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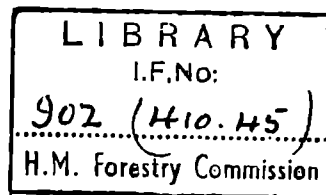
GRIZEDALE

FOREST

NW(CE) CONSERVANCY

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Grizedale

FORESTRY COMMISSION

HISTORY

of

GRIZEDALE FOREST

1936 - 1951

NORTH WEST (ENGLAND) CONSERVANCY

HISTORY OF GRIZEDALE FOREST

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HISTORY OF GRIZEDALE FOREST

GENERAL DESCRIPTION OF THE FOREST

Situation

The forest is situated in the Furness Fells area of Lancashire between the waters of Coniston and Esthwaite. It lies within the Lake District National Park area, and covers a total of 5,807 acres. The name Grizedale is derived from the name given to the valley by the Norse invaders, who in the ninth century, colonised Furness and its Fells. At the heads of the high valleys, the then wild forest land was used for the keeping of pigs.

This then was the "dale of pigs", spelt in the debased Norse of the 14th Century "grisa-dalr". The name has slowly changed until at the beginning of the 20th Century, the late H. Brocklebank, Esq., built the present Grizedale Hall, 4 miles south of Hawkshead. It is from this Grizedale Hall Estate of 4,232 acres, purchased by the Forestry Commission in November 1937, that the forest now takes its name.

Area and Utilisation

The area has always been a largely wooded tract of country, and a comprehensive history of the utilisation of the land, plus its associated industries commences with the Church Commissioners report on the area in 1537 at the time of the Reformation.

Before this date the area was owned and administered by the monks of Furness Abbey. Their administration however was poor and the area generally poverty stricken. It was mainly used for the grazing of pigs and the production of a small amount of house building timber. The woodland at the time of the Church Commissioners Report, consisted mainly of coppice, most of the primeval oak, birch, holly and alder forests having already been felled; and part of our present day woodland especially in Hall Wood and Scale Green is a direct descendant of these coppice woods.

These woods have provided the vital material for the well being of the local industries which include or have included coopery, turnery, swill making, bobbin making, charcoal burning, iron smelting and the production of gunpowder.

The industries, however, have been responsible for the creation of a large area of badly managed coppice. The most destructive agency was the iron smelting industry. Here, the valuable ore mined in Low Furness was transported for smelting to the Fells where there was sufficient wood and also where labour was cheap.

When smelting by charcoal was discontinued, estates dropped sharply in value and the woodlands further deteriorated. It is intended to preserve the site of one old smelting bloomary, towards the eastern end of Farra Grain stream.

The need for industrial charcoal later increased the value of the woods again, but when this material was largely replaced by synthetic preparations, the gradual deterioration of the woodlands continued until in 1937 the area now being described embraced five types of land.

- (a) Agricultural land in the valley bottoms.
- (b) Generally badly managed and in some cases derelict old coppice woods, on the lower slopes of the hills.
- (c) Areas with scattered plantations of various sizes up to a maximum of 65 acres consisting for the most part of 50 to 75 year old European larch, freely grazed by sheep.
- (d) Generally bare, rocky but occasionally heather covered knolls and hill tops, used for grazing.
- (e) A small area of indifferently or badly managed young conifer stands.

Technical forest management started with the purchase by the Forestry Commission, planting, cleaning and systematic thinning of the young conifers being commenced.

Most of the mature or nearly mature conifer plantations were felled by the Home Timber Production Department during the 1939-45 war. These yielded approximately 500,000 cubic feet of timber and pitwood. The felled areas have now all been replanted.

TABLE I

From	By	Date	Plantations Acquired	Plantable Excl. Col. 4	Nurseries	Agricultural	F. W. H.	Unplantable Excl. Col. 4	Other Land				Total
									Land Permanently Transferred		Land Temporarily Transferred		
									Description	Acreage	Description	Acreage	
DAVIS Alfred Sidney Newnham	Lease	31. 1. 36											512.0
MARSHALL James Aubrey Garth	Conveyance	31. 1. 36											323.0
BROCKLEBANK Harold Arthur	Conveyance	11. 11. 37							Conveyance 7.5.43 to Y. H. A.	8.0			4232.0
COWPER Henry Swainson	Lease	27. 11. 37											187.0
MAYNARD Servington Holt	Conveyance	27. 6. 38											350.0
JOHNSTON George Ainslie	Conveyance	5. 4. 39											2.0
WOODMAN Edgar John	Conveyance	4. 1. 47											210.0
										8.0			5816.0
													8.0
													5808.0

TABLE II

	<u>Area</u>
(a) Plantations	
Acquired	222
Formed by the Commission	3186
(b) In hand awaiting planting	
For Afforestation	442
For Re-afforestation	537
(c) Tenanted, pending planting	
For Afforestation	161
For Re-afforestation	283
(d) Nurseries	1
(e) Agricultural Land	893
No. of tenancies - 12	
(f) F.W.H.	
Number -	
(g) Unplantable Land	22
(h) Other Land	61
	<hr/>
	5808 acres
	<hr/>

Utilisation of land is not affected to any degree by sporting rights.

A great part of the land planted during the last 5 years has been used for the pasturage of sheep. The autumn sheep sales in this locality are held late, often in October, and in order to enable the farmers to obtain the best prices resumption of land for planting has sometimes had to be delayed until these autumn sales.

Physiography

The configuration of the forest is oval shaped, with two ridges running on the curved sides and a valley between forming a long axis from North to South, and great variations are to be found in the physiography.

The elevation varies from 125 ft. at Force Forge to just over 1,000 ft. above sea level near Long Crags to the west of Satterthwaite. The area can be divided physiographically into six distinct areas.

