the vegetation varied from Scirpus-Erica tetralix to Molinia-Myrica-Juncus. In the northern portion the vegetation varied generally from pure Calluna through Calluna-bracken associations to pure bracken; there were a few small "mosses" with Molinia-Myrica, while on deeper peat there is the usual range of associations of Calluna-Scirpus-Erica tetralix.

Changes in Vegetation

Except under European larch and some of the Scots pine bracken has died back. Deep peat of several acres in extent, originally heather and Scirpus with some Molinia, has reverted to nearly pure heather, with little Molinia replacing Scirpus; it is on this type that further dressings of phosphate appear to be necessary. On shallow dry peat with better natural drainage, fine grasses and heather have reverted to heather; on such sites heather was usually heavily burnt. On the intermediate peats with heather, Molinia and Scirpus, after drainage Molinia generally becomes dominant, bog myrtle appears and Scirpus goes out, while some heather persists.

After the planting of the south end of the forest brambles developed strongly. This was especially true of some areas near the Bents Farm, and in Compartment 10 the cutting back of this weed was a special operation in F.Y. 38. Whins also were very persistent in patches on the same areas and are still plentiful near the southern boundary above Blackcraig. Vaccinium myrtillus is abundant on Larg Hill.

Meteorology

The average rainfall for the ten years 1940-1949 inclusive was about 50 in. The climate is generally mild and snow will seldom lie long, except perhaps in the extreme north portion of the forest. The prevailing wind is south-west and winds are frequently strong, as is usual so near the west coast, but damage has seldom resulted.

Frost danger is not very great but early and late frosts do occur and crops on eastern aspects have from time to time suffered considerably from the latter though not the former. In this mild and humid climate growth is often early and damage may result from a single frost in late May or early June. In 1935 and 1937 late frost damaged many Sitka spruce and in 1945 severe damage was done to Sitka spruce in Kirroughtree section P.37, Compartments 29 and 38. In Dallash section damage was done to Sitka spruce and Tsuga in 1947.

Scots pine in Dallash section P.34 and P.38 suffered severely with blast in March, 1947, from a cold north-easterly wind. Good recovery was spread over three years.

Risks

Fire

Apart from the fires that picnickers and sportsmen may occasionally attempt to light in or near the forest, the greatest danger has lain in the local custom of "muirburning". This burning of the previous year's excess vegetation by the hill shepherds was seldom systematically done by rotation so that a constant source of tender heather shoots and the like which follow burning was seldom available for the sheep. All too often a match was (and is) dropped at random and without warning with no one present to control the fire or accept responsibility. There is thus a constant menace of unexpected and uncontrolled fires. However, the Hill Farming Act of 1946 has done much to protect the forests against this danger.

Two hill fires have, in fact, entered Kirroughtree estate and burned relatively large areas of heather, fortunately, before planting. Both came from Craighandle on the north-west boundary of the forest. The first, in 1936, entered at a point due west of Talnotrie Cottage and travelled south-westwards between the Old Edinburgh Road and the New Galloway-Newton Stewart road, which it did not cross, burning approximately 100 acres. The second, in 1938, entered at about the same spot and travelled northwards, again between the two roads, to Murray's Monument, burning an area of 120 acres. No further outbreaks have occurred and present day arrangements work smoothly. In general it might be said that local shepherds have become aware of the danger and of their responsibility for damage, and in this way risk of fire has diminished.

Numerous parties picnic in the spring and summer near Murray's Monument. There is some risk from fishing parties on the lochs. All danger points are traced and other precautions taken.

Sheep

The area was netted against sheep when and where necessary. They were most troublesome at Talnotrie, P.49.

Rabbits

The main rabbit population lay to the south-east, south and south-west of the forest and these were the boundaries rabbit-proofed. Rabbits were systematically killed from the beginning and by F.Y.47 there were very few

within the forest boundary. During the snowstorm in the early part of that year, however, many gained entry but the numbers are again being reduced to only a few. The Palmure Burn was frozen over in F.Y.47 and this allowed rabbits to invade Dallash where unfenced against them. The unacquired part of Barncaughla is still a source of danger from rabbits.

Game

Black game have done some damage to pines but this has not been serious.

Deer.

Both red deer and roe deer constitute a considerable risk and have increased greatly since the establishment of the forest. A sanctuary for the deer exists adjacent to the Glenshalloch section and the cover provided by the forest partly accounts for the increase, but the large brashing programmes for the near future will probably remove this protection and consequently a reduction in the number of deer may be expected. Deer drives have been organised from time to time and generally meet with some success.

Goats

The greatest risk to young crops in the Dallash section in the early years arose from the presence of hundreds (at least) of goats on the adjoining estate of Bargaly which lies east from the forest across the Palmure Burn. They seldom appeared in the Kirroughtree section. The goats were of many breeds, though in the main Galloway goats indigenous from some unknown date in the past. These were supplemented by and cross-bred with many foreign species introduced by the late Duke of Bedford who rented Bargaly Estate. The herds were protected and were not fenced in. There was no other stock on the farms of the estate adjacent to the forest although there was no commercial aim in retaining the goats.

Most damage was done during winter and when the Palmure Burn was low the goats crossed and fed on the young trees. The damage was usually confined to newly planted areas, the young trees being uprooted and browsed, and occasionally the leading shoots of older trees were destroyed. In F.Y.36 in particular, large patches of Japanese larch and Norway spruce

which had been newly planted were uprooted and many trees destroyed. These areas had to be replanted in the same year. The goats were shot at whenever they appeared in the forest and, being much easier quarry than the deer, the bags were frequently large. The official figures of goats destroyed from 1935 to 1951 are as follows - a total of 1051:

1935 - 49	1941 - 139	1947 - 15
1936 - 89	1942 - 81	1948 - 2
1937 - 176	1943 - 54	1949 - -
1938 - 74	1944 - 6	1950 - -
1939 - 164	1945 - 7	1951 - 8
1940 - 172	1946 - 15	

These figures represent only a proportion of the current herds and therefore of the potential risk. When the present tenant of Bargaly Farm gained entry in 1937 he rounded up the herds and sent them to Liverpool where they supplemented the meat diet of foreign seamen. As many as 400 were sent in one consignment. This was of great assistance but it was not until recent years that goats have become really few in number.

Die-back on European larch has been serious in some small areas, for example, P.34 Kirroughtree section, Compartment 33.

Roads

The forest is, as usual, subdivided into compartments and all parts served with rides. The majority have not, so far, been developed to carry timber waggons but generally speaking little work will be necessary to make most of these rides accessible for timber extraction by horse. It can be said that they were carefully laid out with a view to such use in the future. One old track, along which peats were hauled, runs through the centre of the Kirroughtree section and will be improved to form a main extraction route for this block. There is a good track round the Larg Hill and the Old Edinburgh Road will be found useful in the future for part of the Dallash section.

The forest on the whole is well served by county roads. A new forest road running more or less parallel with the Palnure Burn is in course of construction. It links the unclassified county road at Craignine with the Newton Stewart-New Galloway road by way of Dallash F.W. Holding. Completion of this road should allow extraction from thinnings in the Dallash section

to begin in F.Y.52.

Labour

Until October, 1935, Dallash and Kirroughtree sections were worked as separate units with a forester in charge at Kirroughtree and a foreman at Dallash. In 1935 they were amalgamated under the forester at Kirroughtree.

Prior to that date there were seven to eight men employed in each section. By 1938 the total labour force had increased to 40, and, until 1939, this was adequate but it would seem that as the numbers increased the quality decreased. To quote from the District Officer's report in February, 1937:- "Lack of good labour, due in a great measure to lack of housing, is one of the main factors which militate against efficient and economical afforestation. It has now become practically impossible to secure any good workmen in the district and the wages paid (less than 40/- per week) are not sufficient to attract good men from other districts when the cost of lodgings (25/- per week) is taken into consideration. Recruiting is limited to unmarried men as the Forestry Commission has no houses to offer to married men. It has already been necessary to postpone important work in connection with fire protection and fencing owing to insufficient labour to undertake it".

The position must have altered somewhat by September, 1938, as there is evidence that it was thought then that the number employed was too large. To sum up, I would say that the labour force no doubt resembled that of most forests in the west of Scotland and possibly elsewhere: a nucleus of very good workers was "filled in" with poorer men.

The majority of the good men were seconded to timber work during the war; many have not returned and most of those who did were dispersed to new units as "key" men.

