

FORESTRY COMMISSION

WORKING PLAN

FOR

SOUTH STROME

PART I

Chapter 1 - Introduction

(a) Situation and Extent

The forest lies on the side slopes of a series of small hills lying to the south of Loch Carron and to the west of the main mountain mass of south-west Ross-shire.

The village of Stroneferry is situated on the northern margin of the forest on the shore of Loch Carron, a tidal sea loch. The plantation area extends southwards from the shore of Loch Carron for a distance of nearly 4 miles.

The National Grid References covering the forest area are:

E 808 to E 903; N. 300 to N. 361.

The forest centre at Achmore is located at National Grid Reference 855337, with a latitude of 57° 22' North and a longitude 5° 36' West.

The total area of the forest at 30th September, 1964 was 3,926 acres, of which 2,514 acres were under plantation.

(b) Civil Administration

- | | |
|--------------------------------|-------------------------------|
| (1) County Council | - Ross and Cromarty |
| (2) Rural District Council | - South-West District Council |
| (3) Parish | - Lochalsh |
| (4) Parliamentary Constituency | - Ross and Cromarty. |

(c) Nearby Towns

The nearest town is Dingwall, 57 miles to the east with a population of 3,600.

Within the south-west District there lie a number of villages andcrofting townships, Kyle of Lochalsh, Plockton, Stroneferry, Balmacara, Dornie, Duirinish, Drumbuie and Erbusaig, all are within 12 miles of the forest by road, their total population about 1,700.

(d) Communications and Transport

(1) Railways

The nearest railway station is at Stroneferry village 1 mile from the forest centre. There are siding facilities for loading, but space is limited. More elaborate facilities are available at Kyle of Lochalsh, 12 miles away. British Railways closed Stroneferry station for goods traffic in 1963.

(2) Roads

The public road serving the forest is the A890 from the pier at Stroneferry to Auchtertyre junction. This road is an extension of the main road linking Dingwall with the pier on the north side of the ferry. At Auchtertyre the A890 joins the A87 which links Kyle of Lochalsh with the Great Glen at Invergarry. South bound traffic follows the A87 to Invergarry and then on to the A82 to Fort William. East bound traffic follows the A87 to the head of Glen Moriston then proceeds via the A887 to Invermoriston, where it joins the A82 leading towards Inverness.

The A87, A887 and A890 are single track roads with passing places for most of their length. Heavy traffic to the south and east must travel via Auchtertyre due to weight restrictions on the ferry at Strone.

The single track roads restrict the free movement of heavy lorries, particularly during the summer months when tourist traffic is considerable. In recent years the local authorities have carried out a number of road improvements and this appears to be a continuing commitment.

There is a proposal to construct a road from Strathcarron at the east end of Loch Carron through part of the forest to by-pass the ferry at Strone.

If carried out, this road would shorten the route to the east by some 20 miles.

(3) Ports and Harbours

There is no proper harbour within reasonable reach of the forest, but good deep water pier facilities exist at Kyle of Lochalsh. Usage for timber loading on a large scale would probably require to be specially negotiated. The pier is capable of taking vessels of up to 5,000 tons gross.

There used to be a substantial pier at Stromeferry belonging to the former Railway Company, but the pier has now been dismantled. The site is still available.

(4) Other Facilities

Normal postal and telephone services are available, but there is no local bus service for Stromeferry and district.

(e) Maps

The maps covering the working plan area are:-

- 1" to the mile O.S. Sheet 26, Seventh Series.
- 2½" to the mile O.S. Sheet 23/84 N.W. military Grid only.
- 6" to the mile O.S. Sheets 116, 117, 118, 1902 Ross and Cromarty.

Chapter 2 - Site

(a) Geology

There is no published account giving details of the geology of the Working Plan area and the maps available are confined to the general issue of the solid geology based on the 1939 survey and a drift edition 1" O.S. sheet covering part of the area. The information recorded below has been extracted from these sources together with notes from British Regional Geology (Second Edition) published by H.M.S.O. 1948.

The solid geology of the area is complicated by the presence of the Moine Thrust plane, which cuts across the forest from north to south. In the main the forest lies on Lewisian gneiss with smaller areas of Moine series schistose rocks. Small outcrops of epidiorite and hornblende schist on the upper slopes have helped to enrich the soils in the forest.

Over the greater part of the forest, the underlying rock has been covered by mixed deposits of glacial drift. On the steeper slopes however, particularly on the Ardnarff section, the soils appear to be directly derived from weathering of the outcropping rock. In some places, the drift layer has been enriched by creep action from freshly weathered scree and rock outcrops.

(b) Soils

In the area at present under plantations or scheduled for planting, there are three main soil types; creep soils, soils derived from morainic drift and peat.

(1) Creep Soils

These are found on the steep slopes at the eastern end of the Ardnarff section and on the lower slopes on the north side of Strath Ascaig. At Ardnarff they extend from sea level to about the 500 feet contour and in Strath Ascaig they lie between the 100 feet and 500 feet contours.

On the lower ground the creep material has accumulated to a considerable depth, especially at Ardnarff. In Strath Ascaig the deposits tend to be shallower. In both areas the soil depth decreases rapidly as the slope is ascended.

These soils are loose in texture and appear to belong to the Brown Forest Soil Series but there are usually signs of slight leaching in the upper few inches of the soil horizon. They are potentially the most fertile soils in the forest but they are loose and liable to erosion.

(2) Soils derived from Morainic Drift

Over the greater part of the forest the underlying rock has been covered by mixed deposits of glacial drift. Soils derived from the drift vary considerably in profile, texture, depth and fertility. They occur at all elevations within the forest and much of the existing plantation area has been established upon these soils.

The variations in soil characteristics are frequent and complex, but appear to be associated with the topography and water status of the site.

On the morainic knolls and ridges podzols are common. These are hard compacted mineral soils often with a thin covering of peat. Leaching is usually pronounced and pan formation is fairly general. On the lower slopes of the moraines the soil is rather less compacted and leaching is usually less marked. A weakly developed podzol without pan formation is typical of this situation. Where there has been some enrichment of the drift by creep action a partially leached brown loam is fairly common. Near the bottom of the moraines, the water table rises and some gleying of the mineral soil is normally evident. In this situation peat is usually present and increases rapidly in depth between the moraines.

(3) Peats

These occur between the moraine deposits and vary greatly in extent. On the lower slopes they are generally flushed by stream and drainage water. More extensive deposits of basin peat occur on the higher slopes where the gradient eases. All types of peat occur from the rather infertile fibrous peat to the relatively amorphous peat. The latter type is local in occurrence, being confined to areas of flush conditions.