1. The Heald, Monk Coniston Moor and Tent Lodge

These areas combine to form the western boundary of the forest overlooking Coniston Water. They have a marked westerly aspect and are exposed, with steep gradients reaching 1 in 3 at the Heald.

2. Carron Plantation, Scale Green, Hall Wood and Farra Grain area

Lying immediately to the west of Grizedale Beck (the long axis), these areas have generally an eastern aspect. Exposure is slight and slopes at their steepest do not often exceed about 1 in 5.

3. South-east portion of Hawkshead Moor, Breasty How and the Eastern side of Low Dale Park

Westerly aspects predominate in these areas and exposure is moderate to severe. Slopes reach 1 in 5.

4. Dale Park (Eastern side)

An easterly aspect prevails here, but as the area is of a low elevation, about 200 ft., exposure is slight. Slopes reach 1 in 5.

5. Hawkshead Moor and High Grass

These areas have a marked northerly aspect, giving a moderate exposure. Gradients are more gentle here than in any other part of the forest area, the steepest being about 1 in 12.

6. Sawrey Ground and Iron Keld Plantation

These two small outliers 2 miles to the north of the main block, have a slight south-east aspect. Exposure is moderate and gradients vary from gentle to steep.

Geology and Soils

The whole area of the forest overlies rocks of Silurian origin, in the form of slates and shales. They are marine sediments of a clayey character. During the Ice Age the area was affected by the action of the Lake District Ice Sheet. Evidence of this can be seen in moraine formations immediately to the west of Ormandy Farm.

The soils are generally of a light clayey nature, characterised by an admixture of grit and stones. In some areas there are beds of grit and sand; with practically no evidence of clay. Leaching and peat formation are restricted to the higher elevations.

These soils are ideally suited to the production of good quality conifer timber, while on selected sites at low elevations they will carry satisfactory hardwoods.

Vegetation

In general, the area is covered with a virile growth of grass bracken and heather. All areas have, however, at one time been under natural forests later denuded by felling, burning and sheep grazing. There are three distinct types of vegetation.

1. About two-thirds of the area consists of Molinia moor, with a varying amount of bracken, heather and other grasses. This applies up to 900 ft. Above this level large patches of heather and Erica cinerea appear, to the exclusion of the majority of grasses. Other associates in this moorland vegetation include bog myrtle (Myrica gale), deer grass (Scirpus caespitosus), cross leaved heath (Erica tetralix), bilberry (Vaccinium myrtillus), Nardus stricta and various species of the bent grasses.

A few small bogs are to be found within the Molinia area where drainage is bad. Associations in these areas include Eriophorum, Narthecium and bog myrtle, with various Juncus species.

2. A quarter of the forest area is covered by old woodlands, consisting in the main of Quercus petraea. These lie in two strips, one each side of the long central axis, from Grizedale Hall to Force Forge. The greater part of them are in a poor condition, having remained unattended for some 30 years.

Some areas in Scale Green and Hall Wood are unique in that the species is pure, with no sign of any hybrids. Most of the trees now standing are from old stools, cut over in former years for charcoal production. Other tree species in natural association with the oak include birch, wild cherry, bird cherry, hazel and rowan. A few ash occur in the wetter places. Undergrowth in these woods is not luxuriant but many varied species occur in small numbers. These include wood sorrel, tormentil, speedwell, pimpernel, bugle, a large number of foxgloves, primroses and the wild hyacinth.

3. The remainder of the area is the flat valley land covered by alluvial deposits and now utilised as agricultural land.

Meteorology

The forest lying as it does on the fringe of the Lake District and in close proximity to the Irish Sea, has a heavy rainfall averaging about 70 in. per year. This is the most important meteorological factor and seriously

affects the planning of all forest works. Snowfalls, frost, thunderstorms and droughts do occur but are generally of moderate intensity.

Very strong westerly winds occur in the autumn and spring, necessitating great care in choice of species for planting on the exposed sites.

Risks

Local risks are not very great, the worst of them being the threat of damage by sheep. The surrounding country carries a large head of mountain sheep (Herdwicks) many of which were born within the forest boundary. They always tend to return to their birthplace, especially at lambing time and during bad weather. Many of them break through the forest fences with resultant damage to young trees. A large part of the fencing erected prior to 1941, is now having to be renewed at a heavy cost.

Due to the heavy rainfall, the fire danger period is relatively short, normally extending over the six weeks from the middle of April to the beginning of June. The fire warning system is simple, consisting of a centrally placed fire tower connected by telephone to the forester's office at Grizedale; and two fire look-out cabins which are in visual contact with the tower. In this way nearly the whole forest area can be watched by three men. Complete coverage can be effected by five. (3 look-outs plus 2 patrols).

Rabbits once very numerous are now few in number and can be kept under control by one full time trapper.

A small herd of red deer and a few roe are to be found in the northern part of the forest amongst the older plantations. They do cause slight damage to trees and their numbers are reduced periodically. This serves to prevent damage from becoming excessive, and at the same time preserves the species from complete extinction. Insect damage has never been severe. In recent times the years 1946-48 were the worst, due perhaps to lack of protective measures during the war years when fellings were heavy.

Fungus infection and resultant damage is also slight. A little damage by honey fungus has been noticed recently.

Red squirrels destroy seed from the few mature trees in the forest, but the grey squirrel has fortunately not yet reached the area.

Roads

Before road construction by the Forest Engineering Branch commenced in 1947, access to the forest area was very inadequate. Access routes consisted mainly of rough moor tracks and two very old badly maintained council roads.

Departmental road work started in late August 1947, the initial emphasis being on unemployed relief. Work has been largely concentrated on the construction of main all weather extraction and access routes, with progressive development by stage construction methods towards a comprehensive roading system. The terrain is very broken with much shallow sidecut in rock and shale, and wet, peaty areas which have tended to make construction difficult.