From 1939 to 1945, the war years, the labour was of variable quality and difficult to get. The number increased to as many as 45 in 1945, of which about 25% were females. On the whole the quality deteriorated and prisoners of war and unfit males were brought in to fill the gaps left by recruitment to the armed forces; fair numbers of men also were attracted to the Imperial Chemical Industries operating in the neighbourhood and the loss of these contributed to the inferior standard.

The development of the nursery which was begun in 1936 made an increase in the labour force inevitable and with three nursery extensions since 1945 the number of employees increased from 45 in 1945 to 108 in 1947, this level having been more or less maintained to the present time. About 25% are women who are almost wholly employed in the nursery. The majority are local residents at Newton Stewart and Creetown. The supply is sufficient and with the exception of say 20% the labour may be considered good.

SILVICULTURE

(In the following K denotes "Kirroughtree section" and D "Dallash section").

Preparation of ground for planting

Standing Crops.

Compartment 59 K. Daltamie Wood. This wood consisted of ash, oak and hazel coppice with birch standards and some scattered European larch and large spreading beech. At the southern end, strips ten yards wide were heavily thinned, leaving ten yard strips untouched, running approximately north-south. In F.Y.39 the thinned strips were under- and inter-planted with ash 1 + 3 and 1 + 1 + 3; the ash failed generally except in a few open patches, and in F.Y.41 the whole was underplanted with Tsuga. This is now growing vigorously except under the heaviest shade where it is becoming suppressed and the overhead cover is being heavily thinned with due regard to considerations of amenity.

Compartment 11 K. Bower Wood. An area of naturally regenerated ash was given some necessary treatment before the war, but with the felling of the older timber during the war much of the ash blew down and what is left is very whippy. The greater part of the area was underplanted with beech in F.Y.48.

Compartments 12 and 13 K. Bower Wood. The timber was clear felled in 1941 and the area drained in F.Y.48 and normal planting carried out except where promising coppice stools or ash seedlings formed groups. These groups are favoured over the conifers that have been planted. Development of natural and planted trees is good.

Compartments 42, 43, 44, 45 K. Larg Hill. Prior to 1855 a strip along the western boundaries carried a crop of Scots pine and European larch which is reputed to have been excellent. The lower west and north slopes were, and

to some extent still are, under indifferent hardwood - oak, ash, beech and elm. In F.Y.39 all very poor or diseased stems were removed and groups widened to allow inter- and under-planting. The species used were Tsuga heterophylla, Abies nobilis, Cupressus lawsoniana, ash and sycamore. Where the clearance amounted to felling, Abies grandis, Pinus insignis, Norway maple and Nothofagus obliqua were planted in F.Y.39 and 40. In F.Y.49 a great deal of the hardwood cover was removed and sold mainly as firewood, and some of the remaining trees were pruned to allow the development of the younger crop. The removal of this poor over wood gradually has been undertaken mainly to retain the amenity.

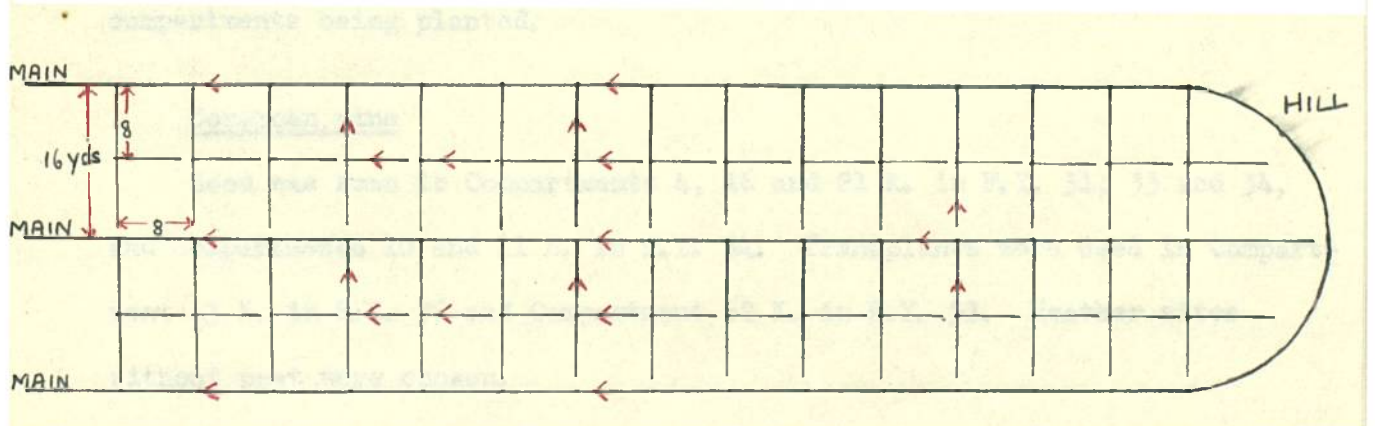
Compartments 6, 7 and 10 D. In F.Y.38 tall coppice was underplanted with Tsuga. Some of the overhead crop was removed in F.Y.48.

Heather

As practically the whole of the Dallash area was unstocked at the time of acquisition, the growth of vegetation, mainly heather, was very strong; but in spite of this there is but one record of burning of heather. This was in Compartments 41, 42, 43 and 44 D. in F.Y.44 when the heather was two to three feet high. The area was not planted until F.Y.49 and 50.

Draining

In F.Y.34 and 35 D, "drains" were cut with the object of producing turves only, and the area had to be drained again in F.Y.36. Apart from this the draining on this forest has, on the whole, been very well done. Until 1941 the herringbone system was generally adopted and from 1941 onwards contour and "crescent" draining was more usual. In the mosses with deep peat a system was laid out as here illustrated:



Care was always taken to cut off water from higher slopes by means of contour drains, and as far as possible all turves from drains were placed around the planting turves. (This practice is locally termed "backing up".) Drains generally worked out at about 28-35 chains per acre.

Fencing

At no time has the whole area of the forest been fenced against rabbits and/or stock. Compartments 1 to 10 K. were fenced against rabbits in F.Y. 31 and 32. These fences were maintained until the war and their remains dismantled in F.Y. 47. F.Y. 33 and 34 K. areas were fenced against rabbits on the east and north sides but the fence on the north (mainly adjacent to Dallash) was removed in F.Y. 36, while the one on the east side is still maintained as rabbits are very plentiful on Craignine Farm. P. 36 K. from Daltamie to the corner of Compartment 44 K. was fenced against rabbits. In F.Y. 39 the western boundary of Larg Hill was fenced against both rabbits and stock. Little Park Wood and Stranord Hill had to be rabbit-proofed in F.Y. 48, 50 and 51. No fencing was necessary on the Dallash Section with the exception of sheep-proofing on the west boundary from Murray's Monument to the Barncaughla march via Talnotrie Hill and the Loch of the Lowes.

Choice of Species.

Scots pine

This species has been planted extensively throughout the forest, in fact it may have been carried rather too high in places, especially on the west of the Newton Stewart-New Galloway road. It was almost entirely confined to pure heather slopes and the harder knolls. It appears to have been very plentiful in F.Y. 34 and 35 as it was planted on chosen sites throughout a number of compartments some time prior to the remainder of these compartments being planted.

Corsican pine

Seed was sown in Compartments 4, 16 and 21 K. in F.Y. 31, 33 and 34, and Compartments 10 and 11 D. in F.Y. 34. Transplants were used in Compartment 43 K. in F.Y. 39 and Compartment 62 K. in F.Y. 51. Heather sites without peat were chosen.

European larch

This species was planted on a moderate scale on sites usually conforming to a definite type with bracken-grass vegetation. The bracken on such areas has frequently been luxuriant and as much as six feet in height. Very frequently these areas had an eastern aspect and the slope was fairly steep. The soils were generally a deep red loam with good natural drainage. The species has been ravaged by canker and "die-back" and in many places barely a final crop will be obtained. Even during the past summer the bracken in the worst of these areas was still growing strongly, forming a tangled damp undergrowth. Drastic opening up is now under way and it is hoped that the general condition of this crop will greatly improve in the next few years, in conformity with experience in neighbouring forests.

It may or may not be significant that some of the best European larch in the forest is to be found near Glenamour in Compartment 47 K. Here it has been planted on relatively level ground where grass and bracken occur and also on a gentle slope with a western aspect. There is little or no "die-back" and it appears probable that an excellent final crop will be obtained. The seed was obtained from Morayshire. Much of the seed originating the older plantations was from continental sources now known to be unsuitable for British use.

