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RADNOR

FOREST

N (W) CONSERVANCY

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HISTORY

of

RADNOR FOREST

1924 - 1951

NORTH (WALES) CONSERVANCY

HISTORY OF RADNOR FOREST

Contents

	Page
GENERAL DESCRIPTION OF THE FOREST	1
Situation	1
Area and Utilisation	1
Physiography	4
Geology and Soils	4
Vegetation	5
Meteorology	5
Risks	6
Roads	6
Labour	7
SILVICULTURE	7
Preparation of Ground	7
Choice of Species	7
Planting	10
Ploughing	11
Beating Up	12
Replanting	12
Other Maintenance	13
Past Treatment of Established Plantations ...	13
Cleaning	14
Thinning	14
Research - Note by the Research Branch ...	16
Felling	27
Conclusions	27
APPENDICES	
I Notes from Inspection Reports ...	29
II Record of Supervisory Staff ...	33
III Extract of article printed in Journal of Forestry Commission (1949) on Selection of Species at Radnor Forest	34

HISTORY OF RADNOR FOREST

GENERAL DESCRIPTION OF THE FOREST

Situation

The forest occupies the eastern slopes and foothills of the old Radnor Forest massif in east Radnorshire. Some of the plantations around Presteigne extend into Herefordshire. Knighton, Presteigne, Kington and New Radnor are the nearest towns.

Area and Utilization

Between 1923 and 1926 two large blocks of rough hill and farm land totalling 3,500 acres were acquired from the nearby estates of Major Thompson at Newcastle Court and Captain Lewis at Evancoed. These included some small immature plantations and shelter belts of European larch, Norway spruce and Scots pine mostly on exposed sites up to 1,550 ft. Despite lack of care and management all these species grew to timber size although badly blasted. They were finally smashed in the 1940 ice storm. All but 6.5 acres were felled between 1940 and 1946. There is one small common or turbary of some 12 acres on the north side of the forest, but apparently no one has exercised the right of turbary for some 60 years.

In 1946 the formation of the lower part of the forest was initiated by the handing over of Nash, Caen, Deep Moors and Upper Radnor woods, totalling 387 acres of P.30-P.36 European larch, Scots pine and older oak coppice belts, by Mortimer Forest of N.W. (E) Conservancy.

This was soon extended by many further acquisitions of old felled hardwood areas scattered between Presteigne, Kington and New Radnor, bringing the total area of this part of the forest to over 1,000 acres.

The great area of plateau moorland known historically as Radnor Forest and lying to the south and west of the existing plantations is the home of the hardy Radnor Forest breed of sheep. No historical records exist to indicate that it was ever a forest in the modern sense and probably the title should be given the ancient interpretation of a wild area of alternating scrub and poor grazing best suited to the activities of hunters and shepherds.

For centuries sheep rearing has been the main activity around the forest and although some merging of the smaller farms into larger units and an increase in the proportion of arable land has taken place since the commencement of the last world war, the area is little changed from, and still retains, the delightful sensation of timelessness associated with the distant past.

Soil conditions and severe exposure have made extensive reseeding of the moorland not worth while, and most of the area is unfenced and "ranched" by the various farms.

The area is reputed to be one of the last haunts of the wolf in Wales (the village named Bleddfa at the northern tip of the forest is derived from "Blaidd", the Welsh for wolf). Wild life has been reduced to badgers, foxes, polecats, red and grey squirrels and many rabbits. Bird life includes numerous buzzards and ravens. Sporting rights are vested in the Commission, but game birds were driven off by a neighbouring army battle training school during the first war and lettings have not been good.

Acquisitions of moorland or open hill are now rare, though one or two on the steep lower slopes and foothills in the neighbourhood of New Radnor and Kington have recently come in. Large and small felled woodland blocks have been the main acquisitions since 1946 and are likely to continue to be so until the many derelict sites in the once well timbered valleys around Presteigne and Kington have all been re-afforested. There has been little attempt to convert these to grazing land as has been tried elsewhere with some success.

Acquisition and area utilisation details are given in the following tables (Tables I and II).

TABLE I

Area and Utilisation - Acquisition Report Proposals

Acquired from	By	Date	Planting Acq'd (acres)	Plantable Excl. Col. 4 (acres)	Nurseries (acres)	Agricultural (acres)	F.W.H. (acres)	Unplantable Excl. Col. 4 (acres)	Other Land		Total
									Description	Area	(acres)
1	2	3	4	5	6	7	8	9	10	11	12
C.B.Masefield and another	Conveyance	31.12.24		893		239		376			1508
S.N. Thompson	"	31.3.27		1218				669			1887
Rads. C.C.	"	15.9.27		59			3				62
Mrs. Fox Edwards	"	19.12.27		144							144
T. P. Pugh	"	6. 9.28		84							84
J.W.B. Griffiths	"	25. 9.28		137							137
Mrs. Scudamore and another	"	17.10.38		51							51
E.P. Davies "	"	8. 7.47		371				30			401
Mrs. E.A. Morris	Exchange	17. 8.28				5					5
A.J. Bedford	Conveyance	27. 7.49		65							65
Herefords. C.C.	Lease	23. 6.50		88				2			90
J.D.P. Bounds	Conveyance	24. 6.50		170							170
M.J.L. Beebee	"	2. 9.50		48							48
Major C.J.L.Lewis and another	"	20.11.50		59				8			67
Sir H.Duff Gordon Bart.	"	5.6.51	13	145				3			161
J. Lloyd & another	"	1.7.51		21							21
Rads. C.C.	Conveyance	13.9.51		1							1
Total acq'd			13	3554	-	244	3	1088	-	-	4902
Disposed of to Mrs.E.A.Morris	Exchange	17.8.28				5					5
Net Total			13	3554		239	3	1088	-	-	4897

TABLE II

Present Utilisation

a) Woods and Plantations:	Acquired	.....	23
	Formed by Forestry Commission		2,847
b) Awaiting planting:	Felled	.....	479
	Bare	.....	250
c) Nursery:		.....	6
d) Agriculture	Farmed by Forestry Commission		-
	Tenanted	.....	152
Transferred permanently to Ministry of Agriculture:-			
	Agricultural		294
	Forest Workers' Holdings		16
	Unplantable		536
e) Forest Workers' Holdings		.....	135
f) Unplantable		.....	149
g) Other		.....	10
		Total	4,897 acres

Physiography

The main forest block consists of blanket plantations occupying the north and east spurs of, and blind valleys entering, the massif from the north-east and ranging in elevation from 900 ft.- 1900 ft. hence aspects are north, north-east and south-east with consequent protection from the prevailing south-west wind. Slopes are extremely steep and the valleys very narrow.

The scattered blocks constituting the lower part of the forest and known as the Presteigne beat occupy the summits and steep slopes of the foothills bordering Herefordshire. Elevations vary from 500 ft.- 1200 ft. Raised above the wide valley floors the plantations have all aspects and exposure is moderate except on the uppermost slopes.

Geology and Soils.