Specifications provide for all weather macadam roads, surface dressed in parts, with pitched or rubble foundations and ample drainage. Full use is made of local stone which is raised and processed in a number of small quarries. In 1947 and 1948 spoil banks at neighbouring disused iron ore mines were intensively exploited for stone. All road and quarrying work is carried out by direct administration saving for limited surface dressing undertaken by the Highway Authority as an agency service. A total of 6.94 miles of new forest road had been built up to the end of F.Y.51 with a further 3.25 under construction. These roads will be of great value when large scale thinning commences in 2 years time and due to this good start in construction there should be no delay in the extraction of thinnings from any areas.

Labour

Owing to the number of cottages acquired with the Grizedale estate it has always been possible to maintain a nucleus of resident workers, and this was increased after the erection of new houses at Satterthwaite and elsewhere in 1948. This local labour is, however, insufficient for the current needs of the forest, and of only average quality, so that of the present staff of 70 just under half are transported to and from work daily. These come principally from Barrow, a distance of 15 miles, and are thought to be of sufficiently good quality to justify the extra expense.

SILVICULTURE

Preparation of Ground

Preparation of ground on old woodland sites has always embraced a policy of complete clearance, burning all lop and top on the ground coupled with cutting and burning all coppice shoots. This policy of complete clearance applied also to birch up to F.Y.1950. In that year, however, 10 acres of naturally regenerated birch in Compartment 141 were accepted as a crop; any small gaps being planted direct with Japanese larch and Sitka spruce. Fences have to be erected which will keep out both rabbits and sheep, proving a costly item. Attempts were made in the years 1939-41 to erect this fencing on a piecemeal basis. This was not a success, for the work was not well done. Many of these fences were in very bad shape 5 years after construction. A heavy expenditure is now having to be made for their replacement.

Another large annual expenditure is incurred in the maintenance of the old woodland fences bordering on the agricultural land in the valley. Expenditure on this work averages just over £100 per year. Heather is not normally burnt before planting as its shelter is considered more beneficial than otherwise.

Choice of Species

Since planting by the Forestry Commission commenced in 1937 the percentages of the total area planted up to and including P.51 by species are as follows:-

1937-51

Sitka spruce	50%	Beech	2%
Japanese larch	16%	Other hardwoods	1%
Scots pine	13%		
European larch	7%		
Norway spruce	6%		
Douglas fir	2%		
Other conifers	3%		

1937-43

Sitka spruce	36%	Beech	2%
Japanese larch	19%	Other hardwoods	1%
Scots pine	22%		
European larch	14%		
Norway spruce	4%		
Other conifers (incl. Douglas fir)	2%		

1944-51

Sitka spruce	64%	Beech	2%
Japanese larch	13%	Other hardwoods	1%
Scots pine	4%		
European larch	Nil		
Norway spruce	8%		
Douglas fir	4%		
Other conifers (excl. Douglas fir)	4%		

The forest is, therefore, predominantly coniferous, and of the conifers Sitka spruce has been the species most favoured. The choice of species during the life of the forest, can thus be divided into two separate periods, 1937-43 and 1944-51.

1937-43

During this period, although over a third of the planted area was allocated to Sitka spruce, this was not a great deal in excess of the other major species the larches and Scots pine.

Some areas, generally bracken covered with a wet, soft soil, were planted with Japanese larch when Sitka spruce would have been more suitable. Scots pine was also planted on some areas that would have given an earlier and perhaps better return with Sitka spruce.

The planting of European larch was discontinued after F.Y.1940 due to the prevalence of die-back in the area. This led to a revision of the choice of species in F.Y.1943, following a visit by the Chairman.

1944-51

It will be seen from the foregoing abstract that this revision led to the planting of a very high percentage of Sitka spruce to the virtual exclusion of all other species except Japanese larch and even this dropped by a third. Relatively, however, both Norway spruce and Douglas fir showed an increase. "Other conifers" planted include Pinus contorta, Pinus excelsa, hybrid larch, Abies grandis, Abies procera, Tsuga heterophylla, Thuja plicata and Lawson cypress. A few specimens of Picea omorika have been planted. "Other hardwoods" include oak, Norway maple, birch, laburnum, alder and a few London plane.

Planting

(a) Spacing

Planting distances have remained constant since forest operations were commenced.

The spruces	5 ft. x 5 ft.
The larches	5 ft. x 5 ft.
The pines	4½ ft. x 4½ ft.
Douglas fir	5½ ft. x 5½ ft. and 6 ft. x 6 ft.
Beech	5 ft. x 5 ft.
Oak	2 ft. x 2 ft.

The 6 ft. x 6 ft. spacing of Douglas fir has proved to be the better. The oak is confined to 0.5 acres only, and owing to weeding losses no conclusions can be reached.

(b) Types of Plants

Types of plants used include:

- (i) The spruces - 2 + 1 and 2 + 2 transplants.
This type was used between the years 1937 and 1950 inclusive, and it was only in 1951 that 2 + 0 Sitka spruce seedlings were used for the first time.
- (ii) The larches - 1 + 1, 2 + 1, 1 + 1 + 1, 2 + 1 + 1 and 2 + 2 transplants.
- (iii) The pines - 1 + 2, 2 + 1, 2 + 1 + 1, 2 + 2 and 2 + 1 + 1 + 1 transplants.
- (iv) Douglas fir - 2 + 1, 2 + 1 + 1, and 2 + 2 transplants.
- (v) Beech - 1 + 0, 1 + 1, 1 + 2, 1 + 1 + 1, 2 + 2, 1 + 3 and 1 + 2 + 1 transplants.
- (vi) Oak - 1 + 0.