(c) Topography

The forest lies on the lower slopes of the foothills to the west of the main mountain mass of the county and is wholly west of the main east/west watershed. Despite the rather broken nature of the locality, the continuity of the plantation area should be clearly recognised. The forest proper lies upon a continuous side slope of moderate to steep gradient and varies in depth from some three hundred yards to nearly one thousand yards. In plan, this side slope forms a contorted "S" shape with the top of the letter facing north-west and the lower part facing south-east. All aspects are found except that facing due east. The steep hill slopes and twisting nature of the valleys appear to provide good protection from excessive wind damage.

The plantable land ranges in height from near sea level on the shores of Loch Carron to a little over the 500 feet contour in the Ardnarff section facing the loch. In Strath Ascaig the plantation area lies between the 100 feet and 700 feet contours. At Carn na Criege in the south-east corner of the forest the plantation limit extends to nearly 850 feet and on the northern and sheltered face of Meall Ailein a block of Japanese larch is growing successfully between the 750 feet and 1,000 feet contours.

The side slope is very steep in places, with an average gradient of over 30° on the Ardnarff section. Frequent streams have cut deep gullies in the slopes. Both of these factors have had an important bearing upon road alignments and continue to cause local extraction difficulties. The slopes on the whole are regular, mainly concave, with few extensive areas of rock outcrop or cliff.

(d) Meteorology

Little statistical information is available other than rainfall figures which are recorded daily at the forest office at Dailfearn 100 feet above sea level and monthly at a higher elevation rain gauge (700 feet).

The average annual rainfall for the period January, 1950 to December, 1959 at Dailfearn was 64 inches, the higher elevation gauge for the same period gave a value of 68.9 inches.

Monthly average values for the period at Dailfearn were:

Total	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
64.05	6.69	4.69	3.49	4.41	5.09	3.42	4.94	4.89	6.31	7.87	5.99	8.25

The rainfall is very evenly spread over the year as a whole and on only two occasions during the period mentioned, did rainfall in any month fall below 1 inch. There is a consistent tendency for the months of March to June inclusive to be rather drier than the remainder of the year, but periods in excess of ten days without measurable rain are rare.

Frost incidence is low and it is rarely recorded during the growing season. Snowfall in winter is seldom heavy and snow cover does not persist at plantation level for any considerable time. Falls outwith the four months December to March are very rare.

The prevailing wind is south-westerly, but exposure effects are not marked in any part of the forest. Winds of gale force are frequent during the winter months but extensive damage has so far been rare. Such wind damage as has been recorded is largely confined to the slopes facing the north-west above Loch Carron. Periods of drying easterly winds are of regular occurrence during the spring months.

In general, the climate is equable, cool and rather humid with few extremes. It appears to be ideally suited to the growth of north-west American conifers, particularly Sitka spruce.

(e) Vegetation

Some two thirds of the plantable area has been under plantation for a number of years. Extensive vegetation changes have taken place since enclosure and planting, so that it is now difficult to assess accurately the major vegetational cover prior to acquisition.

From early records and the 1902 edition of the 6" O.S. map, it is certain that there were fairly extensive areas carrying a scrubby tree cover prior to the start of Forestry Commission operations in 1926. Remaining scrub patches in the district indicate that this cover was largely composed of birch, with scattered hazel thickets as an understorey. Oak, ash and alder must have been fairly common constituents in the mixture. Survivors of all of these species can still be found within the forest area.

The ground vegetation associated with this scrub woodland is usually a mixture of grasses and bracken. The most common grasses are Deschampsia flexuosa and Holcus species. On drier pockets of open ground within the scrub, Calluna together with Vaccinium were probably present, as patches of this combination can still be found on drier areas where the conifer canopy has not yet closed over.

The distribution of the scrub woodland appears to have been correlated with the rich creep soils and with the more fertile of the drift soils. Over the remainder of the forest, the vegetation appears to have been mainly composed of Calluna, Erica, Molinia, Scirpus, bracken, bog myrtle, bog asphodel, Juncus, Eriophorum and mosses in a variety of mixtures and proportions depending upon the local site conditions.

Generally, mineral soils outwith the scrub woodland areas carry a complex dominated by Molinia, Calluna and Erica with bracken locally abundant. Above the 500 foot contour, this relatively rich flora usually merges into typical Calluna heath where the slope remains dry. Where the slope eases and peat has formed in depth, the vegetation is mainly composed of Calluna, Molinia and Scirpus with sedge locally abundant.

In association with flush peat conditions Molinia becomes dominant and frequently there is a local mixture containing Juncus, Deschampsia and bog myrtle.

In the past, over a period of at least one hundred years prior to enclosure, the main land use was for sheep grazing. Associated with the grazing was the practice of frequent and often indiscriminate mairburning. The general effect of these treatments has been the curtailment of the natural woodland cover, the spread of bracken and an increase in the proportion of Scirpus on the peat areas. There is also little doubt that soil conditions have suffered a slight but general deterioration.

(f) Site Classification

There is no recognized site classification available and there is insufficient knowledge of the forest soils to enable a reliable map to be prepared. Despite these handicaps, certain deductions with regard to the locality can be made.

The stock map and crop assessments taken together, provide a definite guide as to the location and extent of three fairly distinct fertility zones within the forest. With a certain amount of overlapping and intermingling these fertility zones correspond reasonably well with the three main soil groups described.

1. Creep Soils

These are concentrated upon the steep faces on the lower and middle portions of the main valley slopes particularly below rock outcrops. The total extent of these soils in the present plantation area amounts to some 450 acres. These sites appear to be capable of sustaining crops of Sitka spruce or Douglas fir of at least Yield Class 180.

2. Better Drift Soils and Flushed Peats

These are mainly located in a band lying above the zone of creep soils, but with local intrusions between the creep soil areas. Their total extent amounts to some 700 acres. These sites appear to be capable of sustaining crops of Sitka spruce of approximately Yield Class 160.

3. Poorer Drift Soils and Basin Peats

These are mainly located on the upper slopes throughout the forest, together with the lower and middle slopes to the west and north of Am Meallan. Within the present plantation area their total extent amounts to some 1,150 acres. These sites are of low fertility and do not appear to be capable of sustaining crops of Sitka spruce of better than Yield Class 100. In many cases, this species has been difficult to establish on these sites. Where planted with Pinus contorta these sites have produced crops of Yield Class 100 which are healthy and relatively easy to establish.

Chapter 3 - History

(a) Local History

There is very little written material dealing directly with the forest area, but much of the history may be inferred from accounts dealing with the locality in general.