The area stands upon Upper Silurian brownish grey, sandy micaceous Ludlow rocks and shales. Except on the steepest shoulders a covering of reddish brown loamy soil 9 in. to several feet in depth exists. Most of the peat areas are above the plantation line where in places it is 2 ft. or more deep.

Vegetation

This falls into three main types governed by the topographical position:-

a. The uppermost slopes and hilltops are of Calluna/Erica moorland with Vaccinium, sedges and Juncus being abundant locally.

b. The intermediate slopes of the main block and most of the Presteigne blocks carry a coarse grass/bracken mixture with gorse and Vaccinium prevalent in places. On the deeper soils and on the more sheltered sites bracken is often dense. Bramble, raspberry and willow herb grow abundantly in damp sheltered situations.

c. Fine grasses with mosses in the wet rocky hollows and luxuriant bracken in places are characteristic of the lower ground of the main block which supported cattle prior to afforestation.

Meteorology.

At the highest elevations frequent mists give a rainfall of 65 in. but on the lowest slopes it averages 45 in. whilst the blocks bordering, and in, Herefordshire probably rarely get more than 40 in.

Low night temperatures are frequent and late frosts occur in the valley bottoms. Heavy snowfalls may be frequent in the early months of the year and sometimes deep drifts in shaded hollows at high elevations remain until May. Generally speaking, however, the climate of the region is fairly mild.

In 1940 the forest suffered from the "glazed" frost which extended in a narrow belt from Aberystwyth across mid Wales and southern England to Winchester. This severely damaged the plantations causing extensive damage to Douglas fir. The spruces and pines also suffered, though to a lesser extent. Unfortunately the Douglas fir was already coarse and uneven and the ice storm served to still further reduce the number of well shaped trees whereas the spruces, particularly Sitka spruce, were of such good form that even the worst damaged areas were left with a high proportion of very good trees.

Drifted snow did extensive local damage over small areas of the steepest slopes in 1947 and in places several acres of the crop were laid prostrate.

Risks

With the main block surrounded on three sides by inflammable vegetation the forest has been fortuitously free from outbreaks of fire. The recent completion of a good roads system giving access to all parts of the plantations and the preparation of a three mile long cultivated trace (to be sown with grass later) across the unplantable mountain has greatly reduced the danger of a large fire. Men, water and fire fighting equipment can now be brought quickly to the scene of a fire.

Most of the Presteigne blocks are widely scattered and in the midst of cultivated farm land so that with the exception of one or two points where main roads adjoin plantations the risk is not very great.

Sheep trespass from adjoining hill land and farms is considerable, primarily because of left-open gates and annual snow damage to fences on the higher ground. Once a ewe has lambed in the plantations her offspring tend to frequently return if they can get through the boundary fences.

Rabbits are numerous in the older plantations, having initially entered in force when the boundary fences were covered by snow in 1947. Persistent warrening controls their numbers but until all the older plantations have been brashed and thinned and neighbouring farmers make a more serious attempt to co-operate with the forester there is no hope of complete extermination.

Occasional slight outbreaks of Tortrix viburniana, Argyresthia atmoriella and Neomyzaphis abietina have occurred but generally insect damage has been very slight.

Roads

Until 1948 only the poorest of tracks passable to vehicles led into the bottom of the forest's narrow valleys. Some attempt to provide narrow ledges across the first thinned steep-sided plantations, along which a tractor and trailer could travel in fine weather, was then made with a small Clark "airborne" dozer.

The construction of new roads proper commenced in 1950 and proceeded through 1951 and 1952. Some of these were able to follow the existing compartment rides but more often new alignments had to be felled.

As a result of these activities contractors are now prepared to come forward and purchase thinnings standing, a thing none would do before.

Labour

For most purposes sufficient local labour has always been available at Radnor except in the first years following the 1939-1945 war when German P.O.Ws from a Presteigne camp had to be utilized.

During the war only the minimum necessary maintenance work was carried out at a time when many of the plantations were ready for brashing and thinning and heavy arrears of this work in addition to nursery work, planting and roads construction had to be faced soon after 1945.

Transportation of men from the Presteigne area solved the problem and until houses are available for workers in and around the forest it will have to continue in spite of the expense and the difficulties of rallying men to an emergency outwith working hours.

The present industrial staff averages about 50-55 men and although contracts are currently being made for selling all thinnings standing to merchants who will find their own staff, there will be plenty of work available for the department men for several years yet planting up the new acquisitions constantly coming in around Presteigne.

SILVICULTURE

Preparation of Ground

Apart from burning off heather, bilberry, gorse, bracken, etc., and eliminating and fencing against rabbits, little preparation of the ground before planting was practised in the earliest years.

The depth of vegetation made burning essential to permit easier planting and to reduce weeding. Turfing of the burnt over Vaccinium for spruce planting became general by 1930.

Although wet areas are almost non-existent in this steeply sloped forest turf drains were often cut in the loamy pockets of soil to augment the supply of turves on the more patchy parts.

Choice of Species

In the mid-nineteen twenties the choice of species in general was Douglas fir on all lower ground with European larch on the intermediate slopes of bracken, bramble, grasses and patches of bilberry/heather. The highest and most exposed slopes, covered with bilberry and some heather, were burnt over and turfed to take Sitka spruce and that was surmounted by

a belt of Norway spruce and Scots pine planted in the proportion of 2 rows of Norway spruce to one row Scots pine across the summit. It was not considered necessary to do any ground preparation for the Scots pine which was simply notched in.

In places the Norway spruce was mixed with Mountain pine instead of Scots pine.

Patches of Japanese larch were tried in different positions across the upper slopes.

From 1930 to 1933 Japanese larch supplanted European larch as the main species for the bulk of the slopes then planted (in the Cwm-y-gerwyn area). These were only screefed in but on some of the most exposed upper shoulders an alternate row of Japanese larch and Sitka spruce planted in mixture was tried, the Sitka spruce being planted on inverted turfs.

A wide shelter belt was planted across the topmost slopes. In places Sitka spruce was planted pure, in other parts it was mixed with Scots pine and Pinus contorta in alternate rows, the spruces being planted on turfs and the pines notch planted.

The valley bottom was planted with Norway spruce.

In 1932 an interesting variation took place when limited supplies of Sitka spruce were eked out by an alternate row mixture with Norway spruce; both species were turf planted on a fairly exposed area of plateau moorland at Fforest fach where the soil is thin over the underlying shaly rock.

In this year also an adjoining very exposed dry shoulder of heather and grasses was direct planted with European larch.

The years, 1934-36, saw the extensive use of pure Sitka spruce planted on inverted turfs on the high plateau moorland and occasionally on old conifer woodland sites north and west of Cwm-y-gerwyn.

In 1938 a break in the common use of Japanese larch for all moderately sheltered grass and bracken slopes was made and European larch substituted. This was continued through 1939 and 1940 with pure Sitka spruce turf planted on the heather slopes and shoulders above. Scots pine was restricted to rocky knolls and screes.

Then a part of Mortimer forest (the now Presteigne Beat woods of Nash, Caen, Deep Moors and Upper Radnor) was cleared of pure oak coppice and replanted in 1930-36 with European larch except for Scots pine along the

rocky summit and patches of Sitka spruce in the small wet hollows. A small 2-acre plot of pure hybrid larch was tried in 1934 on a gently sloping fairly sheltered bramble/bracken site over oak stumps.