The majority of the plants used at this forest comprising the spruces and pines have been supplied by nurseries in the north of the Conservancy. Many of the Sitka spruce used were products of the nursery near Satterthwaite. A large number of Scots pine have been supplied by Delamere nursery.

The other species planted have in the main come from nurseries in the southern part of the N.W. (E) Conservancy; notably Delamere and Cannock.

(c) Grizedale Forest Nursery

Grizedale nursery 5 acres in extent was commenced in F.Y.41 and closed in F.Y.51.

It was situated on agricultural land immediately to the east of Grizedale Beck, and about $\frac{1}{2}$ a mile west of Satterthwaite village. The two main reasons for its closure were:-

- (a) Excessive weed growth, making working costs extremely high and eventually uneconomic.
- (b) The area was very stony and difficult to work.

On closure in 1951 all stocks of major species were transferred to Longtown for lining out.

The walled garden was used for lining out in F.Y.38-40, and in 1951 it was reclaimed for joint use with Research Branch, and devoted to raising plants for special purposes.

(d) Methods of planting

Two methods of planting have been in general use. Firstly, use of the garden spade in turves, the turves being either hand cut or ploughed. This method has generally been used in soft wet ground; where Molinia, rushes and sedges are often present.

Secondly use of the mattock. This tool has been used on most of the drier areas where ploughing was not possible. This means generally dry and rocky sites often with a covering of heather. The mattock is also used for the planting of Japanese larch on dry bracken sites, whether on open ground or old woodland sites.

(e) Annual rate of planting

<u>P.Year</u>	<u>Acreage</u>
37	50
38	252
39	59
40	297
41	375
42	163
43	75
44	13
45	8
46	33
47	270
48	438
49	306
50	281
51	<u>383</u>
	<u>3203</u>

The accompanying Table shows that the planting rate has not been constant, due mainly to the effects of the 1939-45 war, when plant supply and labour were drastically reduced.

The planting target in times of peace has been 400 acres per year, but this has not been closely adhered to.

(f) No manuring of transplants or seedlings in the forest has been undertaken on a large scale.

An experiment of manuring conifer seedlings in the forest was undertaken on behalf of the Research Branch in F.Y.50.

(g) Establishment of crops

In general the use of transplants has been successful over the last fifteen years planting work.

The most successful establishment of the conifers including the spruces, larches and pines, appears to coincide with the use of a 2 + 1 transplant. It is at this age that the plant seems most suitable for planting, because of the ratio of root to shoot. A 1 + 1 transplant in this forest suffers badly during a severe winter following planting; whereas the 2 + 1 stands the strain more easily. The 2 + 2 transplant although often a success in damp areas, seems to suffer severe checking during the year after planting, if the site becomes at all dry.

The use of 2 + 0 Sitka spruce seedlings in F.Y.51 was only moderately successful.

Ploughing

Ploughing was first carried out for P.47 when an area of 60 acres in Compartments 195, 197 and 198 was ploughed with single furrows at 5 ft. intervals. An R.L.R. plough was used for this work on predominantly Molinia ground, and 2 + 1 transplants of Sitka spruce 9 in. - 12 in. in height were then notch planted in the upturned furrow slice with the garden spade. These trees are now in advance of others planted alongside at the same time by mattock. Ploughing was then discontinued until F.Y.51, there being no suitable ground for this operation.

It was then decided to plough at a 5-ft. spacing two differing types of land, Molinia areas, and dry often stony heather knolls. Sitka spruce transplants and 2 yr. seedlings, were notch planted on the top of the upturned furrow slice with a garden spade, on the Molinia ground, whilst Scots pine was planted with a garden spade in the side of the furrow on the heather knolls. This work has been successful, even though severe winter weather and spring droughts handicapped the planting.

This ploughing was carried out mainly with the Cuthbertson plough on the heather knolls and heavy Molinia. Some light Molinia with an admixture

of bracken was ploughed by the Ransome Solotrac.

Beating up

Under normal conditions this work has never been of large extent at this forest, which is believed to be partly due to the high rainfall; precluding drying out of the young plants.

The general rule applied at the present time is that no area is considered for beating up unless casualties are greater than 15%. If casualties are still above this figure three years after the original planting, then consideration is given to replacement of that area with a better choice of species.

The change of a major species had not been carried out since 1940. At that time some areas of P.37 European larch were interplanted with Sitka spruce. This work, however, was never maintained, as the spruce were not weeded. The European larch partially recovered in time, but the interplanting was wasted as no spruces are now present in the upper canopy. The result is a poor crop of European larch. With all species beating up is carried out before the start of new planting and this gives satisfactory results under normal weather conditions.

Weeding

Growth of both bracken and Molinia is heavy and weeding operations have consequently been costly at this forest. This has been due to two main factors, viz:

- (1) The usually wet and warm summers, which encourage weed growth.
- (2) The effect of enclosure against sheep, which stimulates the weed growth.

On bracken ground it has been found that three weedings per year for three years after planting are necessary before the crop is out of danger. Each weeding costs on an average £1 per acre, a total of £9 per acre before total establishment is achieved.

If weeding is not carried out completely in the summer following planting establishment of a full crop is often badly delayed.

Mixture of species

The planting of species in mixture was only commenced in F.Y.51. This consisted of the planting of two rows of Scots pine alternating with two

rows of Sitka spruce on the dry heather knolls where ploughing had been carried out with a Cuthbertson plough at 5 ft. intervals. It is too early yet to decide whether this mixture of the species will succeed in stopping the checking of the Sitka spruce which so often happens on such sites.

Some small areas planted prior to 1951 have a mixed stocking, but this is due to beating up rather than a true mixture of the species.

Underplanting was first carried out in F.Y.50 where 37 acres of open oak woodland 40-50 years old in Compartments 138, 139 and 146 were underplanted with beech, sycamore, Abies grandis, Abies procera, Douglas fir and Norway spruce. This planting has been very successful. It is estimated that 5 years after planting, about 25% of the old oak crop will have to be removed and the remaining oaks high pruned.