The area was known to Neolithic settlers, whose tomb structures are found along the western seaboard, north and south of Stromeferry. During Bronze age and early Iron age times the area was gradually colonised by new settlers. Traces of each new culture are found at various points in the locality. Of these, the remains of a galleried dun of early Iron age may be seen in the recently acquired area near Loch Achaidh na h-Inich.

In historic times, the locality was settled by the Picts. The site of a Pictish broch has recently been identified on the north side of Loch Carron at Keraig, and there is a ruinous structure in Strath Ascaig which may well prove to be another.

Christianity was brought to the people of this area in the Ninth and Tenth centuries A.D. by Columban missionaries, one of whom St. Maclruaba established a monastery at Applecross. The civilising influence of the missionary teaching was offset by continual raiding by Norsemen. Kyleakin nearby, derives its name from "Kyle Haco" or Haco's strait, commemorating the passage of the Norse King's fleet on its way to defeat at Largs in 1263. The hold of the Norsemen upon the western seaboard was gradually broken and a form of feudal society imposed by Robert Bruce and succeeding Stewart Kings. For many centuries the area was ravaged by intermittent clan warfare, culminating in clan support of the Stewart cause in the 1715 and 1745 rebellions.

Following the suppression of the 1745 rebellion, more peaceful ways were enforced by Hanoverian troops and the population began to expand. In the period to 1815, much of the surplus manpower of the area found employment in the armies engaged overseas. After the Napoleonic wars, however, the need for their services declined and the population pressure became acute.

The situation was aggravated by the exploitation of the natural resources of timber during the Eighteenth century followed by the expansion of sheep farming on the better lands.

During the early part of the Nineteenth century, large numbers of people emigrated to the colonies. The remaining families were evicted from the relatively fertile glens and became established in the present crofting areas near the coast.

(b) Forest or Land Management prior to acquisition by the Forestry Commission

The parish of Lochalsh as a whole has little history of forest development, the bulk of the area having been devoted to crofting, sporting interests and to sheep farming for more than a century. There are two localities providing noteworthy exceptions to this, at Duncraig and at Balmacara. At each of these places, substantial plantations were built up, the earliest record of planting being in 1861. Most of the plantings were composed of Scots pine and European larch, with some oak at Balmacara, but a variety of other conifer species were introduced on both estates. The introduction of exotic conifers included some of the earliest plantings of Douglas fir and Sitka spruce in north-west Scotland. Much of the original planting on both estates has now been felled or destroyed by windblow, but some fine specimen trees are still to/

to be seen at Duncraig.

The areas acquired by the Forestry Commission were described as the farms and lands of Achmore, Achbeg, Braeintru, Portchullin and Stroneferry, and also later, the grazings of Ardnarff. These areas together with the farm of Fernaig had been devoted to sheep farming on an extensive scale for many years, with a subsidiary sporting interest. The land formed part of the estates of the Matheson family, originally of Ardross in Easter Ross. The family held the estates from 1854 until the death of Sir Kenneth James Matheson in 1920, when they were held for a time by trustees and were finally broken up by sale in 1925, at which time the first acquisition was made.

On the area originally acquired, there were 38 acres of established woodland composed of Scots pine and European larch with a small amount of Norway spruce. This area lying to the west of Stroneferry village, was the remnant of a wood originally some 75 acres in extent, which had been planted about 1870. There is no record of the date of felling or of the outturn of the wood, but it is most probable that the first felling was carried out between 1914 and 1918. At the time of acquisition, the standing remnant was estimated to contain approximately 1,700 hoppus feet per acre over bark. Windblow and wartime felling (1939-1945) have since reduced the area of this remnant to only 16 acres.

Apart from artificially created woodland, the locality has numerous residual patches of natural stands of mixed hardwoods. Most of this woodland is now composed of scrub birch, with some oak, ash and alder. Hazel is fairly frequent as an understorey. It is certain, that woodland of this type must have been much more extensive in earlier times. The forest areas when acquired, carried in all some 350 acres of scrub of this type, most of which was removed by felling and girdling in the period between 1932 and 1936.

It is of interest to note that substantial sheep stocks were taken over by the Forestry Commission as each farm area was resumed for planting. The stocks were gradually run down as enclosures proceeded and the last sheep were sold in 1936.

Forestry Commission

Acquisitions and Disposals

Schedule of Information from Conveyances, Dispositions, Leases and Feus

Working Plan Area South Strons

Number (1)	Date (2)	Name of other party (3)	Property (4)	How acquired or disposed of (5)	Area (acres)			Compartment Number(s) (9)
					Classified as plantable on acquisition (6)	Total acquired or disposed of (7)	Net Total to date (8)	
1	28/3/25	Trustees of SAR R. J. Matheson, Bart.	South Strons	Purchase Disposition by Feu	1.475	4,800	4,800	
1	1926	J. T. MacRae	House site	Disposition by Feu		0.51		
1	11/3/27	A. D. MacRae	House site	Disposition by Feu		0.25	6,799.25	
2	23/8/29	Murdo Milngavon and Others	Arduarf Grange	Purchase	4.20	74.2	5,241.25	
1+2	18/12/31	Lady Fraser	Grange above Arduarf	Sale		1,985	3,556.25	
1	16/4/36	Trustees of Stroneferry Hall	Site for village hall	Disposition by Feu		0.2	3,556.05	
1	3/4/41	Mr. D. Forbes	Stroneferry Cottage	Disposition by Feu		0.1	3,555.95	
3	27/11/48	Mr. D. Forbes	Highlandish Cottage	Purchase		0.3	3,556.25	
1	24/2/60	Mr. C. A. H. MacRae	Highlandish Cottage Breathna Cottages Nos. 1 and 2	Sale		1.0	3,555.25	
4	15/1/62	Mr. C. A. H. MacRae	Boreale Estate (part) Portchullin crofts and Breathna (part)	Exemption	296	4.08	3,963.25	
1	18/1/62	Mr. J. A. H. MacRae		"	22	37	3,926.25	

Working Plan Area SOUTH STONE

Areas in acres

As at 30.9.1964	Acquired (2)	Plantations Planted by F.C.			Land to be planted				Total (10)	Nurseries (11)	Agricultural and Grazing Land (12)	Holdings (13)	Unplannable (14)	Other (15)	Total (16)
		Before 30.9.1946 (3)	Since 30.9.1946		In hand (6)	Tenanted (7)	In hand (8)	Tenanted (9)							
			Afforested (4)	Replanted (5)											
FOR WORKING PLAN re-survey (1)	16	1,144	214	28	516		71		587		1,572	85	298	11	3,555
P.61 per R1			+ 156		- 156				- 156						
As at 30/9/61	16	1,144	370	28	160		71		231		1,572	85	298	11	3,555
Resumption of Breolintre grazing					+ 692				+ 692		- 787		+ 95		
Female (Exemption)					+ 176		+ 180		+ 296				+ 112		+ 408
					- 22				- 22		- 15				- 37
P.62 per R1			+ 252		- 552				- 252						
As at 30/9/62	16	1,144	622	28	754		191		945		570	85	505	11	3,926
Polled per HO(b)		- 1					+ 1		+ 1						
P.63 per R1			+ 300		- 300				- 300						
As at 30/9/63	16	1,143	922	28	454		192		646		570	85	505	11	3,926
30/9/64	16	1,143	1,127	28	249		192		441		570	85	505	11	3,926