Japanese larch

From inspection of the crop on Kirroughtree section it is clear that the species has been allocated strictly to bracken-grass associations. The rigidity of this practice is well demonstrated by the small patches, often only a few yards across, which occur within blocks of other species. In this section there appears to be no reason why this species should not have been extended to areas of heather-bracken, or perhaps pure heather with a shallow layer of peat, since in the Dallash section it was planted on more varied types with great success in the majority of cases (see Rates of Growth).

Douglas fir

Planted F.Y. 38 in Compartments 33 and 34 K. on sites where light hazel scrub and sizeable ash had been felled. The soil was a deep loam with boulders.

This species was also planted in F.Y.36 Compartment 6 D. under light birch. The soil was gravelly on a plateau above the flood plain of the Palnure Burn.

Norway spruce

Throughout the forest this species has usually been chosen for the sides of burns and gullies, and low lying ground with Juncus. With the exception of an area planted F.Y.50 D. it has seldom been planted on peat of any depth and generally has been confined to mineral soils. Like Sitka spruce it has been occasionally planted on grass-bracken pockets. It could probably have been more widely used in the wetter areas, replacing Sitka spruce to some extent, but we know that plant supplies were not always as desired, for example, in F.Y.34 Norway spruce was asked for but Sitka spruce supplied.

The appearance of some heather on a site seems to have initially checked Norway spruce but once it has developed sufficiently to suppress the heather in its immediate vicinity growth has become rapid and there is no further check. In the west corner of Compartment 36 K. both Norway spruce and Sitka spruce were planted F.Y. 39 on a peaty, stony soil with Molinia, other grasses and a little heather. Drainage was good, there being a gentle slope. The Norway spruce has now recovered from initial check and averages 12 ft. in height, whereas the Sitka spruce appears still to be checked somewhat and only averages 8 ft. It is unlikely that frost has played any part here as there is good air drainage.

Sitka spruce

The bulk of this species has been planted on moist sites now bearing Molinia, heather and frequently bog myrtle, and the peat generally is not deep - seldom more than 2 ft., with the exception of P.41 K, P.51 K, and part of P.50 D. where it reaches more than 8 ft. (See Mixtures). These moister sites were primarily selected but frequently there was extension to slopes which now bear dense close heather, and which must have borne at least some heather at the time of planting. This is illustrated well in the south of Compartment 54 K, where a knoll was planted with Sitka spruce F.Y.35 and beaten up with Scots pine F.Y.36. The Sitka spruce now averages 2 ft. and the Scots pine 8 ft.

It is generally a difficult problem to decide how the vegetation on a peaty area with Molinia and heather will react to drainage. Such areas on Kirroughtree generally show more development of heather following drainage; in some cases it has become dominant and in others appears to have reached a balance with Molinia. In the former the Sitka spruce has a serious check in growth unless it has had sufficient time to become established and dominate the heather, so that the rate of increase of heather is of considerable importance. Usually where the struggle between heather and Molinia is prolonged and a balance finally reached the Sitka spruce establish themselves not too slowly. Once the spruce has developed sufficiently to suppress the heather in its immediate vicinity it seldom returns to check. Often frost and check together retard development on mosses. The initial check allows the plants surrounding the moss to develop faster than those within and as time passes air drainage for the bog becomes increasingly impeded by the surrounding forest. This is important and suggests that the earlier the plants in a moss can be stimulated into growth the greater the chance of establishment. This stimulation might be given by additional draining, mulching, planting in mixture with pines, heather cutting and application of phosphate. Until F.Y.48 none of these measures appears to have been taken with the exception of drainage improvement.

In many places also Sitka spruce has been planted on grass-bracken sites and success has been variable, probably owing to unsatisfactory weeding practice. On all sites until F.Y.47, with one exception, Sitka spruce was planted pure whenever used and this, too, may help to account for the retarded development in areas where heather has become dominant amongst the ground flora. It may be that had the spruce been mixed with Scots pine or Pinus contorta in such places, or beaten up with a pine, the period of check would have been reduced.

Abies nobilis, Abies grandis, Tsuga heterophylla, and Cupressus Lawsoniana have been used for planting under coppice on both K and D sections.

Ash was used to plant under reduced coppice with the intention, presumably, of removing the coppice at an early date. Unfortunately this was not done soon enough and much of the ash has died out (see Preparation of Ground). It is prescribed in F.Y.52 for replanting part of Compartment 14 K.

Beech was used along the southern perimeter of the Kirroughtree section as a fire break. It was also planted in small groups on prominent places throughout the centre of the southern part of this section. It was planted pure on an old woodland site at Bower Wood Compartment 13 K. F.Y.48 and Compartment 62 K. F.Y.50.

Oak was planted for the first time in F.Y.50 in Compartment 62 K. where the soil is a good deep heavy loam. It is in a matrix of Japanese larch or of beech.

Grey Alder was planted in places along the Newton Stewart-New Galloway road in F.Y.34 and 35 for fire protection. It would probably have been more effective had it been planted more closely - say $3\frac{1}{2}$ ft. x $3\frac{1}{2}$ ft. instead of 5 ft. x 5 ft.

Planting

(a) Spacing has been pretty consistently as follows :-

Pines	4 ft. 6 in. x 4 ft. 6 in. except when mixed with Sitka spruce - then as Sitka spruce.
European larch	5 ft. x 5 ft.
Japanese larch	F.Y.33 and 34 at 6 ft. x 6 ft. reduced to $5\frac{1}{2}$ ft. x $5\frac{1}{2}$ ft. thereafter.
Norway spruce	5 ft. x 5 ft.
Sitka spruce	5 ft. x 5 ft. on poorer sites and $5\frac{1}{2}$ ft. x $5\frac{1}{2}$ ft. on better sites.
	(On ploughed areas, spruces are now 7 ft. across the drains and no more than 5 ft. in the lines).
Douglas fir	$5\frac{1}{2}$ ft. x $5\frac{1}{2}$ ft.
	Other conifers generally 5 ft. x 5 ft.
Ash	4 ft. x 4 ft. and $4\frac{1}{2}$ ft. x $4\frac{1}{2}$ ft.
Oak	4 ft. x 2 ft.
Beech	4 ft. x 3 ft.

(b) Type of Plants used and Source of Supply

In the earlier years almost all pines were 2 + 1 or 2 + 2, while 1 + 1 and 1 + 2 are now in common use. (See (f) below, for use of seedlings, etc., generally).

European larch	2 + 1 has been favoured throughout.
Japanese larch	used in earlier years was mainly 2 + 1 and later usually 1 + 1 although 2 + 1 are still used for beating up.
Douglas fir	In F.Y.37 and 38 1 + 1 were used and in F.Y.48 2 year seed-

lings, 2 + 1 and 2 + 2.

Norway spruce. For most part 2 + 2 have been used, occasionally 3 + 1 and 3 + 2 in early years.

Sitka spruce Many different ages of transplants have been planted in this forest. 2 + 2 were most commonly used though 2 + 1 have been employed in later years.

Various other conifers have been mostly 2 + 2.

Ash have been 1 + 1, 1 + 1 + 3, 1 + 2 + 2 and 1 + 3.

Oak 1 year seedlings have been used to date.

From 1931 to 1937 the majority of the plants came from Tulliallan; some came from Fleet from 1934 onwards, and after 1937 nearly all from the home nursery.

(c) Methods of Planting

From 1931 to 1935 Japanese larch were planted with mattocks, but thereafter they were planted with a half worn garden spade or Schlich spade. Pines were mattock planted on dry heather and when in mixture with Sitka spruce on damper sites they were planted through turves with Schlich or garden spades. All spruces were planted with Schlich or garden spades.

(d) Annual Rate of Planting

In the first three years, F.Y.31 to 33, the average annual programme was just over 100 acres; in F.Y.34 and 35, 279 and 291 acres respectively; and in 1936 to 1939 just over 200 acres. Thereafter there was a sharp fall, in F.Y.40 to 132 acres, in F.Y.41 to 80 acres and F.Y.43 to 5 acres. From F.Y.46 to date the area planted has ranged from 100 to 173 acres.

With the commencement of afforestation of the Glenshalloch section, the annual planting programme will rise to a steady 300 acres for some years.

(e) Manuring

There was practically no manuring of trees in the forest until F.Y.48, when African phosphate was applied to Sitka spruce on difficult sites most of which had been considered unplantable until heavy ploughing methods were developed. The rate of application was $1\frac{1}{2}$ ozs. per plant. It is now being considered necessary to apply this manure to some areas of Sitka spruce in which very slow growth has occurred and there still appears to be some tendency to check.