Strips of the oak coppice a chain wide running up and across the slope were left as shelter belts dividing the whole of these woods into blocks of 5 - 10 acres.

During the war from 1941-44 planting ceased but in 1946 a start was made in tackling the old hardwood areas around Presteigne and Kington when Navages Wood was cleared of very inferior oak scrub and planted with Japanese larch on the dry bracken/bramble slopes and Scots pine across the rocky summit.

This treatment became standard for several hundreds of acres as none of the scrub coppice was worth retaining. On some areas Douglas fir was successfully substituted for Japanese larch on the slopes and where the soil appeared deeper and amenity considerations arose beech, oak and American red oak were planted. All these species have got away very well and a similar layout has been tried in 1952 on part of Forest Wood, a fairly high large old hardwood area adjoining the north side of the main block. Here alternate row mixtures of English oak/Lawson cypress across the middle slope are surmounted by Japanese larch with a cap of Norway spruce on the summit.

At different times during the planting of the main block small areas of Abies procera, Abies grandis and Tsuga heterophylla were tried. The Abies grandis and Tsuga have done very well on fairly sheltered sites. Abies procera on a moderately exposed heather/bilberry slope and mixed with European larch, Douglas fir and Sitka spruce has completely suppressed the first species and kept up with the last two. Small pure groups of Abies procera have also done very well and are, if anything, superior in form to the surrounding Sitka spruce.

From the earliest years rideside belts of beech and sycamore have been tried mainly on the more grassy areas but sometimes across what has later turned to strong Vaccinium. Once the surrounding conifers got up and provided shelter the hardwoods followed and generally have done well. Form is poor and ringing by rabbits has slowed growth but these belts have a

great amenity value and efforts will be made to preserve all those that have survived road construction operations.

From 1926-30 it was the practice to plant a belt several chains wide of 2/1 Norway spruce/Scots pine or 2/1 Norway spruce/Mountain pine mixed by rows as a windbreak along the top edge of the plantations next to the mountain fence. After 1930 this was amended in the light of experience to a 1/1 Sitka spruce/Pinus contorta or Sitka spruce/Scots pine mixture by rows or to a belt of pure Sitka spruce.

In the Norway spruce/pine mixtures the latter outgrew the spruce at first but were later so broken by storms and constantly cut back that the Norway spruce were able to keep sufficiently ahead and are now in most cases the dominant trees.

Some of the Mountain pine took on a prostrate form and seemed never to provide the Norway spruce with adequate shelter so that the latter have been checked by repeated blasting and they have not yet closed up.

The pure and mixed Sitka spruce belts have done remarkably well in all places other than where rock outcrops have caused checking.

Planting

The earlier spacing of species was as follows:-

Douglas fir	at	6 ft. x 6 ft.
Sitka spruce	"	5 ft. x 5 ft.
Norway spruce	"	4 ft. x 4 ft.
Larches	"	5 ft. x 5 ft.
	or	6 ft. x 6 ft
Pines	at	$4\frac{1}{2}$ ft. x $4\frac{1}{2}$ ft.

The spacing of Sitka spruce and the pines has not changed but now the following species are planted thus:-

Douglas fir	at	5 ft. x 5 ft.
Norway spruce	"	$4\frac{1}{2}$ ft. x $4\frac{1}{2}$ ft.
Larches	"	$5\frac{1}{2}$ ft. x $5\frac{1}{2}$ ft.

These are varied where necessary, e.g. on ploughing where it may be difficult to get furrows nearer than 5 ft. apart, or in mixing a close with a wide spaced species on turves in which case the turves are put at the wider spacing.

With the exception of a few years when transplants were not available and seedlings were used, transplants of varying age have always been planted on conifer areas. Plants used for postwar planting of hardwoods have been 1 yr. or 2 yr. seedlings.

In 1926 and a year or so after all species were notch planted except on the bilberry/heather areas (generally high up the slopes) which were burnt over and planted on inverted turfs except for Scots pine which was planted into a small patch of cultivated soil screefed clean of vegetation.

By 1930 all preparation of the ground for pine planting ceased and this species was simply notched direct into the soil unless the density of vegetation dictated some clearing. Turfing for spruces and Douglas fir became general except on the best mineral soils on the lower slopes where these species could be notch planted.

Other than screefing the worst overgrown sites the cutting of turfs and other preparatory work was never practised for either of the larches.

Ploughing

In 1951 the first ploughing for planting was done with an R.L.R. plough behind a Mark VF Fowler tracklayer over some 25 acres of old conifer woodland which had reverted to heather, gorse and poor grass grazing. Results were very good and the pure Sitka spruce crop suffered few failures, contrasting remarkably with the same species surface planted in 1950 on a more recently felled conifer area which reverted to the same vegetation.

Seedlings of beech, English oak and American red oak have all been successfully established by surface planting at 4½ ft. x 3 ft., 4 ft. x 2 ft. and 5 ft. x 5 ft. spacings respectively on felled hardwood areas since 1950.

The first planting was carried out in 1926 when some 74 acres were planted; in 1927 428 acres were planted. Thereafter the rate of planting dropped slowly until 1933 and averaged 75 acres per annum from then until 1939. Small programmes were completed in the first years of the war but by 1943 these had stopped altogether.

The post war planting gathered momentum slowly as shown below but it should be borne in mind that all these areas represent re-afforestation of derelict scrub which had to be laboriously cleared and freed of rabbits:-

Year	Acres Planted	
1947	37	
1948	Nil	(labour difficulties)
1949	83	
1950	134	
1951	133	
1952	275	

There is unlikely to be any shortage of sites for re-afforestation at Radnor for many years hence as several fairly large acquisitions are pending and the department will undoubtedly be offered further derelict old hardwood areas around Presteigne and Kington.

Beating Up

Frost damage to spruce in areas of dense vegetation and to European larch on exposed sites was the primary cause of deaths in the earliest years. The advent of turfing and the restriction of European larch to the less exposed slopes reduced these failures.

Species to replace them varied greatly to begin with; P.26 European larch was beaten up with European larch, Sitka spruce and Scots pine. P.27 Douglas fir with Japanese larch. Later extensive use was made of Japanese larch to fill in the gappy European larch areas and these were further reinforced by planting chain wide strips of Sitka spruce through the worst sections.

As a general rule Sitka spruce was used for beating up on peat areas and where exposure was an important factor.

All species used for beating up were planted on turfs except those planted on the best rich mineral soils where screefs sufficed.

In the early plantations, particularly of Douglas fir with Sitka spruce, beating up continued for several years and it is apparent today that though large trees were used they often failed to catch up with the originals and were suppressed within a few years.

Replanting

14 acres of a mixture of Sitka spruce and Norway spruce planted on turfs in dense heather and bilberry in 1932, failed. In 1943 this area was ploughed with a Ransome solotrac plough and replanted with a mixture of Sitka spruce and Scots pine, in the proportion of 2 rows of Sitka spruce to one row of Scots pine.