Planting in groups in old oak woodland was also carried out in F.Y.51 in Compartments 22 and 24. This consisted of groups of Tsuga, Thuja plicata, beech and Abies grandis. The planting has been successful.

Interplanting was carried out in F.Y.46 in Compartment 10, where European larch areas (P.37) suffering from dieback were interplanted with Sitka spruce. This has been successful and the crop now consists of groups of Sitka spruce and Japanese larch, the European larch having been completely removed. The Japanese larch were beat up in the original European larch crop.

Rates of Growth

Rates of growth are generally high, with the exception of Scots pine. This is due to exposure effects on the pines which have presumably originated from areas of low rainfall. Pinus contorta or coastal types of Scots pine might be more successful.

The best growth is that of the spruces which excel in the often wet, warm summers and open winters.

The growth of the larches is average. A striking feature of all growth is the large lammas shoot. This lammas growth often exceeds that of the spring, especially in the Sitka spruce. Due to the open and mild winters, the lammas shoot usually hardens off properly, but in some years when an early autumn frost occurs growth is severely reduced in the following year. This tends to produce alternate thick and thin annual rings which will lead to the timber not being of the highest technical quality.

The following lists of rates of growth are representative of the species throughout the forest area. The geological formation, Silurian slates and shales is constant throughout.

Compartment	Species	P. Yr.	Age in Yrs.	Geology and Soil	a. Altitude b. Aspect c. Slope d. Exposure	Mean Ht. of Dominants (ft.)	Mean Annual Height Increment (in.)	Current Annual Height Increment during last 5 years. (in.)
1	S.P.	37	14	Mixture of small stones and clay.	650-700 ft. East Nil Moderate	12	12	15
1	S.S.	30	22	Peat bog	650-700 ft. South-east Gradual Moderate	32	18	20
2	S.P.	31	20	Mixture of small stones and clay.	625-675 ft. S. and S.E. Slight Sheltered	29	9	15
2	E.L.	31	20	Loam on rock with rock outcrop.	625-675 ft. S. and S.E. Very slight Sheltered	36	9	12
3	S.P.	38	13	Small stones in clay.	700-800 ft. South Gradual Exposed	33	7½	10
3	N.S.	37	14	Peat soil moist.	700-800 ft. South Nil Sheltered	32	15	17
4	E.L.	30	21	Heavy loam with rock outcrop.	675-725 ft. South-east Slight Sheltered	41	8	12
37	J.L.	38	13	Light loam	725-900 ft. East Gradual Moderate	24	9	12
43	J.L.	46	5	Light loam	600-775 ft South-east Moderate East exposure.	11	18	20
50	S.S.	41	10	Peat bog	750 ft. South-east Nil East exposure.	15	19	20
66.	S.S.	41	10	Peat bog	875 ft. South-west Nil Moderate	12	15	18

Compartment	Species	P. Yr	Age in Yrs.	Geology and soil	a. Altitude b. Aspect c. Slope d. Exposure	Mean Ht. of Dominants (ft.)	Mean Annual Height Increment (in.)	Current Annual Height Increment during last 5 years. (in.)
128	S.S.	40	11	Heavy clay with rock outcrops	600-650 ft. South-east Gradual to S. E. Sheltered	15	24	25
128	J.L.	40	11	Good loam with rock outcrops.	400-600 ft. South-east Gradual to S. E. Sheltered	28	15	17
133	J.L.	39	12	Good loam with rock outcrops	350-375 ft. South-east Moderate Sheltered	16	24	27
156	J.L.	05	46	Loam with rock outcrop.	600 ft. North-west Gradual Exposed	70	6	9
155	J.L.	24	27	Loam with rock outcrop.	500 feet North-west Gradual Exposed	55	10	13
207	S.S.	41	10	Peat bog (deep)	750-875 ft. North-west Moderate Exposed	17	27	27
216	Beech	39	12	Good loam	650 ft. North-east Flat Sheltered	8	8	9
217	N. S.	39	12	Good loam	625-775 ft. North-east Gradual Sheltered	19	20	22
217	E. L.	39	12	Light stony loam	625-775 ft. North-east Gradual Sheltered	31	15	18

Past Treatment of Established Plantations

(a) Brashing

This work commenced only a year ago and the general practice has been to brash all trees over 3 in. D.B.H. in Japanese larch stands. This method has proved quite economical, combined with a good quality of work.

(b) Pruning

No pruning has yet been done.

(c) Cleaning

Little cleaning has been necessary in the plantations to date, as nearly all these areas have comprised the re-afforestation of old conifer woodland. A small area of old oak woodland in Dale Park, re-afforested in F.Y.1950 has required cleaning due to the invasion of natural birch and heavy growth from the old coppice stools. This has proved costly.

Isolated trees on the areas planted prior to 1942 were ringed and in many cases are still standing, though now dead. Since 1942 the policy has been to leave only clumps of trees to provide some shelter for the new young crop; not single, isolated specimens.

(d) Thinning

Thinning has not yet commenced in areas planted by the Forestry Commission, but will do so amongst European larch and Japanese larch crops planted in 1937; during F.Y.52. This will amount to approximately 50 acres.

The young conifer woods purchased on acquisition in 1936 and 1937 were very badly neglected and thinning has had to be carried out lightly, at short intervals to enable the crops to become windfirm.

A thinning plan has recently been prepared to embrace all thinnings for the period 1952-1957 inclusive.

It is considered that a 3 year cycle of thinnings will be needed to maintain health and vigour throughout the conifer woods, although this may have to be modified in the light of further experience.

Regular thinning of the old hardwood areas, commenced in F.Y.51.