(f) Degree of Success of Establishment

Scots pine seedlings were planted in Compartments 19, 23, 25 and 39 K. in F.Y.34, a total of $8\frac{1}{2}$ acres. Growth and development appear to be up to the average for transplants.

The Corsican pine seed sown in Compartment 16 K. F.Y.34 - $1\frac{1}{2}$ lbs. over 1 acre - is doing exceedingly well. Corsican pine seed was also sown in Compartments 10, 11 and 12 D. F.Y.34, in patches spaced at $4\frac{1}{2}$ ft. to 5 ft. apart and prepared with mattock by screefing heather with the blade and procuring tilth with the pick-point, finally working up and raking with a home-made "creeper". In Compartments 10 and 11 and part of 12 this was a success but on the west side of Compartment 12 it failed owing to smothering by Molinia blown from wetter ground in the same compartment.

Japanese larch 2 year seedlings planted in Compartments 1, 2, 3 and 11 D. F.Y.34 have done very well, as also have those in Compartments 29, 36, 37, 40 and 44 D. and Compartment 62 K. F.Y.50. The seedlings in Dallash were beaten up F.Y.51 but no beating up was required in Compartment 62 K, the planting in the latter having been on Begg ploughing. 2 year seedlings in Compartment 60 K. F.Y.36 have also done well.

Douglas fir 2 yr. seedlings in Compartments 12 and 13 K, F.Y.48 have been very successful.

Sitka spruce 2 yr. seedlings in Compartments 15 and 16 K, F.Y.33, and 13 and 14 D. F.Y.36 are indistinguishable in development from transplants.

Oak 1 yr. seedlings were planted Compartments 14 and 62 K. F.Y.51.

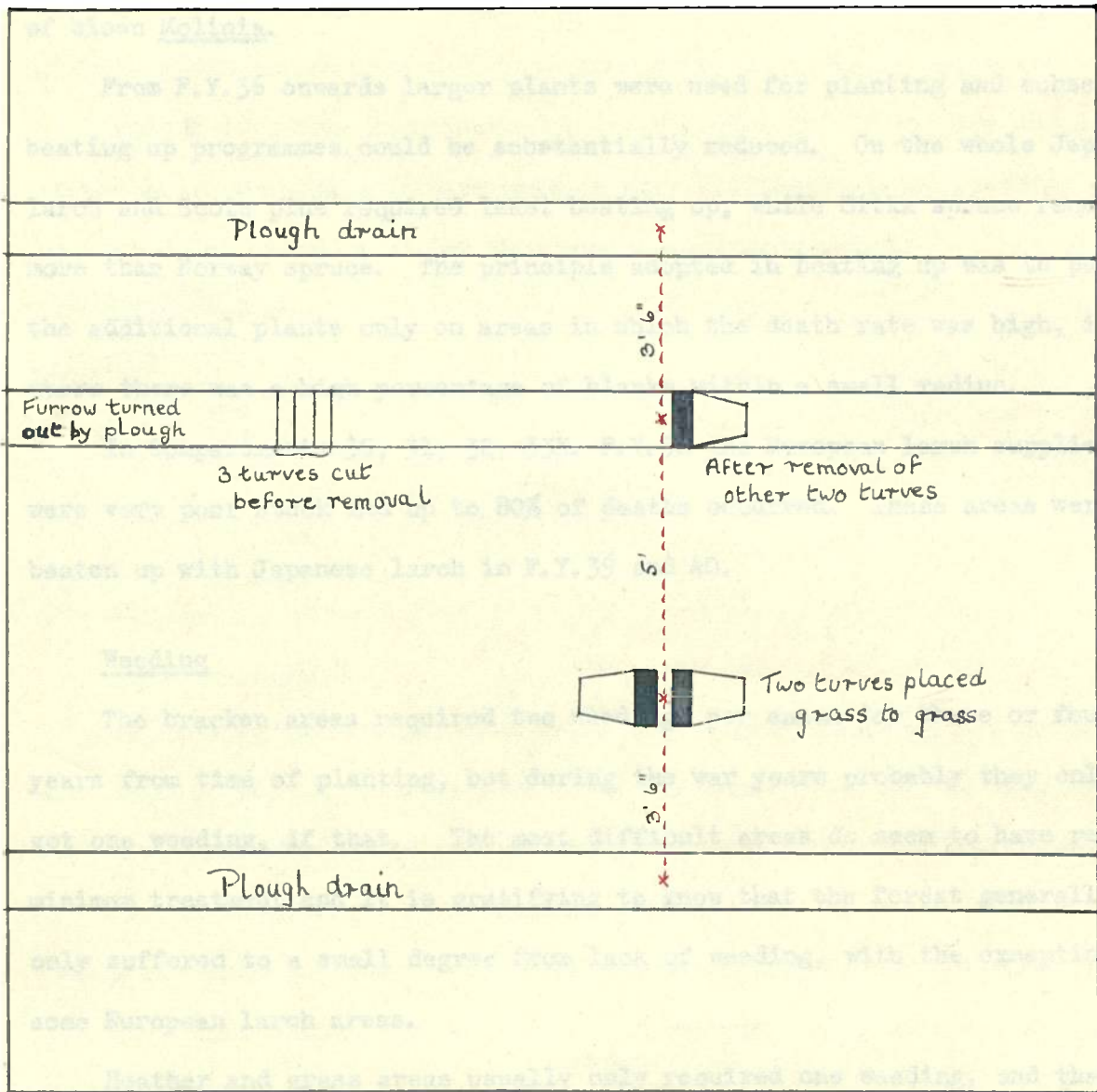
On the whole the transplants used have been very successful.

Ploughing

There was no ploughing on this forest until the summer of 1949 - Compartment 36 D for F.Y.50. This was with single mouldboard Cuthbertson at 12 ft. and 17 ft. spacing on mosses. The same type of ploughing was used in F.Y.50 and 51, and Begg plough and tine plough also were used, at 5 ft. spacing in Compartments 62 K, F.Y.50 and 51. Ploughing will be carried out in future where at all possible.

The diagram below illustrates the most recent method of turfing from furrows ploughed by single mouldboard Cuthbertson in deep peat areas. It is perhaps premature to give a final opinion on the success of establish-

ment of any species on ploughing in this forest, but to date all are looking well.



Beating Up

It can be assumed that in the early stages of the forest the plants used for planting were small and difficult to find at weeding. This would apply to Kirroughtree section especially, where beating up was deferred in the hope that there were still sufficient live plants to make a crop. Heavy beating up programmes were, however, carried through in F.Y. 36 and 37 using larger plants. In the Dallash section normal beating up, seldom involving change of species, was carried out in the year after planting.

In Compartments 10, 11 and 12 D in F.Y. 35, owing to disagreement with the direct sowing of Corsican pine in the previous year the screefs were beaten up with Scots pine. In some cases on the eastern side of the area the Scots pine plant was surrounded later by as many as five or six Corsican pine in the same screef; in the west the beating up appears to have had

more justification, although there is no reason to think that the Corsican pine would have been less successful there had the screefs been kept free of blown Molinia.

From F.Y.36 onwards larger plants were used for planting and subsequent beating up programmes could be substantially reduced. On the whole Japanese larch and Scots pine required least beating up, while Sitka spruce required more than Norway spruce. The principle adopted in beating up was to put in the additional plants only on areas in which the death rate was high, i.e. where there was a high percentage of blanks within a small radius.

In Compartments 30, 31, 32, 33K. F.Y.38 the European larch supplied were very poor stock and up to 80% of deaths occurred. These areas were beaten up with Japanese larch in F.Y.39 and 40.

Weeding

The bracken areas required two weedings per annum for three or four years from time of planting, but during the war years probably they only got one weeding, if that. The most difficult areas do seem to have received minimum treatment and it is gratifying to know that the forest generally has only suffered to a small degree from lack of weeding, with the exception of some European larch areas.

Heather and grass areas usually only required one weeding, and that generally from the second to third year.

Whins, brambles and coppice occurred on old woodland sites and were especially bad in the neighbourhood of the Bents, in Daltamie Wood, Larg Hill and Bower Wood. The weeding in the latter has been very expensive.

The increase in size of the nursery has tended to delay the weeding in the forest until later in the year, a point which needs to be watched carefully.