Schedule of Plantable Land

Working Plan Area **South Strome**

Areas in acres

[illegible]

Chapter 4 - Estate Management

(d) Considerations affecting land management

1. Boundaries and Fencing Liabilities

(a) Type of Boundary

The boundaries as described in the titles in favour of the Forestry Commission are rather vague, except for the northern boundary, which is the high water mark of ordinary spring tides on Loch Carron. The remaining boundaries are those traditionally recognised as separating the acquired farms from adjoining estates.

In the main, these follow the courses of the Ascaig River to the south and west and the Glen Udalain burn to the south east.

These boundaries are well known locally and fairly readily distinguished. To the east, however, the original march which followed the parish boundary in part, is no longer valid because of the sale of the unplatable high ground to Lady Fraser in 1931. The boundary between Lady Fraser's purchase and Forestry Commission land was taken to be the line of the permanent forest deer fence between Glen Udalain and Loch Carron.

This fence is not in fact situated on the legal march as shown on the Deed map of 1931, the variations are numerous but largely self cancelling.

For all practical purposes, the fence may be accepted as the march.

(b) Fencing Liabilities

No fencing liability is mentioned in any of the title deeds referring to the forest area, except for small areas feued by the Forestry Commission to other parties. These make the responsibility for fencing a charge upon the feu holders together with liability for maintenance. In default of specific mention of a fencing liability, it is normally assumed under Scottish Law that there is a mutual responsibility between neighbours to maintain fences in stock proof condition, where such fences are recognised as march fences.

In fact, only the Glen Udalain to Loch Carron boundary fence covering some 5 miles and the fence above Stromsferry village covering some 400 yards are subject to mutual liability for repair. The remainder of the forest fences are within the boundaries and are a charge upon the Forestry Commission alone.

Within the forest boundaries lie the farms of Achmore and Achbeg let to outside parties, and the crofting township of Portchullin. In each case, the Forestry Commission is responsible for the maintenance of the boundary fences only, internal fencing is the responsibility of the tenants. In the case of the two farms, however, the Forestry Commission is responsible for ensuring that the internal fences around the arable land are in good order on a change of tenancy.

2. Restrictive Covenants, Reservations etc.

(a) Railway

The rights of the railway companies, now vested in the British Transport Commission to pass their line, embankments, cuttings etc. through the area and thus excluding free access to the legal boundary of high water mark.

(b) Stromeferry Village

A number of sites for church, school and houses were feued in the area of Stromeferry village and at Achmore, prior to acquisition by the Forestry Commission, their water supply and access rights were reserved.

(c) Portokullin Township

There are four tenants sharing grazing rights over 120 acres of common land, their position as tenants is a special one governed by the Crofter Acts. Only three are resident.

3. Easements, Servitudes and Licences

(a) Achbeg

The trustees of Stromeferry Public Hall have a right to take a water supply from the pipe line to Achbeg Farm, with a wayleave for the additional piping required for this supply plus a waste pipe for disposal purposes. The Forestry Commission reserve the right to restrict the water supply in times of drought.

(b) Ardnarrff

The British Transport Commission have a right to draw a water supply for their buildings at Stromeferry with right of entry for repair and maintenance of supply. Stromeferry Hotel has a similar right.

(c) Transmission Power Lines

11 Kilowatt distribution lines for the North of Scotland Hydro-Electric Board pass over Commission land at Achmore, but do not affect any plantation areas.

4. Public Rights of Way

There are no public rights of way through the forest area other than the track from Achmore School to Portokullin Crofts.

5. Sporting Interests

Nil.

6. Obligations of Outside Parties to the Forestry Commission

Nil.

Chapter 5 - Amenity

(a) Description of Amenities

No special regard to aesthetic considerations has been given in the past, but because of the mixture of species and accidents of siting, the scenic value of the area has been much enhanced. The northern part of the forest on the slopes above Loch Carron provides a fine decorative facade visible for several miles along the public road on the north side of the loch.

The formation of the forest has provided a more favourable habitat for wild life and several animals formerly absent are now established, for example the wildcat and pine marten.

The forest community at Achmore provides a useful amount of additional tourist accommodation.

(b) Policy and Existing Obligations

There are no legal commitments in this forest with regard to amenity. There are no local organisations concerned specifically with amenity, but the local District Council have shown some interest in this matter. The Balmacara Estate covering a large part of the Parish is the property of the National Trust for Scotland and Duncraig Estate belongs to the County Council for Ross and Cromarty.

There is a keen interest at present in this district on the subject of tourism, with a consequent awakening of interest in improving the amenities of the area. The County Council have taken steps to improve matters with regard to the disposal of litter and the Forestry Commission has undertaken to maintain litter bins on the public roadsides in the forest area.

(c) Measures Adopted

No special aesthetic measures have been undertaken.

Six litter bins were placed along the public road at likely viewpoints and parking places in 1960. Arrangements have been made for periodic emptying of these in conjunction with normal scavenging for Commission house tenants. This arrangement proved to be successful during 1960 and has been continued since that time.

The ground remaining to be planted in Glen Udalain is visible from the public road over a considerable distance. The land nearest the road is of low quality and selection of species other than along normal silvicultural lines will be difficult. Experience indicates that the appearance of the area will be much improved as the forest crops grow, particularly where species changes follow natural rather than artificial boundaries.

Summary Statement of Growing Stock

as at 30.9.1964.