In 1944 some 23 acres of failed P.31 Sitka spruce in rank heather on a very dry slope were ploughed and replanted as above. Both these areas are now doing very well though there is a danger in places that the Sitka spruce may get too far behind the vigorous Scots pine because it has not reacted as strongly as was hoped to the ploughing.

Several small areas of storm devastated Douglas fir and Japanese larch were replanted in 1941, 1942, 1945 and 1946.

During 1946-7 the Home Grown Timber Production Department clear felled some 57 acres of P.28 and P.29 Douglas fir and Japanese larch in Cwm-y-gerwyn. After allowing several years for weevil activities in the old stumps to abate these areas were replanted with 13 acres of Norway spruce in 1949 and 43 acres of Sitka spruce in 1950. At present large patches of both these species are in check where strong gorse or heather has returned. The failed areas are being treated with basic slag.

Other Maintenance

A small amount of drainage upkeep has proved necessary now that large areas of the early plantations have been opened up for thinning but neither the main or Presteigne beats ever required many drains so this problem will never be extensive.

Wind loosened P.28 Douglas fir was staked in the early nineteen-thirties. Though rather expensive this operation proved quite effective within a year or so. Weeding was necessary in the early years in order to (a) free checked spruce from smothering heather and gorse and (b) keep back the strong bracken so prevalent on the mineral soil of the middle and lower slopes.

Of the two the former was by far the slowest and most expensive as frost damage cut back the small trees and made them difficult to treat before they eventually outgrew the vegetation.

Replanting of old hardwood areas since 1947 has entailed vigorous cutting back of coppice on the old stock and strong bramble, grass and bracken growth developed whilst the sites were derelict. Where they were grazed this has not been so much of a problem.

Past Treatment of Established Plantations

A war-time lack of labour to maintain the Nash, Caen, Deep Moors and Upper Radnor Woods taken over from Mortimer Forest in 1946 left a legacy of several hundred acres of extremely vigorous oak coppice which was rapidly overgrowing the European larch and Scots pine. This was cut out just in time to prevent suppression of the conifers and it allowed them to recover in a year or so. This work could not have been done without the

substantial aid of German prisoners of war from Presteigne camp.

The main block plantations likewise suffered from lack of attention during the last war and extensive brashing only commenced in 1946 with some 200 acres completed. This programme was increased in subsequent years and arrears were overhauled by 1951. This programme was assisted by only brashing one rack in three (i.e. one side only of the trees down each side of the rack), thus the cost per acre was reduced and the quantity increased but subsequent experience of extraction showed this entailed a risk of injury to tushing horses so that contractors insisted on complete brashing of every row before they would purchase thinnings standing or at stump.

Brashing of larch has been done with sticks and slashers reversed but with other species a saw has been used.

Cleaning

Apart from the Presteigne beat woods taken over from Mortimer (see Past Treatment above) coppice growth has been no problem at Radnor. Mountain ash, birch and willow are allowed to remain to improve the soil humus content provided they do not interfere with the crowns of good conifers around them.

Thinning

Apart from thinning the small patches of old acquired plantations no real start was made at Radnor until 1946 when 20 acres of the war time accumulated thinnings were done. By 1948 the programme had expanded to 200 acres.

Because of labour shortage it was soon necessary to introduce contract sales of standing thinnings but merchants were reluctant to undertake sizeable areas because of the extraction difficulties. In 1951 silvicultural thinning was subordinated to felling road alignments which produced a greater volume of produce than that estimated as the output of the postponed thinning programme for that year.

By the commencement of F.Y.53 the road making programme will be completed and already (April 1952) some 54,000 cu.ft. of standing thinnings have been purchased with a further 40,000 cu.ft. being negotiated for by the same merchant.

It is anticipated the felling of this 94,000 cu.ft. will be completed in F.Y.52 and further contracts be negotiated for the subsequent years.

Table of Thinnings

Forest Year	First Thinning		Second Thinning		Felling	Remarks
	by F.C.	by Contractor	by F.C.	by Contractor		
1946	20	-	-	-	34.5	Felled by T.P.D.
1947	33	-	11	-	22.85	" "
1948	157.3	7.0	52.5	-	-	
1949	127.5	57.0	20.0	-	3.0	For Roads
1950	66.25	4.0	65.25	7	-	
1951	29.5	-	17.75	-	(39.7 ((34.5	For Roads Scrub sold to Contractors.

Research Note by the Research Branch

Twenty-six experiments were laid down in Radnor Forest between the years 1928 and 1932. Of these, sixteen are extensions into the forest of nursery experiments carried out at Bagley and Kennington nurseries, Oxford, and ten are provenance trials dealing with European larch, Japanese larch, Douglas fir and Sitka spruce.

The following table shows these experiments grouped according to subject species and year of planting.

Subject Group	Year of Planting and Species					
	1928	1929	1930	1931	1932	Experimental Area
1. Nursery Extension Experiments	1(D.F.)					Ednol Hill
(a) Method & Density of Sowing	2(E.L.) 3(S.S.)					" " " "
			8(E.L.)			Cascob
(b) Grading of Seedlings	4(S.S.) 5(N.S.) 9(E.L.) 10(D.F.) 11(S.S.)					Ednol Hill " " " " " " " "
		21(N.S.)				Cwm y Gerwyn
(c) Spacing of Trans-plants	6(N.S.) 7(S.S.) 12(E.L.) 13(D.F.) 14(S.S.)					Ednol Hill " " " " " " " "
		22(N.S.)				Cwm y Gerwyn
2. Provenance Studies	15(D.F.) 16(E.L.)					Ednol Hill " "
		17(E.L.) 18(J.L.) 19(D.F.) 20(S.S.)				Cwm y Gerwyn " " " " " "
				23(E.L.) 24 " 24a "	23(E.L.)	Glydre " "
					25(E.L.)	Bleddfa
3. Age and Type of Plant Nursery of Origin				23(E.L.)	23(E.L.)	Glydre

Experimental Areas

The experimental work has been concentrated at four main areas - Ednol Hill, Cwm y Gerwyn, Glydre and Bleddfa.

Ednol Hill

Fifteen experiments have been laid down at Ednol Hill, which is situated five miles west of Presteigne and $2\frac{1}{2}$ miles north-east of New Radnor. The experimental plots are situated at an elevation of 1250 ft. to 1450 ft. on a relatively gentle slope which rises steeply above to the summit of Bach Hill (2,000 ft.), one mile distant. Below, the ground falls steeply to 925 ft. in the bottom of a broad valley about half-a-mile away. The aspect varies from south-east to north. The area is slightly sheltered on the south-west, west and north-west by the rising ground behind, but the general exposure over most of the area is moderately severe by virtue of its high relative elevation.

In some places the curve of the slope is concave and parts of the area have suffered from frost injury from time to time. In January 1940 serious damage was caused to many of the better grown plots at Ednol Hill and also at Cwm y Gerwyn by a glazed frost which broke off the tops and branches of many trees, particularly of the larger individuals, the damage thus being most adversely selective. The severity of the damage suffered by the various species was in the order, Douglas fir, European larch, and Sitka spruce. Very little damage to Norway spruce was recorded.