Mixture of Species

In some instances, especially in F.Y.37, 38 and 39 K. the various species were held so rigidly to the different vegetation types and degrees of moisture occurring throughout a rapidly varying locality that the result constitutes almost a mixture - or rather an association - of species. This has resulted in most satisfactory production.

In Compartment 14 D approximately 2 acres were planted with a mixture

of Sitka spruce and Scots pine in the proportion of four to one. The Sitka spruce were in lines as usual at $5\frac{1}{2}$ ft. x $5\frac{1}{2}$ ft. and Scots pine were planted in lines between. The Scots pine now average 12 ft. while the Sitka spruce are being somewhat suppressed, averaging 3 ft. to 4 ft. in height.

From F.Y.48 onwards mixtures of Sitka spruce and Scots pine and Sitka spruce and Pinus contorta were used on more difficult sites, generally two by two in the lines. So far they are proving successful.

Rates of Growth

Scots pine

Generally the growth has been very good except on exposed ridges. This species gives a strong impression of being healthy, vigorous and most promising. Where there is great exposure, as would be expected, the quality class will be much lower.

Corsican pine

Planted in Compartment 43 K F.Y.40, on a rather exposed site at an elevation of 500 ft. this species is so far healthy but not growing very fast nor surpassing Scots pine nearby. The height is approximately 4 ft.

In the compartment where seed was sown in F.Y.34, the successful trees, though not exceptional in growth, show remarkably good form, perhaps owing to the intense competition between the seedlings. The unwanted trees were cut out in F.Y.51. The average height is 20 ft.

European larch

On the whole this species has been very disappointing, many plantations suffering from canker and "die-back" which are most extensive in P.33 and 34. It is expected that the present treatment will induce sufficient recovery to ensure a moderate final crop. The mean annual height increment varies from 5 in. to 21 in.

Japanese larch

The development of Japanese larch in Compartments 1, 2, 3 and 4 D. F.Y.34 and 35, varies from one extreme to the other. On the higher ground with considerable exposure, and with shallow peaty heather-covered soil over rock, which frequently becomes very dry in summer, the average height is only 12 ft. to 14 ft. There are hollows at these higher elevations where the soil is similar but deeper and where the crop averages 18 ft. to

20 ft. On the lower slopes Japanese larch has developed exceptionally well and shows excellent form with slender and clean boles. The average height is around 27 ft. These trees were mattock planted on heathery eastern slopes and the soil is fairly deep and slightly peaty.

On the lower slopes of Compartment 5 D, F.Y. 34 Japanese larch was planted on land which had been cleared of oak scrub. The development here is exceptional for the region; heights of 40 ft. and even up to 48 ft. are not uncommon. The form, however, is not quite so good as when this species is planted on heather, corkscrew leaders being rather frequent. Other plantations on bracken-grass types have produced crops of a form and development between the extremes described.

In Compartment 42 K, F.Y. 41, the tallest Japanese larch trees were estimated to be about 32 ft. and the average 25 ft.

Hybrid larch

This is the fastest growing species in the forest and has the best form of the larches.

Douglas fir

Results to date are good in the small areas carefully chosen for this species. The average height is 15 ft. to 18 ft. at age of 13 years and health and form are good.

Norway spruce

With the exception of limited sites where this species has been checked at planting, it can be said that it has been the most consistent in growth of all throughout the forest. Form and health are always good. It is evident that in this forest Norway spruce gets away more quickly out of check than does Sitka spruce though it may be that the Sitka spruce may ultimately outgrow the Norway spruce.

Sitka spruce

This species shows the most varied growth of all, partly owing to frost damage during the early years. Although the height is very variable trees of all heights and ages have good colour. The annual rate of growth has varied from 1 in. to 5 ft.

Tsuga

With the exception of a small area in Compartment 43 K, F.Y.40, this species has been planted under coppice or other older crop. It has, however, generally suffered from frost at first; this is especially marked in Compartment 6 D, F.Y.38. It is now healthy and vigorous.

Abies nobilis

Very little has been planted. The trees are healthy but height growth has been erratic. There is slight evidence of Armillaria mellea in Compartment 45 K.

Abies grandis

The rate of growth has been more even than that of the Abies nobilis.

Cupressus lawsoniana

Only a few small patches have been planted; these are healthy.

Pinus insignis

Only planted in Compartment 42 K, F.Y.40. 50% failed; the remainder are variable, the best tree being 15 ft. high. Beaten up with Scots pine.

Picea omorika

After a slow start, owing to inferior drainage on a difficult site, the 2.5 acres in Compartment 20 K, F.Y.34, are healthy and generally have good form.

Ash

In the very few patches in the forest the growth has been fairly good but form very poor owing to not very good choice of soil, to failure to remove the older cover at the proper time and to frost. The origin of the plants also may not have been satisfactory.

Beech

The forester states that the idea of the group planting was that it was hoped the leaves would be blown to the surrounding area to the benefit of the soil generally. This species has grown best in the belts round the edges of the forest, and if these are well cared for some good beech should ultimately result.

Oak. None was planted until F.Y.51.

Grey Alder. Form is poor.

Sycamore and Norway Maple.

These species have been planted in very small groups among old coppice, etc. Rate of growth and form are generally moderate.

Nothofagus obliqua

One small plot in Compartment 42 K, F.Y.40, under a few remaining standards, is doing fairly well. The average height is 20 ft.

Past Treatment of Established Plantations

Up to F.Y.51 nearly all brashing was done by workers during wintry weather and the conditions being unfavourable the cost was high. The first brashing was done in F.Y.47, 41 acres in Compartments 1, 2, 9 and 10 K,P.32. In F.Y.49, 40 acres were brashed in P.31 and 32; in F.Y.50, 66 acres in P.32, 35 and 36; and in F.Y.51, 97 acres in P.35, 36 and 37. A large programme for F.Y.52 is well under way; a maximum of 60% of stems will be brashed, with no disadvantage in management to set against the considerable saving in cost.

In 1942-43 approximately 90 acres were cleaned, this work consisting of the removal of whins, brambles, honeysuckle and so forth from the area of regenerated ash in Bower Wood, and from European larch in P.32 K. From 1947-51 approximately 250 acres were cleaned of overhead coppice and scrub, some whin, etc., and this total also includes the cutting out of too dense Corsican pine on the sown areas, and cleaning areas of "die-back" of European larch.

Maintenance of drains has proceeded quite satisfactorily during the post-war years.

The Scots pine/European larch/Norway spruce "acquired" plantations at Dallash have received one thinning. Thinnings of Forestry Commission plantations commenced on a very small scale in F.Y.49 and there is a large current programme. All the early thinnings were sold at stump but those made in F.Y.51 were sold standing and it is hoped to continue this practice. So far little but Japanese larch has been dealt with.

Research

There are six experiments, all dating from F.Y.39 and 40. Two provenance experiments consist, for the most part, of single plots of plants left over from full scale replicated trials elsewhere. They thus give little information on their own, but taken in conjunction with the main experiments serve to confirm the main results for another locality.

The Pinus contorta trial L.P.39 includes some twenty lots left over from trials at Achnashellach and Millbuie; coastal British Columbia, Washington and Queen Charlotte Islands lots are all represented and differences in form are clearly visible. In general the coastal lots are more vigorous.

No.2 P.39 includes twenty lots of European larch from Alpine, central European (Silesia and Saxony) and Scottish origins. Striking differences in growth are apparent, the Alpine lots being very slow and badly cankered. The fastest plots are those from the European parent trees at Dunkeld and include some obvious hybrids. The other Scottish and central European lots are generally similar in characters and growth.

Three small trials of hardwoods were laid down in the same year. Beside Daltamie nursery is a plot of fifty-five cricket-bat willows planted after the publication of the Commission Bulletin on the subject. In spite of some neglect during the war most of the trees survived and about half have grown well, having an average height of 25 ft. to 30 ft. in ten years.

A trial of walnuts (Juglans regia and Juglans nigra) has suffered rather badly from suppression by coppice and only about half the trees of each species survive, practically all being of poor form.

The third hardwood trial consisted of plots of fourteen species of Eucalyptus. Unfortunately the vast majority were eaten or died during the war when adequate protection and weeding were impossible. Only a few trees of Eucalyptus Johnstonii and Eucalyptus urnigera survive, and one tree of each of these species is now about 30 ft. high. It is unfortunate that it is not known to what extent the losses were caused by deer or frost.