Working Plan Area SOUTH STROMEComplete as
necessarySection -Working Circle -Felling Series -

Type (1)	Area (acres) (2)	Volume (h. ft.) (3)	Current Annual Increment (h. ft.) (4)
<u>High Forest</u>			
Coniferous	2,314	1,779.8	176.0
Mixed			
Broadleaved			
Total High Forest	2,314	1,779.8	176.0
Coppice with Standards			
Coppice			
Partially Felled			
Reserved Timber			
Scrub	20		
Felled	51		
Other Plantable	370		
Other Land	1,171		
TOTAL	3,926	1,779.8	176.0

Signature G. TaylorDate of Compilation 30. 9. 64

Area Statement of Growing Stock as at 30.9.1964

Working Plan Area South Zone
 Complete as necessary
 Section Working Circle
 Felling Series

 Delete as necessary
 High Forest—Main Storey
~~High Forest—Subsidiary Storey~~
 Coppice

Areas in acres

Species (1)	Over- or Under- storey (2)	Even-aged																Uneven-aged		Total (21)
		1966 1970 (3)	1961 1965 (4)	1956 1960 (5)	1951 1955 (6)	1946 1950 (7)	1941 1945 (8)	1936 1940 (9)	1931 1935 (10)	1926 1930 (11)	1921 1925 (12)	1901 1920 (13)	1881 1900 (14)	1861 1880 (15)	1841 1860 (16)	Pre 1841 (17)	Pre 1900 (18)	Post 1900 (19)	† Pre and Post 1900 (20)	
<u>S.P.</u>			18	2					22	25										67
<u>L.P.</u>			572	143					11											526
<u>H.P.</u>										7										7
<u>E.L.</u>									61	22				16						99
<u>J.L.</u>			16	13					73	19										141
<u>H.L.</u>			16							5										21
<u>D.F.</u>									35	64										79
<u>N.L.</u>				0					82	26										116
<u>S.S.</u>			470	50		24	5	164	302	715										1,228
<u>O.S.</u>			7						2											9
<u>W.H.</u>									4											4
<u>N.F.</u>				2					1											5
<u>G.F.</u>			14																	14
																			TOTAL	2,524

† Uneven-aged crops in which pre P.1900 and post P.1900 age groups each occupy at least 20% of the canopy.

Signature G. TaylorDate of Compilation 30.9.64

Working Plan Area **South Strone**

Species	P. Year Class	Areas by Yield Classes														Total Area (ac)	Weighted Av. Yield Class
		(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)		
S.P.	61-70												18			18	50
	51-60											8	2		2	2	60
	41-50											6	12		16	22	60
	31-40												3			25	80
Total S.P.							14	35		18						67	60
L.P.	61-70										372					372	100
	51-60										143					143	100
	41-50										7	4				11	100
Total L.P.											522	4				526	100
H.P.	51-60															5	-
	41-50															2	-
	31-40																-
Total H.P.																7	-
E.L.	51-60									15	30	10	3	3		61	100
	41-50											22				22	80
	31-40											16				16	80
Total E.L.										15	30	48	3	3		99	100
J.L.	61-70												16			16	120
	51-60												13			13	120
	41-50												4			73	120
	31-40												7	9		39	100
Total J.L.													14	13		141	120
															c/s	840	

Date of Compilation

Signature

Working Plan Area **Rough Storms**

[illegible]

Date of Compilation

Signature _____

Working Plan Area South Stream

Species	P. Year Class	Areas by Yield Classes															Total Area (ac.)	Weighted Av. Yield Class
		(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16) Check			
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	
N.F.	51-60			2											B/E	2,297	240	
	61-70			1												1	240	
Total N.F.				3												2	240	
S.P.	61-70			14												14	240	
															TOTAL	3,521		

Date of Compilation

30. 9. 64

Signature _____

E. Taylor

Working Plan Area **South Strose**

Complete as necessary { Section
Working Circle
Felling Series

Species or Species Groups (1)	Year Class (2)	Volumes by Size Classes (B.H.Q.G.)						Total Volume (9)	Pre- cision (10)	Current Annual Increment (11)
		2½-6" (3)	6½-9" (4)	9½-12" (5)	12½-15" (6)	15½-18" (7)	18"+ (8)			
Pines	1926									
	1935	31.5	-	-	-	-		31.5		3.0
E.L.	1926									
	1935	73.7	24.0	3.9	-	-		131.6		7.0
H.L./	1926									
J.L.	1935	55.5	163.9	13.8	-	-		233.2		16.0
D.F.	1926									
	1935	27.4	91.5	64.0	-	-		182.9		15.8
N.S.	1926									
	1935	155.6	33.9	-	-	-		194.5		18.0
S.S.	1926									
	1935	294.0	418.5	87.1	-	-		799.6		101.2
	1936 onwards	77.0	51.2	-	-	-		128.2		13.0
Other		13.3	-	-	-	-		13.3		1.0
S.P.	Pre 1900	0.1	0.7	3.6	6.6	1.4		12.4		
E.L.	Pre 1900	-	5.8	19.5	24.7	2.6		52.6		
Total Pre 1900								65.0		1.0
							TOTAL	1,779.8		176.0

Felling Series

Volumes in hoppus feet

Species or Species Groups (1)	Year Class (2)	Volumes by Size Classes (B.H.Q.G.)						Total Volume (9)	Pre- cision (10)	Current Annual Increment (11)
		2½-6" (3)	6½-9" (4)	9½-12" (5)	12½-15" (6)	15½-18" (7)	18"+ (8)			
Pines	1926 1935	31.5	-	-	-	-		31.5		3.0
E.L.	1926 1935	73.7	54.0	3.9	-	-		131.6		7.0
H.L./J.L.	1926 1935	55.5	163.9	13.8	-	-		233.2		16.0
D.F.	1926 1935	27.4	91.5	64.0	-	-		182.9		15.8
N.S.	1926 1935	155.6	33.9	-	-	-		194.5		18.0
S.S.	1926 1935	294.0	418.5	87.1	-	-		799.6		101.2
	1936 onwards	77.0	51.2	-	-	-		128.2		13.0
Other		13.3	-	-	-	-		13.3		1.0
S.P.	Pre 1900	0.1	0.7	3.6	6.6	1.4		12.4		
E.L.	Pre 1900	-	5.8	19.5	24.7	2.6		52.6		
Total Pre 1900								65.0		1.0
							TOTAL	1,779.8		176.0

Signature G. Taylor

Date of Compilation 30. 9. 64

Chapter 6 - Growing Stock

(e) Enumeration Methods

The basic survey was undertaken during the period 20th February to 3rd May, 1961. The external boundaries consisting of the county road to the west, Gleann Udalaire to the south, the deer fence to the east and Loch Carron to the north were well defined. Internal boundaries in the older plantations were also easily delineated as the area is almost entirely roaded and these road lines, together with streams and some of the wider rides were used as the revised compartment boundaries. Over the remainder of the area the compartment boundaries were marked by removing a line of trees, or by means of pegged or ploughed lines.

Crop assessment was carried out between 21st March and 28th March, 1961 and the data therefore relate to the position as at 30th September, 1960. Standard crop assessment methods in force at the time were employed.