The natural vegetation of the region is grass-bracken-Vaccinium.

Cwm y Gerwyn

Six experiments have been laid down in the Cwm y Gerwyn area which is a steep sided valley having a narrow outlet to the north-east. The ground rises on three sides to an elevation of between 1700 ft. and 2100 ft. and there is moderate exposure to the south-west wind which sweeps down the valley. The vegetation of the region is of the grass-herb type.

The four provenance experiments are concerned with European and Japanese larch, Sitka spruce and Douglas fir and are situated on a moderate slope almost in the bottom of the steep-sided valley head at an elevation of 1200 ft. The region is subject to severe frosts on account of its topograhpical position and injury to plantations has been frequent.

Glydre

The three experiments at Glydre are all concerned with European larch provenance and are situated at an elevation of 1400 ft. to 1500 ft. on a severely exposed north-facing slope. The soils are somewhat variable and in the main consist of shallow-brown earths with podsols frequent at the upper planting limits. Pan formation is frequently found. The site is open to the north and relatively frost-free.

The vegetation of the area is of the Calluna-Vaccinium association with Calluna frequently dominant and luxuriant. Bracken and grasses are abundant locally.

Bleddfa

The European larch provenance plots at Bleddfa are situated at the foot of the steeper part of the northern slope of an upland valley at an elevation of 1300 ft. to 1420 ft. Relative to the valley floor the elevation is 100 ft. and the lower part of the area is subject to severe frosts. The upper part of the area is severely exposed.

The soils are similar to those of the Glydre. Brown earths are the common type with podsols occurring in some of the plots on the higher ground.

A bracken-grass-herb vegetation occurs on the deeper soils of the lower ground, gradually merging into a Calluna-Vaccinium association in the upper, exposed, part of the area. Grasses are abundant.

The Nursery Extension Experiments

Thirteen nursery extension experiments are situated at Ednol Hill, two at Cwm y Gerwyn and one at Cascob. They are intended to form a study of the long term effect of different treatments carried out at the nursery stage. The subjects studied were: method and density of sowing; grading of seedlings; and spacing of transplants. The indicator species used were Douglas fir, European larch, Sitka spruce and Norway spruce. In all these experiments the plants, on lifting, were graded and put out in the forest keeping the good plants and the culls separate.

The outstanding feature of the results obtained from these experiments is the complete absence of any significant effect from the various nursery treatments and it is clear that they have little or no influence on the growth of the trees under conditions prevailing in this forest. The only

point which emerges is that culls invariably give poorer results than good plants, in both growth and survival.

The last assessments were carried out in 1939 and the experiments are now on a maintenance only basis.

Provenance Studios

Provenance studies have formed an important part of the research work carried out in Radnor Forest by the Research Branch. Six experiments with European larch, two with Douglas fir and one each with Japanese larch and Sitka spruce, using seed of various geographic origins, were laid down during the years 1928 - 1932 and have been the subject of various assessments and investigations from time to time.

European larch

Seed lots of European larch from a wide range of origins have been tried at Radnor mostly under severely testing conditions. Frost in narrow valley bottom sites and exposure have been the chief adverse factors, but at one or two sites, notably at the Glydre and at Bledffa, the presence of a podsolic pan has provided an additional complication. The weakest provenances, mainly those from the Austrian, Italian and Swiss Tyrol, have therefore suffered severe losses, dieback and canker, and have also shown bad stem and crown form and slow growth in most of the experiments.

In general the Scottish seed origins have grown better than any of the continental lots, while one lot from Czechoslovakia and one or two from the Sudetan district of Silesia have proved much better than the average of the imported seed lots.

Experiment 16, P.28 (Ednol Hill)

This was the second larch provenance trial laid down in Great Britain by the Research Branch of the Forestry Commission, the oldest having been laid down at Drummond Hill, Perthshire, in 1926. The layout of the experiment is in unreplicated blocks on gently sloping ground. Exposure at this point of the area is moderate to severe and the effect on the crop, particularly on the poorer alpine provenances, has been very injurious.

Twelve larch origins are compared in this experiment including three from Scotland (Perthshire), four from the Austrian Alps, two each from the Swiss and Italian Alps and one from the Sudeten mountains.

The Scottish provenances, particularly the Ladywell strain, are outstanding in vigour, rate of growth, form of stem and crown and in freedom from disease. These plots are almost fully stocked compared with losses ranging from 50 to 70 per cent for the continental lots, which have all suffered die-back in a varying degree. Of the latter the Sudeten and the Swiss Frontier lots are the best followed by the Austrian and the Swiss Alpine lots.

All plots have suffered severe damage from the ice storm of 1940.

The mean heights at 23 years of age are shown in the 1950 assessment data, as follows:

Seed Origin	Altitude (feet)	Ident. No.	Mean Height (feet)
Scotland, Ladywell, Dunkeld			33.0
" Loch Ordie			29.4
" Drummond Hill			23.1
Austria	3280	25/10	23.2
"	2953 - 4265	25/14	22.9
" N. Calcareous Alps	2625 - 3937	25/13	22.8
" Tyrol	1969 - 2625	25/26	22.7
Italy Tyrol		25/8	25.5
" Swiss Frontier		25/58	23.5
Switzerland, Munsterthal	4265 - 4593	25/17	21.3
" Vintschgau	3281 - 3937	25/45	21.6
Silesia, Sudeten Mountains		25/28	23.2

Experiment 23, P.31 and P.32 (Glydre)

This experiment was laid down in 1931 as a trial of two Scottish and two Continental larch origins and also to test the effect of two different nurseries of origin (Kennington and Nagshead) and two types of plant (two-plus-one transplants and two-year seedlings).

An assessment made in 1947 at the end of the 17th growing season shows that the Aberdeenshire race (Tillyfourie, 29/9) is consistently the best, followed closely by the Morayshire lot (W. Elchies, 29/524). The continental origins (Munsterthal, 28/30 and Silesia, Sudeten, 31/27) are distinctly inferior as regards growth rate, form, stocking, wind injury and die-back. The mean heights were: 16.8, 15.2, 12.4 and 11.8 feet respectively. It is

noteworthy that the Munsterthal lot in this collection has a slightly greater mean height than the Silesian, being rather better than the average for this origin.

There were no noticeable effects of seed origin upon losses at planting.

Effect of Nursery of Origin

It is thought that loss of soil, during transport and handling, by the roots of the Kennington plants owing to its lighter, sandier texture, caused heavier initial seedling losses (20.5 per cent) than those suffered by the Nagshead plants (4.5 per cent). Losses of transplants were negligible.

In the first eight or nine years the Nagshead plants grew at a slightly faster rate than those from Kennington, but by 1947 any former differences had become insignificant.

Effect of Type of Plant

The losses on establishment over the whole experiment were approximately five times greater for seedlings (mean 12.5 per cent) than for transplants (mean 2.2 per cent), but it should be borne in mind that they were planted in different years.