No.6 P.39 is a species trial on a deep Scirpus peat on Auchlinnoch Hill. Species included are Scots and contorta pines, Japanese larch, hybrid

larch, Sitka and omorika spruces, noble fir and grey alder. Grey alder has practically failed and the larches are poor. Scots pine is growing very slowly while Pinus contorta after early deer damage is now making good growth. The spruces and noble fir are at present only growing slowly but, except for Sitka spruce, appear healthy.

(J.W.L.Z. January, 1952).

Conclusions in the Light of the Experience Gained

Had ploughing become the practice earlier, some of the spruces on difficult sites would now be showing much better growth.

More use could have been made of mixtures, for example, pines with Sitka spruce.

Norway spruce could have been more widely used on some sites where Sitka spruce has been planted.

Japanese larch might well have been extended to some sites with poorer soils.

Corsican pine could usefully have been planted more extensively.

February, 1952.

History of Kirroughtree Forest

APPENDIX I

NOTES FROM INSPECTION REPORTS

29 August, 1935. Visit of Sir Alexander Rodger, Commissioner.

Kirroughtree section :- "Sir Alexander Rodger seemed well pleased with the growth of European larch in P.32, especially in Compartment 10. He attributed the few twisted stems to bad seed. He did not approve of underplanting the hardwood scrub; he said it ought to be clear felled and hardwoods planted".

30 March, 1940. Visit of Sir John Sutherland, Commissioner.

"Sir John was told that the plantations were in good order. The beating up was now up to date except for small isolated areas; back drainage work still remained to be done. Recent snow damage was noted.

The forester had lost 11 of his men within the past few days to go to better paid jobs in the neighbourhood".

29 April, 1941. Visit of Sir Roy L. Robinson, Chairman, with

Mr. A. H. Gosling, A/Assistant Commissioner.

"Dallash and Glenamour plantations were seen. Scots pine were seen to be swinging on heather knolls. Japanese larch and hybrid larch were doing fairly well. Some of the Sitka spruce plots required re-draining."

"Compartments 60, 52, 51, 50, P.35 and 36. Sitka spruce has been slow but the colour is good and the plants appear to be getting away now. Japanese larch growth is good especially on heather types. The European larch on bracken type was seen to be poor.

The extraction question was discussed and Forester MacMillan pointed out several cart roads which could be utilized with comparatively little repair."

The Chairman's Observations. "The plantations which I saw are making reasonable to good progress".

3 February, 1943. Visit of Mr. A.H. Gosling, Acting/Assistant Commissioner.

"During the inspection, which was devoted to the nursery, the question of fire protection was raised and the Acting/Assistant Commissioner said that he would do what he could to get a fire pump to go with the tank already supplied for use with the lorry. He also mentioned to the forester that when he was doing his periodic burning on the Newton Stewart-New Galloway road, would he pay special attention to one or two isolated groups of whins which appeared to be dangerous".

3 March, 1948. Visit of Sir Henry Beresford Peirse, Director.

"The P.36 and P.37 plantations between the Palnure Burn and the Old Edinburgh Road were seen to be developing well and to be reaching the thinning stage in patches.

The plantations in the Kirroughtree Deer Park, P.32 Compartments 1 and 2, are coming on fast and require thinning".

History of Kirrroughtree Forest

APPENDIX II

SUPERVISION

CONSERVATORS

1946 - 47	J. R. Thom
1947 (March to May)	F.W.A. Oliver
1947 - 51	J. R. Thom
1951 to date	J.A.B. Macdonald

DIVISIONAL OFFICERS

1931 - 34	J. M. Murray
1934 - 38	O. J. Sangar
1938 - 39	F.W.A. Oliver
1939 - 42	A. Watt
1942 - 45	J. R. Thom

STATE FOREST OFFICERS

1948 to date	R. E. Fossey
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DISTRICT OFFICERS

1931	A. H. Gosling
1931 - 38	J.M.M. MacDonald
1938 - 39	A. Watt
(1939 - 46	No District Officer)
1946 to date	R. R. Donald

FORESTERS

1931 - 33	J. McK. Graham (Foreman-in-Charge)
1933 - 35	J. McK. Graham
1935 to date	H. MacMillan (Head)
1947 to date	F. J. Cannon (Gr. II)
1948 - 49	F. J. Rogers (Gr. II)

APPENDIX III

Some Particulars of Trees of Previous Crops.

C.59 K. Daltamie Wood

Species	No. of Trees	Volume (H.ft. u.b.)	Age
Scots pine	3	100	70+
European larch	29	580	70+
Oak	7	260	100+
Sycamore	1	20	100+
Beech	10	Not measured	150+

C.14 K. Beech Wood.

Species	No. of Trees	Volume (H.ft. u.b.)	Age
Scots pine	3	100	100+
Ash	30	580	
Beech	28	1000	
Oak	44	1115	
Sycamore	46	820	
Elm	3	61	
Alder	12	160	

C.12 & 13 K. Bower Wood. Conifers 45-70 years Hardwoods 100-200 years

Species	Description	No. of Stems	Av. Ht. to 6 ins. diam. (ft.)	Av. Q.G. @ $\frac{1}{2}$ -timber height (ins.)	Volume (H.ft. o.b.)
Scots pine	12" & over	65	41	13	3127
	8" to 12"	245	43	10 $\frac{1}{2}$	8064
	Under 8"	224	34 $\frac{1}{2}$	7	2591
Totals		534			13782
Corsican pine	12" & over	13	54	14	955
	8" to 12"	172	61	10	7281
	Under 8"	624	51	7 $\frac{3}{4}$	13260
Totals		809			21496
European larch	10" & over	175	62	13	12731
	7" to 10"	171	64	10	7623
	Under 7"	146	40	6 $\frac{1}{2}$	1713
Totals		492			22067
Norway spruce	12" & over	117	60	14	9555
	8" to 12"	274	64	11	14727
	Under 8"	104	35	7	1238
Totals		495			25520
Silver fir	12" & over	3	44	12	132
Ash	12" & over	13	42	15	852
	under 12"	338	47	10	11013
Totals		351			11865
Beech	Average	150	40	14	8162
Oak	18" & over	29	43	21	3818
	14" to 18"	25	54	15	2108
	12" to 14"	63	40	14	3430
	Under 12"	212	43	8	4028
Totals		329			13384
Sycamore	Average	149	32	7 $\frac{1}{2}$	1862
Birch	Average	48	27	6	324
Elm	Average	399	34'6"	10	9409
Chestnut, Horse		1	40	16	71

APPENDIX IV

SOME EXAMPLES OF HEIGHT INCREMENTS

Comp.	Species	P.Yr.	Age	Geology & Soil	a. Altitude b. Aspect c. Slope d. Exposure	Mean Height of Dominants. (ft.)	Mean Annual Height Increment (ins.)	Current Annual Ht. Increment during last 5 years. (ins.)
59	S.P.	37	17	Light Loam	a. 175 ft. b. S.E. c. Moderate d. Nil	17	12	9½
59	J.L.	36	18	Light Loam	a. 175 ft. b. S.E. c. Moderate d. Slight	31½	21	26½
59	H.L.	37	17	Light Loam	a. 150 ft. b. N.E. c. Moderate d. Slight	30	22	30
59	N.S.	36	19	Medium Loam	a. 100 ft b. N. c. Moderate d. Slight	24	15	16½
53	S.S.	36	18	Peat 1-2 feet overlying gravelly clay.	a. 225 ft. b. N. c. Gentle d. Slight	25½	17	18