The forest inventory was carried out on two basis:

- (i) by visual estimate in individual sub-compartments based on basal area sweeps by relascope, top height assessment by hypsometer and the use of alignment charts.
- (ii) by the measurement of forty-nine 1/10th acre sample plots to give the total forest volume of the main strata, namely pines, European larch, Japanese and hybrid larches, Douglas fir, Norway spruce, Sitka spruce and other species. In the strata with relatively small areas the plot volumes were supplemented by visual estimates. This was permissible because the total volume obtained by visual estimates and that obtained by plots differed by only 2%. Stratum totals should therefore be fairly precise although individual sub-compartment volumes will be less accurate. Volume increment was calculated from Yield Tables using the basal areas measured in the 1/10th acre plots as adjusting factors.

(f) Description of Growing Stock

The crop type over the whole Working Plan area is Coniferous High Forest, most of which is established in pure stands. Only 56 acres of plantation are classified as mixed but admixture on a minor scale is not uncommon due to changes in species during beating up. The most common minor constituent species is Sitka spruce which figures in some 170 acres of pure stands of other crops.

Sitka spruce - 1,228 acres.

Sitka spruce occupies a greater acreage than any other species in the forest, accounting for 53% of the area under plantation. It was used extensively in the first decade of the forest's formation between 1926 and 1935, when 517 acres out of a total of 976 acres were planted with the species.

Of the total acreage planted up to 1935, 191 acres are recorded in check and, of the remainder, over two thirds are already in the thinning stage. Most of area recorded as checked is now closing canopy in a satisfactory manner.

Yield Class assessments are not high, the average being only Yield Class 160. The low rating of the species is a reflection of early practice which favoured Douglas fir and the larches for the better sites to the detriment of spruce. Despite the low rating, the volume increment of 114,200 hoppus feet per annum accounts for 65% of

the total for the forest. There are indications that the rate of growth in many stands is accelerating and higher ratings may be achieved at the next assessment.

Norway spruce - 116 acres.

Most of the Norway spruce stands were established prior to 1935. This species was for a time mistakenly used on rather more adverse site conditions than was Sitka spruce. After this was appreciated, the use of Sitka spruce increased and only minor areas were planted with Norway spruce. Most of the area surviving today had been planted on good, fertile land. The average for the species is Yield Class 160. Poorer sites which were originally planted with this species were mainly converted to Sitka spruce during the process of beating up.

Larches - 245 acres.

European larch - 99 acres.

This species was concentrated mainly in the area of Strome Wood and includes 16 acres of the 1870 planting acquired with the forest area. The rate of growth has on the whole been good. The high rate of growth was to be expected, as the species was deliberately selected for the best soils in the early Working Plan prescriptions.

Many of the seed provenances used do not appear to have been the most suitable for the climatic conditions, as form is rarely in keeping with the high rate of growth. The stands in Strome Wood in particular suffered badly from larch canker in the early years. Recovery of these stands has been good, but the species does not appear to be really healthy on the site.

European larch has not been planted in the forest since 1935.

Japanese larch - 141 acres.

Japanese larch was mainly planted as a substitute for European larch in the period up to 1935 and consequently concentrated on very fertile sites. Since 1935, only 29 acres of the species have been planted, mainly in fire protection belts. The rate of growth has been good and the form is also moderately good. The average for the species is Yield Class 120.

Hybrid larch - 5 acres.

This species has been planted in two small stands, one of which is now a registered seed stand. The rate of growth and tree form are good. The seed stand is of interest, being of Dunkeld origin and being the first area to be thinned in the forest in 1939.

Douglas fir - 79 acres.

The present stands of Douglas fir were almost entirely established in the course of the first five years of the forest's history. Only sites with good quality soils were selected for this species. Unfortunately the seed provenances used were poor and growth has been very disappointing as regards form, although the rate of height growth is moderately good. It would appear that the poor showing made by these early plantations restricted the further use of the species in the forest. The rate of growth does indicate however that the species has a place, provided suitable seed origins are selected. The average for the species is Yield Class 140.

Pines - 593 acres.

Pinus contorta/

Pinus contorta - 526 acres.

All but 11 acres of this species have been planted since 1956. Before 1956, the species was used mainly as a last resort to complete the stocking on areas found to be unsuitable for spruce. Since 1956, Pinus contorta has been recognised as a useful species in its own right for afforestation on the poorer sites. It has been used both as a pure crop and in mixture with Sitka spruce. Growth in the small area of older plantation has been on the whole rapid but the tree form is generally poor.

Scots pine - 67 acres.

Most of this area was planted before 1955, at which period the species found a place on the poorer soils near the plantation limits and as a replacement for badly checked spruce. Scots pine has in general been a disappointing species under west coast conditions, but in this forest, on the sites chosen it appears to have done reasonably well. The average rate of growth is Yield Class 60.

Form is on the whole good, but needle retention is poor, giving rise to an unhealthy appearance in most stands.

Mountain pine - 7 acres.

This pine was used in the early years of the forest in a similar manner to Scots pine, but on the poorest sites, mainly as a marginal wind belt. The form is poor due to the use of prostrate many branched provenances. The species does not appear to have any useful place in this forest, with the possible exception of providing ground cover on otherwise unplantable knolls within new plantations.

Other Species - 30 acres, composed of

<u>Picea omorika</u>	-	9 acres
<u>Abies procera</u>	-	3 acres
<u>Tsuga heterophylla</u>	-	4 acres
<u>Abies grandis</u>	-	14 acres

None of these appear to be of special interest, with the exception of the Abies species, which may have a place in the replacement of felled areas.

There are in addition, small pockets of beech, Lawson's cypress and Thuja plicata used for underplanting, but few of these are likely to appear in the main crown canopy.

Within the forest area there are 20 acres of scrub, mainly of birch, with some oak and ash. This area is made up of small pockets lying on scree, in stream gullies or on steep embankments. No economic advantage would appear to be gained in converting these sites to conifer crops due to extraction difficulties. The present scrub crops are of no special interest in either form or rate of growth.

Chapter 7 - Organisation

(a) Previous Plans

The first plan was written in 1927 to cover the original acquisition for the period to 1931. This plan was revised in 1930 and again in 1931 to take into account the second acquisition at Ardnariff.

These early plans were detailed but not very comprehensive, being largely concerned with the control of land resumption, the rate of enclosure and the disposal of sheep stocks, together with detailed prescriptions for planting and nursery work.

There were considerable fluctuations in detail during the period of these plans, but by the end of F.Y. 33 a total of 783 acres had been planted against a prescribed target of 745 acres.