During the early years the transplants showed a faster rate of growth than the seedlings those ex Nagshead having put on approximately 25 per cent and those ex Kennington 10 per cent more growth than the corresponding seedlings. By 1947, however, there were no appreciable differences in height or girth, or in any other important respects, as between the two types of plant.

Experiment 24 and 24a, P.31 (Glydre)

These two provenance experiments both deal with trials of European larch each using the same ten origins, six being Scottish, two Silesian and two Alpine.

Two different methods of layout were used: in Experiment 24, Dr. M. L. Anderson's group method was adopted with a unit group of thirteen plants and ten replications, while in Experiment 24a the plants were put out in normal lines, with two replications. Site conditions in the latter experiment are rather the more severe of the two.

All lots of Scottish origin have shown healthier and stronger growth than those of Continental origin, in 1940 Drummond Hill being remarked as the most vigorous.

At the 1947 (October) assessment the Scottish lots were still growing strongest with not a great deal of difference between the various home origins. If anything, the Balblair (29/523a) and Drummond Hill lots tend to be the most vigorous. Mean heights in Experiment 24 range from 18 ft. for the Drummond Hill lot to 14 ft. for the Silesian origins.

Rather surprising is the relatively poor performance as regards growth and losses, of both Silesian lots as compared with the alpine origins on these two sites, illustrating the wide variation which exists between lots of so-called Silesian origin. This point is also noted in Experiment 23 adjacent.

Experiment 25, P.32 (Bleddfa)

In 1932 a trial of nine European larch provenances was laid down at Bleddfa comprising two Scottish (Morayshire), one Moravian, one Silesian and five alpine (Tyrolese Alps) origins. The site is of low quality for larch being very exposed and subject to frost. The soil of the lower part of the area is a brown earth, but in the upper part it is podsolised. Three replications are provided in the layout.

Details of seed origin are given in the 1950 (October) assessment table below.

The main interest in this experiment is in the fact that the medium altitude Moravian strain from Czechoslovakia (Id. 30/9) has done relatively well, (mean height 23.3 ft.) being as vigorous and healthy as the two Scottish lots (mean heights: Blervie 22.5 ft. W. Elchies 19.0 ft.) It is, however, inferior in quality of stem. Thinning was carried out in some of these plots in 1952.

The Silesian lot comes next in order of quality and growth (mean height 18.3 ft.) but is very poor in comparison with the Scottish and Czech lots. This is followed by the two Austrian lots from the Inn Valley and the Tyrol, with the Swiss and Italian Tyrolese lots poorest of all (Munsterthal 13.7 ft.). The poorest lots are from altitudes over 3250 ft. as is often the case elsewhere.

Die-back at the Bleddfa site is more severe than in any of the other larch experiments. The alpine lots are the worst affected, stocking being as low as 25 per cent in some cases, with a large proportion of moribund trees and severe canker of stem and branches. The Scottish and Czech lots have also been affected but to a much less degree.

The 1950 (October) assessment data are as follows:-

Seed Origin	Ident. No.	Altitude (ft.)	Mean Height (ft.)	Mean Girth (in.)	Deaths Per cent
Scotland, Blervie			22.5	12.9	21
Silesia, Sudeten	30/37		18.3	11.8	51
Switzerland, Munsterthal	30/28	4000 - 5000	13.7	9.3	63
Austria, Tyrol	30/13		17.9	12.3	58
Czechoslovakia	30/9	1500 - 2000	23.3	12.5	36
Austria	30/15	2000 - 2750	17.8	11.7	49
Switzerland, Laatsch	30/27	3250 - 4000	14.1	9.5	75
Italy, Trentino	30/63		15.3	10.9	64
Scotland, W. Elchies	29/524		19.0	11.3	31

Experiment 17, P.29 (Cwm y Gerwyn)

This experiment occupies a site in the bottom of a narrow, steep sided valley, subject to severe frosting and therefore provides severe testing conditions for European larch. In it seven provenances are compared, including five alpine, one Silesian and one from the Swiss Frontier region of Italy. The experiment was assessed in October, 1947.

Die-back has generally been severe throughout the experiment having greatly reduced the stocking and caused malformation of stems and crowns. The crop is very open and weed growth is rank.

The most vigorous and uniform growth is shown by the Swiss Frontier race (Id. 25/58, mean height 24.1 ft.) followed by the Silesia, Sudeten race (Id. 25/28, mean height 21.4 ft.). These two are in a much healthier condition than any of the alpine lots, which show the following mean heights: Austria, Cavalese Mountains (Id. 26/1, mean height 20.4 ft.); Italy, Tyrol (Id. 25/8, mean height 19.2 ft.); Austria, Cavalese Mountains (Id. 26/2, mean height 17.8 ft.); Switzerland, Engadine, (Id. 25/46, mean height 19.5 ft.); Switzerland, Vintschgau (Id. 26/20, mean height 16.4 ft.).

The last three lots are the poorest in every respect. It is worth noting that the Sudeten lot is late flushing

Japanese larch
Experiment 18, P.29 (Cwm y Gerwyn)

Plants raised from seed of three different origins in Japan, one of which was labelled Larix kaempferi, were put out in single blocks near the bottom of the valley, near Experiment 17.

All three lots have shown vigorous and uniform growth with little differences to record between any of the provenances. The general mean height in 1947 was 33 ft. as compared with 24 ft. for the best plot of European larch (Swiss Frontier) in the adjacent experiment. This experiment illustrates the greater resistance of the Japanese species to frost and canker injury. It is now managed by the Mensuration Officer as sample plots (Nos. W.170, W.171, established June 1944).

Douglas fir
Experiment 15, P.28 (Ednol Hill)

In this experiment four origins from British Columbia from altitudes between 1200 ft. and 2700 ft. and one from California are compared on a moderately exposed north facing site. This experiment was severely damaged by the ice storm of 1940 resulting in broken stems and crowns and irregular stocking, over 60 per cent of the crop being affected in some of the more vigorous plots.

The last assessment, carried out in 1947, showed that the differences in growth rate between the five provenances were negligible, mean heights varying only from 25.4 ft. to 27.2 ft.

On account of the close rates of growth in this experiment it is chiefly on form of stem and crown and resistance to physical damage that the provenances will have to be judged.

The Salmon River race (Id. 24/25) from 2700 ft. altitude is the best in this respect and Louis Creek (Id. 24/24, altitude 2600 ft.) is the poorest. Craigellachie (Id. 24/22, 1400 ft), Shuswap (Id. 24/23, 1200 ft.) and California (Id. 24/28) are intermediate in quality.

Experiment 19, P.29 (Cwm y Gerwyn)

Three provenances from the U.S.A. and one from British Columbia are compared on a moderately steep, middle slope. This experiment suffered

severe damage by the ice storm of 1940 in a similar manner to the previous experiment.

As in Experiment 15 a high altitude race, Crater Forest, Oregon (Id. 26/13, altitude 4300 ft.) has proved the most satisfactory, having good clean stem form and comparatively little injury from the ice storm. The Washington Coast (Id. 26/15) and Shuswap Lake, B.C. (Id. 25/51) varieties are very coarse in stem form but of equal vigour to the former, all having an average height of 27 ft. A Chelan Forest lot (Id. 26/14) has suffered many losses and poor growth, averaging 10 ft. less than the other races, but this plot is however in a more exposed position.