AGE/HEIGHT GRAPHS FOR

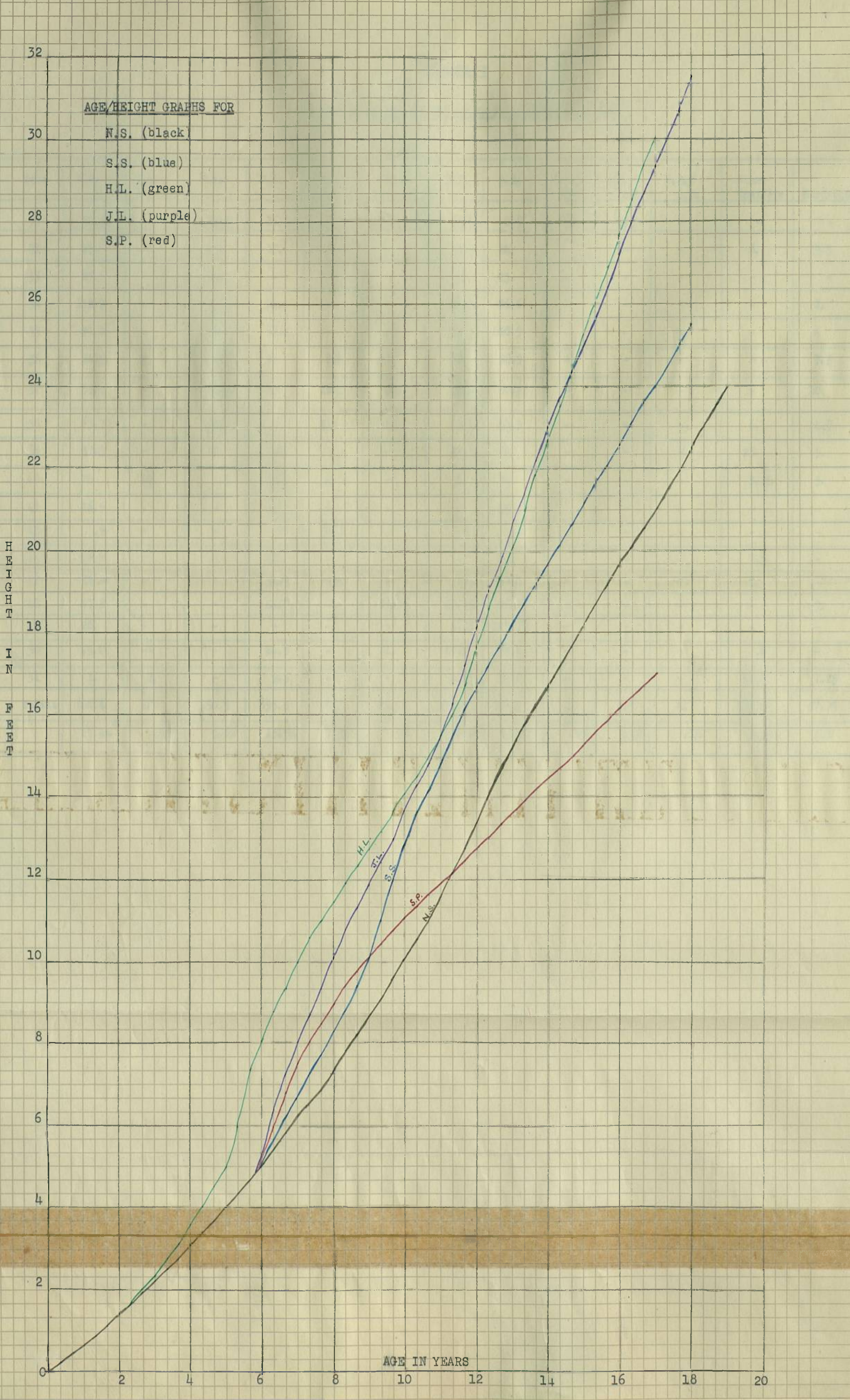
- N.S. (black)
- S.S. (blue)
- H.L. (green)
- J.L. (purple)
- S.P. (red)

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AGE IN YEARS



APPENDIX V

DISTRIBUTION by SPECIES - F.Y. 31 to F.Y. 51 (acres)

Year	S.P.	C.P.	E.L.	J.L.	H.L.	D.F.	N.S.	S.S.	S.P./ S.S.	J.L./ S.P.	N.S./ S.S.	Other Conifers	Hardwoods	Totals
31	30.5	-	12.5	16.2	-	-	23.5	8.8	4.	2.5	-	-	-	98.
32	25.	-	29.	13.	-	-	9.5	24.	-	-	-	6.	9.5	116.
33	85.5	-	14.5	-	-	-	2.	23.	-	-	-	-	-	125.
34	112.5	-	5.5	24.	-	-	38.9	96.6	-	-	-	-	2.	279.5
35	91.2	-	8.	65.4	-	-	14.	108.9	-	-	4.	-	-	291.5
36	14.5	-	14.5	35.	8.5	-	57.	98.9	-	-	-	-	7.3	235.7
37	53.1	-	24.6	45.	16.5	2.2	15.4	60.2	-	-	-	-	10.	227.
38	63.7	-	28.4	-	22.	6.	21.4	63.5	-	-	-	6.	4.7	215.7
39	32.5	-	13.	14.	-	-	22.5	91.	-	-	-	25.	5.	203.
40	25.	10.	.5	51.5	-	-	9.	24.	-	-	-	9.25	3.	132.25
41	16.5	-	-	4.	-	-	-	59.5	-	-	-	-	-	80.
43	.5	-	-	-	3.2	-	.7	.6	-	-	-	-	-	5.
46	53.5	-	-	17.	-	-	-	22.	-	-	-	7.5	-	100.
47	58.6	-	-	31.7	5.5	-	.25	38.3	-	-	-	2.	-	136.35
48	47.8	-	-	44.7	-	15.5	29.75	26.25	-	-	-	-	9.	173.
49	28.	-	-	-	-	-	6.25	105.75	-	-	-	-	-	140.
50	45.2	-	-	24.5	-	1.	17.5	78.4	-	-	-	.4	-	167.
51	1.	2.	-	9.5	-	-	4.25	56.2	-	-	-	52.8	7.25	133.
Totals	784.6	12.	150.5	395.5	55.7	24.7	271.9	985.9	4.	2.5	4.	108.95	57.75	2858.
	27.4%	.5%	5.6%	13.5%	1.9%	.9%	9.6%	34.5%	.1%	.1%	.1%	3.8%	2.%	100%

APPENDIX VI
THINNING RECORD

F.Y. of Thinning	Compartment	Species	P. Yr.	Area Thinned	Removed per Acre	
					No. of Stems	Hoppus Feet
49	1	E.L.	32	6.	200	230
49	1	J.L.	32	3.	145	226
	1	S.S.	32	2.	55	34
49	2	J.L.	32	1.	202	199
49	3	J.L. S.P. ‡ N.S. ‡	32	6.5	133	167
49	8	J.L.	31	12.	155	149
49	9	J.L.	32	4.	114	76
49	10	E.L.	32	12.	72	37
51	4	J.L.	31	1.	444	363
51	5	E.L.	31	3.5	439	194
51	7	J.L.	31	1.5	185	264
51	7	E.L.	31	7.	533	221
51	49	J.L.	35	4.5	229	170
51	50	J.L.	35	5.	313	222
51	51	J.L.	35	10.	332	241
51	54	J.L.	35	6.5	291	224
51	55	J.L.	35	3.5	311	277
	56	J.L.	35	11.1	309	191

‡ Small areas of S.P. and N.S. through J.L.

APPENDIX VII

SUMMARY of STEM ANALYSIS

COMPARTMENTS 53 and 59 K.