The following table shows all the areas thinned and outturn since F.Y.41. Figures for the latter up to 1943 are not yet available.

Forest Year	Compt.	P. Yr.	1st Thinning (Acres)	2nd or Subseq: thinning (Acres)	Species	Remarks and Outturn
1941	59	1900		5.0	Mix. Conifers	
	91	1888	2.5		Oak	
	155	1924	5.5		J.L.	
	155	1924	2.0		E.L.	
	156	1905		7.0	Mix. Conifers	Mainly J.L - a good stand
	163	1924	4.5		J.L.	
	217	1925		1.0	J.L.	
1942	1	1882	1.0		E.L.	
	40	1925	4.0		E.L.	
	59	1925	1.0		Mix. Conifers	
	59	1907	2.0		Mix. hardwoods	Thinning for pulpwood
	91	1888	1.0		Oak	
	105	1907	1.0		Mix. hardwoods	Thinning for pulpwood
	129	"	6.0		"	"
	130	"	7.0		"	"
	132	"	3.0		"	"
	134	"	9.0		"	"
	140	"	3.0		"	"
	141	"	5.0		"	"
	142	"	4.0		"	"
	152	"	5.0		"	"
	163	1924	4.5		E.L.	
	163	1924	3.0	3.0	J.L.	
	166	1902	1.0		Mix. Conifers	E.L., S.P., N.S. and D.F.
	189	1924	0.5		J.L.	
	215	1924	3.0		J.L.	
1943	30	1924	1.5		E.L.	
	155	1924		5.5	J.L.	
	155	1924		2.0	E.L.	
	156	1906		8.0	Mix. Conifers	Mainly E.L.
	163	1924		4.0	J.L.	
1944	26	1924	2.0		Mix. Conifers	410 Conifer poles
	29	1924	17.5		Mix. Conifers	5347 "
	30	1924	7.8		Mix. Conifers	4260 " + 160 H. Ws
	30	1924	11.5		E.L.	6850 "
	56	1904	.75		Mix. Conifers	200 "
	59	1909		7.5	"	174 " + 1192 c.f
	59	1927		3.0	"	1000 " + 105 "
	90	?		1.5	"	38 " + 645 "
	155	1924		1.5	J.L.	130 "
	155	1924	2.0		Mix. hardwoods	430 hardwood poles
	163	1924		8.0	J.L. & E.L.	2320 Conifer poles
	166	1922	1.0		Mix. Conifers	560 "
	215	1924		2.0	J.L.	444 "
	217	1924		1.9	J.L.	232 "
1945	26	1924	20.0		Mix. Conifers	4077 "
	29	1924	5.0		Mix. Conifers	2109 "
	156	1904		1.0	J.L.	170 "
	189	1924		0.2	J.L. & D.F.	40 "
1946	No thinning					

Forest Year	Compt.	P. Yr.	1st Thinning (Acres)	2nd or Subseq: thinning (Acres)	Species	Remarks and Outturn
1947	59	1924		2.5	Mix. Conifer	1616 cu. ft.
	155	1924	2.0	2.0	J.L.	500 conifer poles
	163	1924		11.0	J.L.) 1240 conifer poles + 315 cu. ft.
	163	1924	5.0		E.L.	
	215	1924		2.0	J.L.	488 conifer poles
	217	1924		1.9	J.L.	155 " "
1948	1	1929	.5		E.L.	100 " "
	4	1929	.3		E.L.	480 " "
	26	1924		18.5	Mix. Conifer	3062 " "
	29	1924		22.5	"	5170 " "
	30	1924		20.8	"	4010 " "
	156	1904		7.5	"	1720 cubic feet
	166	1922		2.0	"	100 conifer poles
1949	1	1929	6.0		E.L.	3394 cubic feet
	2	1929	6.0		E.L.	4064 " "
	3	1929	5.0		E.L.	2200 " "
	4	1929	4.0		E.L.	2164 " "
1950	3	1929	4.0		E.L.	300 " "
	60	1929	3.0		Mix. Conifer	1623 " "
	168	?	5.5		Coppice Oak	6811 " "

1951 A total area of 77.3 acres were thinned

Produce Hardwood timber 5240 cubic feet
Coppice poles 9333 poles
Conifer timber 1252 cubic feet
Conifer poles 2057 poles

Total area of thinnings up to F.Y.1951 inclusive

= 418.7 acres

Total volume production from thinnings to F.Y.1951 inclusive,

Conifer poles = 46,223
Conifer timber = 27,401 cubic feet
Hardwood poles = 1,523
Hardwood timber = 5,240 cubic feet

= Poles 47,346

Timber 32,641 cubic feet

Types of produce

Nearly all poles both conifer and hardwood have been prepared and used as fencing stakes and firewood. Some hardwood poles have been sold for swill making and bobbin wood.

The major part of the hardwood timber has been sold direct to Timber Merchants. About one-fifth of the conifer timber has also been sold direct to them, the remainder being converted for Forestry Commission internal use in the Grizedale sawmill.

Research

The Grizedale Walled Garden

The walled garden at Grizedale is approximately one acre in extent. Over 2,000 square feet are under glass and there are also outbuildings which include a pot store and potting shed. Since September 1950 the the garden and glasshouses have been worked jointly by Conservator N.W. England and Research Branch and since August 1951 a Foreman of Research Branch has been stationed at Grizedale as a full time plant propagator. Conversion of the garden and glasshouses proceeded steadily during 1951 and it is anticipated that the available space will be fully utilized for the propagation of grafts and cuttings and the raising of special seedlings and transplants in the spring of 1954. The Grizedale Walled Garden will eventually produce between 10,000 and 12,000 special plants each year in addition to larger quantities of normal planting stock. The special plants will include grafts and rooted cuttings from selected parent trees for inclusion in tree seed orchards; seedlings resulting from controlled self and cross pollinations made on selected parents being tested for tree breeding purposes; rooted cuttings from outstanding individuals of species such as London plane and Sequoia sempervirens for use in the forest; seedlings and rooted cuttings from trees of amenity value.