Sitka spruce
Experiment 20, P.29 (Cwm y Gerwyn)

One of the earliest provenance experiments with Sitka spruce was laid down by the Research Branch in 1929 on a frosty site in the bottom of the valley at Cwm y Gerwyn. The slope of the ground is even and moderately steep.

Three origins from the U.S.A. (Washington, Oregon, California) at altitudes between 150 ft. and 200 ft. and one from Queen Charlotte Islands, British Columbia, are represented, in unreplicated blocks.

At the last assessment, in 1947, the Siuslaw, Oregon race (Id. 26/7, mean height 37.6 ft.) and the Siskiyou, California race (Id. 26/10, mean height 35.1 ft.) were the most vigorous, followed by the Olympic Mt., Washington race (Id. 26/6, mean height 31.9 ft.) and the Queen Charlotte Island race (Id. 26/50, mean height 26.6 ft.). An outstanding feature of this trial is the relatively slow growth of the last provenance which, in respect of survival and stem form is, however, superior to the others.

Stem Crack

The Oregon and California races, now the most vigorous, suffered the most severe losses from frost injury and also suffered the most severe damage from stem crack in 1947. This appears to be in some way related to vigour. The percentage of cracked stems for the four provenances were: Oregon 30.1, California 9.6, Washington 3.3, Queen Charlotte Islands 2.2.

SUMMARY

1. Nursery extensions

The outstanding feature of the results from the thirteen nursery extension experiments is the complete absence of any significant effect resulting from the various nursery treatments. Indeed the only point that emerges is that culls invariably gave poorer results than good plants.

It should be noted that this similarity of growth of plants from various nursery treatments after a few years in the forest is our general experience and by no means restricted to Radnor Forest.

2. Provenance studies

(a) European larch

In general the Scottish seed origins have given the best results but one lot from Czechoslovakia and one from the Sudeten district of Silesia also grew decidedly well.

The weakest provenances were from Austria, Italy and Switzerland.

Only the best races have reached a mean height of 25 ft. in 20 years but the sites are either exposed or frosty.

(b) Sitka spruce

Of the four origins used Siuslaw Oregon is the fastest and Queen Charlotte Island the slowest but the latter is superior in both stem form and rate of survival.

The faster provenances have suffered most both from frost injury and from stem crack.

(c) Douglas fir

Owing to lack of replication and to severe glazed frost damage in 1940 no very useful comments can be made on these plots.

(d) Japanese larch

No marked differences due to provenance but of interest because the experiment is flanked by European larch and forms

a nice example of the greater resistance of the Japanese species to frost damage and to canker and its faster rate of growth on this site (33 ft. as against 24 ft. after nineteen years).

3. Age and type of plant

Losses in 2 + 0 European larch were five times greater than with 2 + 1 plants (12.5% against 2.2).

Felling

As a result of the severe ice storm in early 1940 it became necessary to clear fell some 42 acres of old acquired European larch, P.27 Douglas fir and P.29 Japanese larch during the succeeding year or so. On some of the exposed older felled European larch sites a marginal shelter belt was left standing.

In 1946-47 the Home Grown Timber Production Department felled a further 6 acres of the old acquired mixture of Norway spruce/European larch and some 51 acres of rough P.28 Douglas fir and P.29 Japanese larch all in Cwm-y-Gerwyn.

This acreage would have been bigger but for the fortuitous closing down of the timber production department of the Ministry of Supply.

Conclusions

In the light of the quick establishment of the 1943 replanting and the 1951 planting on ploughed heather/bilberry ground it is clear that wherever possible all such newly acquired areas must be so treated and preferably planted with Sitka spruce for quick volume production.

Other sites such as bracken slopes will take a wide range of species but it would be wise to go very carefully with Douglas fir above the 1,000 ft. contour and restrict it to where good shelter is available. Similarly Japanese larch might well be limited to the poorer sheltered sites above this altitude because if it is grown quickly on high sites it becomes mis-shapen as a result of wind action. Both Douglas fir and Japanese larch make excellent first crops over strong coppice stools such as are found on many of the old woodland acquisitions around Presteigne.

The strength of the coppice regeneration along with amenity considerations should govern the use of hardwoods on these acquisitions. Unless a quick growing conifer is used where the stools are vigorous weeding may be unduly prolonged and expensive. However, some of these coppice sites have a deep rich soil. Because of repeated cutting or heavy grazing the regeneration is poor, on such sites the preference should obviously be for beech or oak, both of which species do extremely well in the Presteigne-Kington area.

Pines have an important part to fulfil on the new acquisitions for planting on dry, exposed, stony knolls and shoulders (preferably Pinus contorta or Corsican pine), and also on the immediate thin soiled surround to rock outcrops and stony screes sometimes found on the old hardwood areas. Care should be taken, however, to keep Scots pine away from exposure if taken above 1,000 ft. or it will inevitably be blasted and broken every few years.

The land now coming in will provide a considerable planting programme for several seasons yet but there may come a time when all the new areas are completed whereupon two obvious but important tasks should fall due. These are:-

(a) The opening out and underplanting of the many poor European larch areas in the main block with Tsuga heterophylla or Abies grandis. The first stage of this has been started in the P.27 European larch at Hillhouse.

(b) The raising of the planting line on Ednol, Glasdir, Glydre and Fron Wen. Most of these sites could be ploughed and successfully planted with Sitka spruce to the total extent of several hundred acres without encroaching on the very exposed mountain plateau.

APPENDIX I

Notes from Inspection Reports

The following inspection reports have been referred to:-

Date	Inspecting Officers
30th August, 1928	Divisional Officer
24th April, 1929	Divisional Officer
21st & 22nd August, 1929	Assistant Commissioner
25th April, 1933	Chairman and Assistant Commissioner
2nd April, 1937	Chairman and Assistant Commissioner
21st April, 1938	Chairman and Divisional Officer
2nd & 3rd November, 1941	Chairman
31st July, 1942	Acting Divisional Officer
17th October, 1942	Messrs. W.L. Taylor and M.P. Price
15th December, 1942	A/Divisional Officer
13th April, 1943	A/Divisional Officer
25th November, 1943	A/Divisional Officer
29th June, 1946	Conservator
24th September, 1946	Conservator
2nd April, 1947	State Forest Officer
10th April, 1947	Conservator
28th May, 1947	State Forest Officer
19th August, 1947	Director, Conservator and S.F.O.
10th December, 1947	State Forest Officer
2nd March, 1948	State Forest Officer
23rd April, 1948	Chairman, Director, Conservator, S.F.O.
25th June, 1948	State Forest Officer
17th September, 1948	Advisory Committee on Forest Research
21st September, 1948	Director, Conservator, S.F.O.
28th January, 1949	Conservator
22nd April, 1949	State Forest Officer
5th October, 1949	Conservator
11th October, 1949	Conservator, Directorate Engineer, Deputy Conservancy Engineer.
24th & 25th May, 1950	State Forest Officer and Assistant Engineer.
2nd June, 1950	Director and Conservator
15th June, 1950	Conservator and State Forest Officer
18th April, 1951	State Forest Officer
22nd June, 1951	Conservator
23rd August, 1951	Radnorshire Planning Committee, Director General of Nature Conservancy, Conservator.
9th January, 1952	State Forest Officer
21st February, 1952	State Forest Officer

Extracts from selected Inspection Reports

25.4.33 - Chairman's inspection

Ednol Block (P.28). Unsatisfactory condition of the Douglas fir noted and the Chairman considered the P.33 beating up with Sitka spruce unnecessary, and further that same should have been on turfs. In explanation the difficulty of cutting turfs in areas which have been enclosed for a considerable period was mentioned. Some of the Douglas fir which have browned are to be marked and watched.