The original plan envisaged an eventual forest of 1,641 acres, assuming the resumption of all farm land, which even then was in doubt. If one excludes the farm lands, this figure would have been reduced to some 1,150 acres. In 1950, by which time, all land considered fit for planting without ploughing had been afforested, the total plantation area was recorded as 1,151.5 acres.

Although no copies of plans are available for the period 1933 to 1950, some form of plan must in fact have been used. Copies are available of five year working prescriptions similar in many ways to the present WP 14, which relate to this period and show from the entries that an effort was made to control the work in a logical manner.

From 1951 to the present time, a simple form of plan has been in use, with periodic revision as required. This plan of operations gave a short description of the main features of the forest, together with a corrected land utilisation statement at each revision. The main feature of these plans was the five year working programme for all major operations.

Control of timber production was initially based upon area, but wide fluctuations in outturn led to a change in favour of control by volume over short periods.

Due to a variety of causes, such as intermittent road working, the resumption of planting and fluctuations in marketing conditions, a regular outturn of produce has not been possible and the progress of other operations has also varied considerably.

The main lesson to be learned from these plans, is the need for elasticity in management. It is clear however from the history of the forest, that the first plan carried a well reasoned policy statement with regard to the type of plantation to be created and set long term targets which were never forgotten and were finally achieved. The important lesson here is the value of having rational long term objectives with a reasonable period of time in which to achieve them.

(b) Administrative Subdivisions

1, 2, 3, 4. The area of the plan lies within one District and comprises one forest. There are no subdivisions into sections or beats.

5. The forest area has been subdivided into six working blocks. Five of these comprise the thinning and possible felling areas together with adjacent areas of younger established plantation.
Five/

Five working blocks were selected to conform to the five year thinning cycle now practised.

The sixth block is made up of the reserve of plantable land together with the more recent plantations which are still in the establishment stage.

The boundaries of these blocks will change periodically, in order to give a balanced outturn from the five production blocks and to allow for incorporation of the younger established age classes.

At present the blocks are made up as follows:-

Production/Maintenance blocks

- A. Compartments - 32, 33, part 34, part 37, part 38, 40, 41, 42, 43, 44, 45, part 46, part 47, 48, 49.
- B. Compartments - 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 61, 82, 83.
- C. Compartments - part 21, 22, 23, 24, 25, 26, 27, 28, 29, part 30, 31.
- D. Compartments - 1, 2, 6, 7, 8, 9, 10, 19, 20.
- E. Compartments - 3, 5, 11, 12, 13, part 14, part 15, part 16, 17, 18.

Planting/Establishment block

- F. Part of Compartments - 14, 15, 16, 21, 30, 34, 37, 38, 39, 46, 47, and whole Compartments - 35, 36, 60, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81.

6. Compartments

The original compartment system, based mainly on cross contour rides had in the passage of time become obscured, while post war planting had added further complexities.

It was therefore decided to carry out a complete revision of the compartment system during the course of the Working Plan Survey.

The present lay out is based mainly on the road system constructed since 1946, together with future road lines which have been carefully marked out and surveyed after approval by Engineering staff.

Additional features required to demarcate the compartments were found in sizeable streams and existing rides widened where necessary.

As far as possible compartments were designed to contain not less than 15 acres and not more than 50 acres of plantation or plantable land. A few compartments containing unplatable land were fixed with a slightly greater total area. The majority of compartments are between 25 acres and 45 acres in extent. In all there are 83 compartments.

(c) Management Subdivisions

- 1 and 2. The Working Plan area comprises a single felling series within one working circle.
3. No cutting sections have been selected at present.
4. Sub-compartments have at present only been defined in the productive areas of the forest. The boundaries of the sub-compartments were determined and mapped by the Working Plans survey team which enumerated the growing stock.

Chapter 8 - Planting Rate and Resumption of Land

(a) Planting

The first acquisition was completed in 1925. Planting started the following year and a varying programme was carried out annually until 1939. The fluctuations from year to year were considerable, with a maximum of 224 acres in 1931 and a minimum of 10.5 acres in 1939. The planned rate of development had envisaged an annual programme of 100 acres from 1927 onwards. The major cause of deviation from this planned programme was due to changes in the programme of resumption of farm lands. In the period 1936 to 1939, work was concentrated upon the poorer areas requiring intensive ground preparation which had been left unplanted in the earlier phase.

The areas claimed as planted by planting years are given below:

<u>P. Year</u>	<u>Planted</u>	<u>P. Year</u>	<u>Planted</u>
26	35.25	40-42	Nil
27	110	43	7 Replanting
28	82	44-46	Nil
29	47	47	10 Replanting
30	127.5	48	10 Replanting
31	224	49	5 Replanting
32	166	50-53	Nil
33	100	54	2.5 Underplanting
34	106	55	22
35	101	56	32.5 (3.5 Replanting)
36	78	57	34
37	21	58	25 (1.0 Replanting)
38	25.5	59	20
39	10.5	60	50

The data given above were taken from the planting records of which a complete set exists. At the census of plantations in 1958, 23 acres of P.27 were written off. A fire on the Ardaraiff section in 1942 destroyed 32 acres of the P.32, P.33 plantations. Windblows in 1953 and 1957 destroyed 1 acre of P.26 and 4 acres of P.30. Making due allowance for these losses, the area stocked at the close of F.Y. 60 should have been 1,390.25 acres of Forestry Commission plantations.

At the resurvey carried out in 1961 by the Directorate surveyors the total area of Forestry Commission plantations was found to be 1,386 acres.

The difference of 4.25 acres is largely due to rounding of areas to the nearest whole acre and to allowance being made for minor gaps in plantations not previously recorded.

Since 1960 a further 913 acres have been planted as follows:

1961	-	156 acres
1962	-	252 acres
1963	-	300 acres
1964	-	205 acres.

(b) Resumption

1. Reserves of Plantable Land

At the end of F.Y. 60, the reserve of plantable land was approximately 380 acres, being land lying above the existing plantations which was reclassified as suitable for planting in 1958./

1958. Early in F.Y. 61 a further reserve of approximately 690 acres of plantable land was added by the resumption of the Glen Udalain portion of the Braeintru grazings from Achbeg Farm. During F.Y. 62 a new acquisition from Fernaig estate added a further 274 acres of plantable land. The details of the location of the land to be planted are given on Form WP 12.

2. Resumption

The revised procedure for the resumption of land has been laid down in a Directorate Instruction dated 25th March, 1958. The main point is that land purchased by the Forestry Commission involving any agricultural interest is managed by the Department of Agriculture and Fisheries for Scotland on behalf of the Secretary of State for Scotland.