Two small experimental seed orchards have also been established at Grizedale, one for birch and the other for alder. These are intended to provide some of the basic information required for the management of future seed orchards of the more important timber producing species.

J.D.M.

Geneticist

Conclusions

The rejuvenation of this ancient forest area has proceeded successfully according to plan over the last fifteen years since acquisition.

The main conclusion reached in the light of experienced gained, shows that of the major species Sitka spruce is the most easily established in the area. This is indicated by the large percentage of the species planted during the period 1944-51; a figure of 64%. The ease of establishment has led I believe to its overplanting, in detriment to the

planting of the pines and larches.

Many dry areas during this period of 8 years would have produced better crops of pure Scots pine or a fifty-fifty mixture of Scots pine and Sitka spruce. The Sitka spruce on some of these dry, heathery knolls are beginning to fall off in height growth and some are tending to check badly. It must not, therefore, be assumed that Sitka spruce will grow anywhere at Grizedale, and choice of species has to be a matter for very careful thought.

Soils and underlying rock formations are I consider ideal for the growing of good European and Japanese larch. The first named has I know, suffered extensively from die-back in this area; but I feel that this is due more to inadequate weeding and thinning coupled with a poor strain of seed rather than a bad choice of species.

The start of the European larch troubles comes I feel from the lack of sufficient weeding in its youth. Complete weeding should be carried out for at least 5 years after planting. Plantations have also not been thinned early enough, nor have they been thinned heavily enough. If these three points were adhered to, I feel sure that successes with European larch would increase.

Ploughing, although only commenced on a large scale in F.Y.1947 will assist the establishment of all major species, and improve the soil; a vital factor where land has been allowed to degrade over twenty years or more.

Notes on Grizedale Forest History

Grizedale is a fortunate forest with a favourable climate and soil and with such variations of aspect, exposure and elevation, that in some part or other all the major tree species and many of the minor ones, could be grown to perfection.

It is, therefore, a pity that it has suffered through much of its history from unavoidably large planting programmes, which have operated against the detailed adjustment of species necessary to take the best advantage of such local variations. The swing towards wholesale planting of Sitka spruce is to some extent a policy of expediency, and although it may well give the best average results over the areas chosen these do include in the aggregate a considerable proportion of ground which by more careful selection could better have carried Scots pine, Japanese larch, Norway spruce or Pinus contorta. It is not suggested that very small scale changes of species are desirable, but there is a happy medium which from pressure of circumstances has not always been attained, and in a district where amenity is of special importance this point may well be held against us in the future.

The acquired estate woods are of great interest, both because they contain older samples of conifers now being planted on a large scale, and because they preserve good examples of the indigenous oak coppice woods in various stages of conversion to high forest. The old mature European larch scattered through these oak woods are of exceptional quality and in view of the die-back which has affected later importations, are likely to prove a valuable source of material for provenance studies and tree breeding.

The method of rehabilitating badly stocked oak woods by interplanting as was adopted in F.Y.50 is open to the criticism that the stems left, already sub-mature, cannot remain in the stand for the rotation of the under crop, and cannot be removed without causing damage or leaving gaps. The group planting adopted in F.Y.51 is much to be preferred.

J. S. R. CHARD

State Forest Officer.

History of Grizedale Forest

APPENDIX I

Notes from Inspection Reports

April 1936	-	The Chairman
November 1937	-	Mr. W. L. Taylor, Assistant Commissioner
March 1938	-	Mr. W. L. Taylor, Assistant Commissioner
September 1938	-	The Chairman
December 1938	-	Mr. W. L. Taylor
January 1940	-	Mr. A. P. Long, A/Assistant Commissioner
August 1940	-	Mr. A. P. Long, A/Assistant Commissioner
April 1941	-	The Chairman
February 1943	-	Mr. A. P. Long, A/Assistant Commissioner
May 1943	-	The Chairman
September 1944	-	The Chairman
May 1946	-	Mr. C. A. Connell, Conservator, State Forests (E)
July 1947	-	Mr. O. J. Sangar, Director (E)
November 1948	-	Mr. C. A. Connell, Conservator, State Forests (E)
June 1949	-	The Chairman
June 1951	-	Mr. G. L. Batters, Conservator, State Forests (E)
August 1951	-	Mr. W. H. Guillebaud, Deputy Director General
October 1951	-	Mr. A. H. Gosling, Director General

The forest was first visited by the Chairman in April 1936. During this and recent visits he has continually stressed the importance of correct drainage siting. The first endeavour, under the alternating wet and dry conditions prevailing over large areas, should be to cut off the water before it reached the wet hollows. In 1937 and 1938 the Chairman advised that where hardwoods such as birch and sycamore seeded into the conifer plantations the best of them should be preserved, to assist in soil improvement.

During the Assistant Commissioner's visit in November 1937 he agreed that for the hard heathery knolls Scots pine should be chosen, Sitka spruce for the wet land with perhaps some Norway spruce in the lower and more sheltered areas. The larches should go on the less exposed and drier bracken areas. In August 1940 the A/Assistant Commissioner considered that only Sitka spruce should be planted on doubtful ground, not Scots pine or the larches.

The Assistant Commissioner inspected the forest again in February 1943 during operations in the hardwood areas. He pointed out that there was no need to tackle all the hardwood areas in the war years. An attempt had been made to do this, with the result that many compartments had been partly cleaned up, but none completed. The work should be more concentrated

and according to a working plan.

The first major revision of choice of species was made in 1943 after a visit by the Chairman. He considered that the larch species had been planted on too exposed and damp sites which were far better suited to Sitka spruce. This choice of species has continued up to the present time.