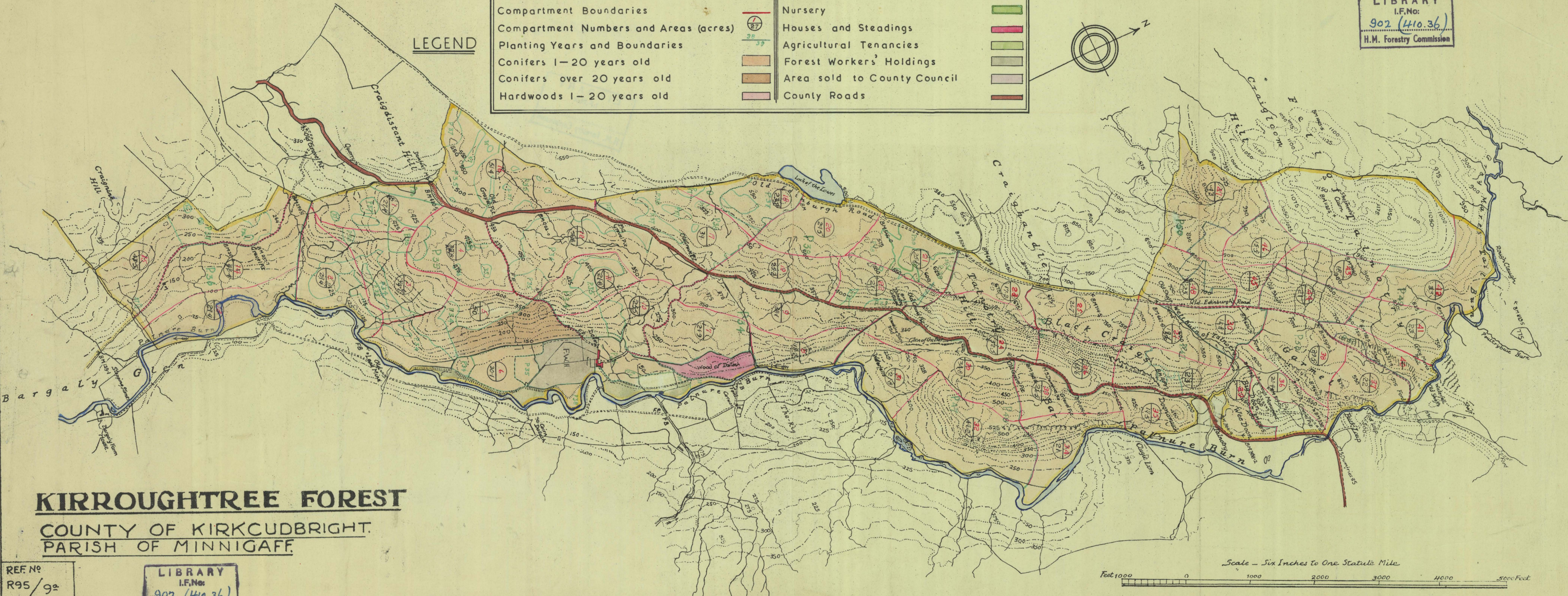
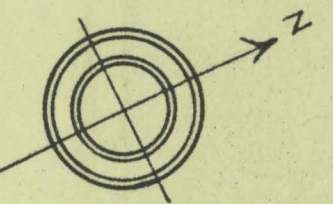
	<u>Ht. in Ft.</u>	<u>No. of Rings</u>	<u>No. of Years</u>
1. <u>Scots Pine</u>	0	17	0
	5	11	6
	10	8	9
	17	0	17
2. <u>Japanese Larch</u>	0	18	0
	5	12	6
	10	10	8
	15	7	11
	20	5	13
	31½	0	18
3. <u>Hybrid Larch</u>	0	17	0
	5	12	5
	10	10	7
	15	6	11
	20	4	13
	30	0	17
4. <u>Norway spruce</u>	0	19	0
	5	13	6
	10	9	10
	15	6	13
	24	0	19
5. <u>Sitka Spruce</u>	0	18	0
	5	12	6
	10	9	9
	15	7	11
	25½	0	18

Kirrougntree

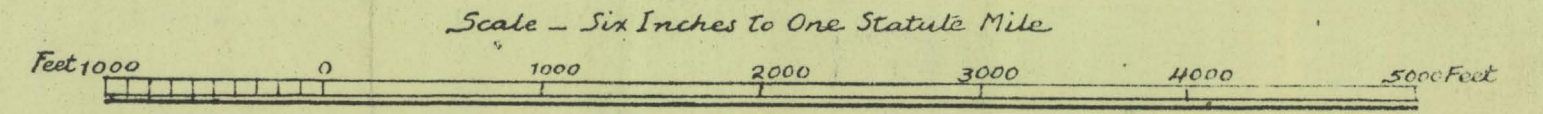
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LEGEND

Forestry Commission Boundaries	—	Hardwoods over 20 years old	■
Compartment Boundaries	—	Nursery	■
Compartment Numbers and Areas (acres)	⊙	Houses and Steadings	■
Planting Years and Boundaries	—	Agricultural Tenancies	■
Conifers 1-20 years old	■	Forest Workers' Holdings	■
Conifers over 20 years old	■	Area sold to County Council	■
Hardwoods 1-20 years old	■	County Roads	—



KIRROUGHTREE FOREST
COUNTY OF KIRKCUDBRIGHT,
PARISH OF MINNIGAFF.



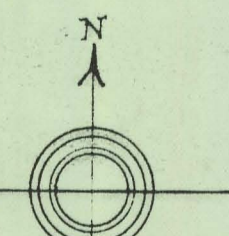
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KIRROUGHTREE FOREST

COUNTY OF KIRKCUDBRIGHT
PARISH OF MINNIGAFF.

LIBRARY
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H.M. Forestry Commission



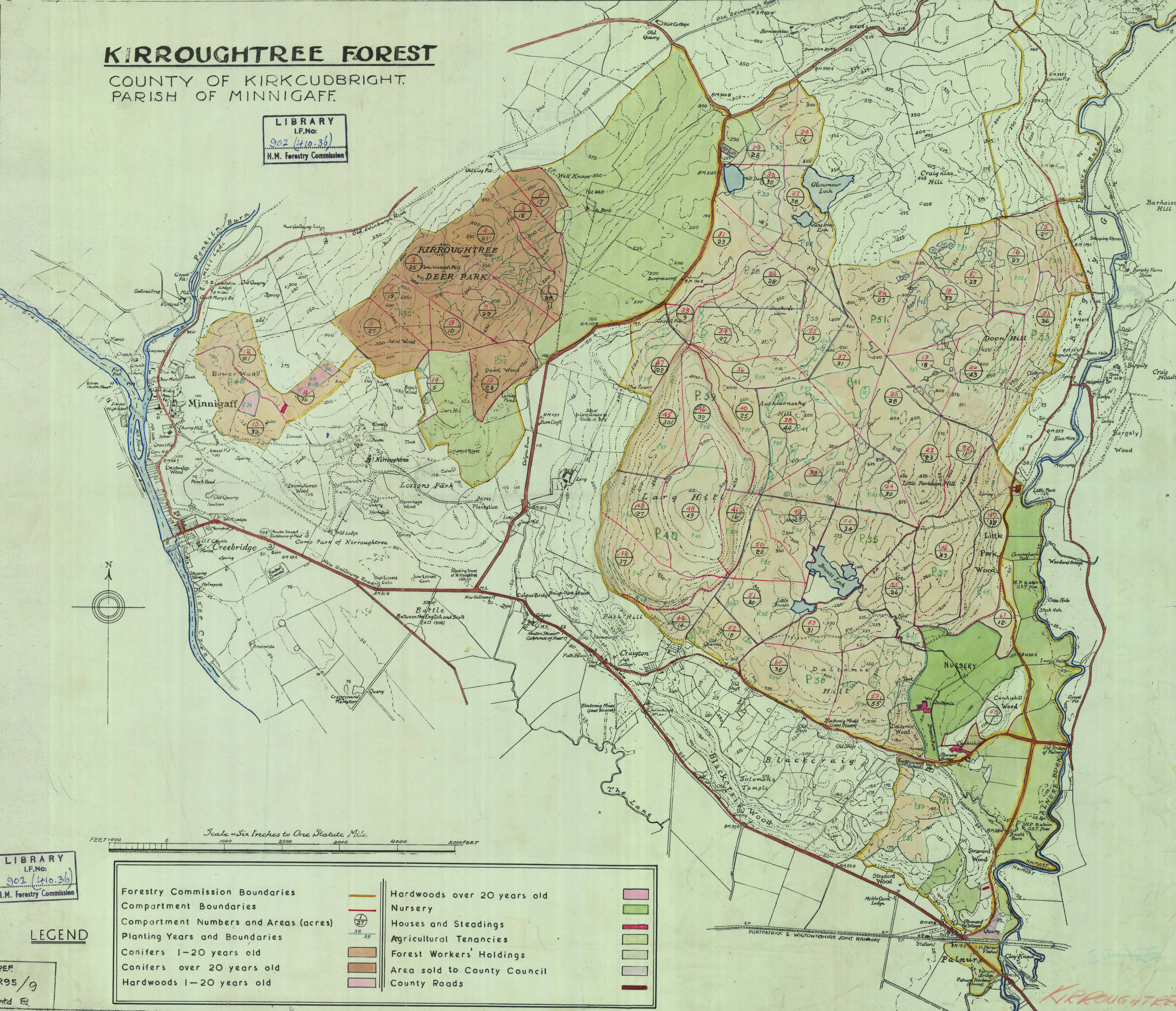
Scale = Six inches to One Statute Mile.
0 1000 2000 3000 4000 5000 FEET

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H.M. Forestry Commission

LEGEND

REF
R95/9
Intd R

Forestry Commission Boundaries		Hardwoods over 20 years old	
Compartment Boundaries		Nursery	
Compartment Numbers and Areas (acres)		Houses and Steadings	
Planting Years and Boundaries		Agricultural Tenancies	
Conifers 1-20 years old		Forest Workers' Holdings	
Conifers over 20 years old		Area sold to County Council	
Hardwoods 1-20 years old		County Roads	



KIRROUGHTREE