The Norway spruce/Scots pine belts on higher ground are unsuitable and this area should have been planted with Sitka spruce. This also refers to P.27.

Cwmygerwyn Valley. (West side of Compartments L.19 and 20)

The Japanese larch were poor but the Chairman considered that they would come away in time. The Norway spruce in this area were considered satisfactory.

2.4.37. Chairman's inspection

From the inspection the Chairman formed the opinion that Douglas fir, European larch and Japanese larch in the older plantations had been carried too high and gave the following instructions:-

(i) That the top third of the area should be planted with Sitka spruce.

(ii) That the lowest ground, liable to frost, should be planted with Norway spruce.

(iii) That the intermediate ground be planted with larches (preferably European larch) but in any case no large blocks of Japanese larch are to be formed.

Turf planting seemed essential on most ground owing to the dense ground flora appearing after the exclusion of sheep.

Try to bring in sycamore on ride sides at the lower elevations as follows:-

(i) Two rows of beech against rides.

(ii) Two rows of sycamore between beech and conifers.

(iii) Care to be taken not to plant hardwoods too close to conifers or else nearest row is suppressed by conifers. Such a state was evident on Compartment N.34 (P.30).

21.4.38. Chairman's inspection

Compartment L.29 (P.29 Japanese larch/Sitka spruce alternate rows). The Chairman considered the plantation very interesting and pointed out that the ideal Sitka spruce is one that comes up in a confined space with a consequent small core. With this object in view it is necessary to keep the Sitka spruce behind the Japanese larch. However, some of the Sitka spruce are too far behind and becoming suppressed. To prevent this there are two alternatives:

(a) Brash up the Japanese larch
(b) Remove the Japanese larch wolves

The Chairman instructed that the plantations be carefully watched but that we were at once to treat 6 rows each in the following manner:

(a) Brash the Japanese larch lightly
(b) Brash the Japanese larch hard
(c) Remove Japanese larch wolves (some brashing will also take place here to enable the men to get through).
(d) Leave a control.

From this it will be possible to judge the most efficacious method.

Compartments L.22 and L.15 (P.30, Norway spruce). Same were considered satisfactory and a discussion took place as to the general use of Norway spruce at Radnor. The Chairman pointed out that Norway spruce was probably the safest tree except for heather ground and could probably be used on most of the Radnor area. However, it is apparent that good larch and Sitka spruce could be produced at this forest, and he confirmed the instructions laid down at his visit on 2.4.37, i.e:-

(a) Top ground to be planted with Sitka spruce
(b) Middle ground with larch (preferably European larch)
(c) Bottom ground liable to frost with Norway spruce.

2.11.41. Chairman's inspection

Following points were discussed:-

Larch race experiments in Compartment N.3. where the Loch Ordie and Ladywell seed is given the best results, straight and clean and now forming canopy at 12/18 ft.

P.38 European larch in Compartments N.47 and N.48. In view of the poor European larch growth in the older plantations at Radnor it is interesting for record purposes to note the extraordinarily good growth in these compartments.

Height 5 ft. 6 in. average) Indent Nos. 34/84 and 34/93
Leading shoot 24 in. average)

Chairman's minute:

The Larch Races Experiment. Scottish seed has obviously given the best results on a site which is really too high for European larch.

23.4.48. Chairman's inspection

A discussion was held on the effect of the various types of soil on the growth rate and quality of Japanese larch, it being generally agreed that poor dry heather soils over rock appear to produce slower growing but good quality trees as opposed to the faster grown types found on rich bracken areas.

History of Radnor Forest

APPENDIX II

Supervision

Conservators:

1945/47	Mr. R. H. Smith
1947/to date	Mr. F. C. Best

Divisional Officers:

1924/25	Mr. D. W. Young
1926/30	" O. J. Sangar
1931/37	" A. P. Long
1937/39	" A. H. Popert
1939/41	" C. E. L. Fairchild
1941/45	" R. H. Smith

State Forest Officers:

1947/51	Mr. W. A. Cadman
1952/to date	" J. R. Hampson

District Officers:

1926/27	Mr. A. H. H. Ross
1927/39	" F. E. B. de Uphaugh
1939/40	" W. D. Haldane
1940/46	" W. G. Roberts
1946/to date	" C. E. Peaty

Foresters:

1926/27	J. T. Smith
1928/35	P. Harrison
1936/to date	P. Yapp

APPENDIX III

Extract from an article printed in the Journal of the Forestry Commission (1949) on the Selection of Species at Radnor Forest.

Proposals for Allocating Species to Particular Classes of Ground

1. Extreme bottom of valleys where late spring frosts occur:

   (a) on mineral soil - Norway spruce;
   (b) on heather and loose stone - Lodgepole pine (Pinus contorta).

2. Steep lower heather/bilberry slopes on thin peat - Japanese larch, Lodgepole pine (Pinus contorta). Corsican pine on the poorest ground.

3. Sheltered lowest slopes on mineral soil: Norway spruce, Abies grandis, Tsuga. Douglas fir on selected sites only.

4. Small rocky faces and screes:- Japanese larch, Lodgepole pine (Pinus contorta). Corsican pine on screes.

5. Dry intermediate and bracken slopes not open to exposure:- Norway spruce. Abies grandis on selected sites.

6. Old woodlands:-

   (a) Coniferous: - Norway or Sitka spruce
   (b) Hardwood: - Japanese, hybrid or European larches, to kill off the coppice.

   Rocky patches:-
   Scots or Corsican pines.

   Occasional wet hollows:-
   Norway spruce.

7. Peat moorland, heather/bilberry vegetation:-
   Plough and plant Sitka spruce.

8. Steep heather/bilberry slopes on upper limits, severe exposure:-

   Sitka spruce or Abies procera; or mixtures of Sitka spruce with Corsican pine, Lodgepole pine (Pinus contorta) or Abies procera; all on turfs.

9. An additional type of area which we will shortly have to treat is the European larch plantation that has died back and is now too open ever to form canopy, and is slowly becoming a jungle of weeds. Suggestions for treating such areas:-

Standing European larch areas:

Thin out where necessary and underplant with Abies grandis or Tsuga. Where the crop is extremely rough and open, clean up and replant with Sitka spruce or Abies procera, as these plantations are mainly on exposed areas.

Radnor