A detailed inspection of die-back in European larch was made following the Chairman's visit in June 1949 and it was considered that these areas would have to be interplanted with Sitka spruce after removal of all but the elite trees. A policy of clear felling was not approved.

The Conservator, State Forests (E) inspected the forest in June 1951. During his visit it was decided that some areas of pure oak forest should be thinned. The aim was to keep the side branches alive, at least until the crowns are vigorous, so that rapid occlusion could be obtained after pruning. This would reduce the risk of Stereum infection.

After his inspection of August 1951, the Deputy Director General considered that not enough Norway spruce was being planted.

The Director-General paid a brief visit to the forest in October 1951 and pointed out that some areas of Sitka spruce on bad ground, generally containing a Scirpus association, would have benefited from a dressing of basic slag.

History of Grizedale Forest

APPENDIX II

Supervision

Year	Conservators	Divisional Officers	State Forest Officers	District Officers	Foresters
1936	-	Mr. A. D. Hopkinson	-	Mr. J. R. Thom	Not known
1937	-	(Mr. A. D. Hopkinson Mr. A. H. H. Ross	-	Mr. J. R. Thom	Mr. Jones (Foreman)
1938	-	Mr. A. H. H. Ross	-	Mr. J. R. Thom	Mr. J. R. Small
1939	-	Mr. A. H. H. Ross	-	Mr. J. T. Fitzherbert	"
1940	-	Mr. J. R. Thom	-	Mr. J. H. Edwards	Mr. Weir
1941	-	Mr. J. R. Thom	-	Mr. J. H. Edwards	Mr. Weir
1942	-	Mr. J. H. Thom	-	Mr. J. H. Edwards	Mr. Weir
1943	-	Mr. G. W. Backhouse	-	Mr. H. C. Watts	Mr. Weir
1944	-	Mr. G. W. Backhouse	-	Mr. E. E. Dixon	Mr. L. A. King
1945	-	Mr. G. W. Backhouse	-	Mr. E. E. Dixon	"
1946	Mr. G. W. Backhouse	-	-	Mr. E. E. Dixon	"
1947	Mr. A. H. H. Ross	-	Mr. J. T. Fitzherbert	Mr. E. E. Dixon	"
1948	Mr. A. H. H. Ross	-	Mr. G. I. Mackenzie	Mr. E. E. Dixon	"
1949	Mr. A. H. H. Ross	-	Mr. G. I. Mackenzie	Mr. E. E. Dixon	"
1950	Mr. A. H. H. Ross	-	Mr. G. I. Mackenzie Mr. J. S. R. Chard	Mr. H. W. Bell Mr. J. V. Grosland (15. 11. 50)	Mr. D. S. Morley "
1951	Mr. A. H. H. Ross	-	Mr. J. S. R. Chard	Mr. J. V. Crosland	"

History of Grizedale Forest

APPENDIX III

Other notes of interest

1. Coppice demonstration area

An area for the demonstration of oak coppice growing has been decided upon and work commenced during F.Y.1952.

A working plan has been prepared which will embrace a total area of 32 acres of existing well stocked coppice to be worked on a 16 year rotation. This will allow for the cutting of 2 acres of coppice per annum.

The produce will be available for the local industries of swill making and small turnery.

It is hoped that this venture will provide data on working costs, yield, and technique, and help private owners in the Furness district to manage their coppice woodland correctly and so halt the decline in the local industries.

2. Headquarters Seed Store

About two-thirds of the total amount of seed used annually by the Forestry Commission is now stored at Grizedale.

Grizedale

LIBRARY

I.F.No:

H.M. Forestry Commission



Looking north along the central axis of the forest area, from Ormandy Farm. The Satterthwaite - Hawkshead road can be seen on the right hand.



The photograph is taken from Compartment 196 (Sitka spruce P.47) looking south west obliquely across the long axis to Carron Hill. The sheltered side of Carron, with an easterly aspect is well seen here.

LIBRARY

I.F.No:

H.M. Forestry Commission



Again the photograph is taken from
Compartment 196, but this time looking
west across the northern section of the
forest.



Looking west from immediately above Ormandy
Farm. This illustrates a good example of
the old hardwood areas now designated mainly
for amenity purposes.



The photograph shows in the foreground the office and general store buildings, with the Grizedale Hall buildings immediately behind.

The exposed western face of Hawkshead Moor (S.E. portion) can be seen in the background, with New South Wales plantation on the skyline. The whole exposed face is now planted with S.S. Further hardwood belts can be seen behind the Hall.



Dense coppice in Hall Wood, which is to be converted to high forest where possible. Where it is impossible to do this the area will be gapped up with beech.

GRIZEDALE FOREST

1

- Looking north along the central axis of the forest area, from Ormandy Farm. The Satterthwaite – Hawkshead road can be seen on the right hand.

- The photograph is taken from the Compartment 196 (Sitka spruce P.47) looking south west obliquely across the long axis to Carron Hill. The sheltered side of Carron, with an easterly aspect is well seen here.

2

- Again the photograph is taken from Compartment 196, but this time looking west across the northern section of the forest.

- Looking west from immediately above Ormandy Farm. This illustrates a good example of the old hardwood areas now designated mainly for amenity purposes.

3

- The photograph shows in the foreground the office and general store buildings, with the Gizedale Hall buildings immediately behind.

The exposed western face of Hawkshead Moor (S.E. portion) can be seen in the background, with New South Wales plantation on the skyline. The whole exposed face is now planted on the sky line. The whole exposed face is now planted with S.S. Further hardwood belts can be seen behind the Hall.

- Dense coppice in Hall Wood, which is to be converted to high forest where possible. Where it is impossible to do this the area will be gapped with beech.