By negotiations with Department of Agriculture and Fisheries for Scotland, areas to be planted are agreed and mapped. When required by the Forestry Commission for planting, resumption procedure is set in motion by the District Officer applying to the Estate Officer. Tenants must usually have at least a full year's notice of resumption, so that it is usual to initiate resumption procedure at least fifteen months in advance of the required date of entry.

3. Prospects of Further Expansion

In 1963 negotiations were opened for the acquisition of a further portion of Fernaig farm; this acquisition is proceeding normally and will yield a further 64 acres of plantable land. Tentative proposals have been made with regard to Duncraig Estate, where the acquisition of the Dedicated areas is possible. This would yield some 600 acres of forest land, most of which has already been planted.

In 1964 negotiations were opened for the purchase of a small block of felled woodland on Auchtertyre farm; this acquisition if successful will yield a further 58 acres of plantable land.

Within the district there are substantial areas of plantable land but farming tenancies at present prevent acquisition for forest use. Large acquisitions are unlikely, but a continued expansion of the forest area is possible.

Chapter 9 - Silvicultural Systems

(a) General

To date, all plantations have been established by planting.

(b) Thinning

The type of thinning practised throughout has been a low thinning of a B, C or C/D grade. Labour shortages and indecision on the question of thinning policy produced delayed and light grade early thinnings. These factors were aggravated by lack of suitable extraction roads and by fluctuations in markets.

Although thinning was started early in certain accessible and fast growing stands and had in fact been carried out over most of the thinnable area by 1955, the yields per acre obtained were low and a considerable accretion of increment had been built up in the forest. Since 1956, most species have been thinned to a C/D grade on a four to five year cycle.

Approximate average yields per acre for the principal species during the four years P.Y. 57 to P.Y. 60 were:-

1st Thinnings	Sitka spruce	660 hoppus feet
	Norway spruce	630 hoppus feet
2nd and subsequent Thinnings	Sitka spruce	740 hoppus feet
	Norway spruce	650 hoppus feet
	Douglas fir	860 hoppus feet
	Larches	630 hoppus feet

These yields are abnormal, due to delayed first thinnings and to the cutting of surplus stored increment in the stands previously thinned.

(c) Felling

No felling of Commission plantations has taken place to date but part of the acquired wood above Stromeferry was felled during the War period 1939 to 1945 by the Timber Production Department. No reliable figures for this felling are available, but in all, some 26 acres of the acquired woods were felled or blown between the time of acquisition and 1945.

Chapter 10 - Crop Establishment

(a) Choice of Species

In the original acquisition report the following notes appeared with regard to choice of species: "On the best of the ground almost any of the usual coniferous species should thrive. A suggested proportion, subject to amendment, is as follows:- spruce 46% (mainly Sitka spruce), larches 30%, Douglas fir 21%, pines 3% ...". The forest area was thus clearly recognised at an early stage as being fertile and suited to the growth of North West American conifers. It is also clear from the proportions given, that many of the fertile slope sites were considered to be too dry for spruce.

In the first Working Plan, a clear set of planting prescriptions were given, which were to a very large extent followed to 1939. Briefly, these were as follows: spruce, mainly Sitka spruce to be the principal species, Douglas fir to be planted on the best soils where slopes were not too steep and where exposure was not severe, larch to be used on steep but fertile slopes provided exposure was not too severe, and Scots pine to be used on dry heather covered knolls. There was also a recommendation that Japanese larch should be tried on the shallow Scirpus covered peats, but there is little evidence that this was in fact done on any scale.

1. Creep soils and drift soils improved by creep action

It is perhaps unfortunate, that these soils were early recognised as the most fertile areas of the forest. Following the planting prescriptions set out in the first plan, a large proportion of these soils were planted with larch and with Douglas fir to the detriment of spruce which thus secured a smaller proportion of these areas than would have been desirable. Even more unfortunate was the choice of Japanese larch in preference to European larch, so that three-fifths of the larch areas now carry this species.

In general, it can be taken that almost all of these sites are capable of carrying Sitka spruce of at least Yield Class 200 or Norway spruce of at least Yield Class 160 where the exposure is not severe.

2. Partially leached drift soils and better peat areas

With small exceptions in favour of Douglas fir, Scots pine and Japanese larch, almost all of these sites were planted with spruce. Norway spruce appears only to the extent of an eighth of the total but has on the whole done fairly well. Prior to 1930, there was a tendency to place Norway spruce on the rather more adverse sites, due to a mistaken belief that the species was rather more hardy than Sitka spruce. In almost every case, Sitka spruce has grown well on these sites and they appear to have an average Yield Class rating of 180.

3. Dry podsols, peaty podsols, poorer peats

The total extent of these soil types is considerable; together they account for all the areas of poor or checked growth and present cases where extreme care in choice of species is necessary. Following the initial prescriptions, the dry podsols were mainly planted with Scots pine, which has done reasonably well. On some areas of dry podsol and on all the areas of peaty podsols and poorer peats planted before 1945, Sitka spruce and Norway spruce were the main choices, with small amounts of Pinus contorta.

LarchesHybrid larch

There are only two small areas of hybrid larch in the forest, planted in 1926 and 1931 respectively. The former is of interest, being a stand of some 4 acres extent, the seed being of Dunkeld origin. The stand is of good form and very fast growing. It was also the first area to be thinned in the forest, receiving a light thinning in 1939. It has now been registered as a recognised seed collection stand, Identification Number (4115)6 and has an Almost Plus rating.

European larch

European larch in this forest is of very mixed origins, the bulk of the material having come from the Swiss Alps and Italian Tyrol. Growth on the whole is fairly good, but many areas suffered rather badly from larch canker in their youth. One stand in Compartments 1 and 3 has been the subject of favourable comment by Silviculturist (North). This stand planted in 1931 was mainly composed of plants raised from home collected seed of Lot Numbers 52/27 and 24/27. Part of the collection was from Drummond Hill but the origin of the remainder is now lost. It is known, however, that the lots were mainly collected in old stands selected by Mr. Mark L. Anderson for their form and vigour.

Japanese larch

Japanese larch has been extensively used on good quality sites, but nothing is known of the seed origins. Rate of growth and form are usually good, but there has been a tendency for wind sway to produce deformation at the butts.

PinesScots pine

Scots pine was only sparsely used during the period 1926 to 1935, mainly in small scattered lots. Material was drawn from a wide variety of sources, but principally of Scottish origin. Since 1955, small amounts of this species have been used, the main point being that they have all been drawn from seed lots of North West Scottish coastal origin. No evidence is yet available that plants of this origin will perform better than previous lots, but the practice is in line with the present general policy for this species in the Conservancy, by which regional matching of a selected seed source with planting site is carried out wherever possible.

Pinus contorta

Only 40 acres of this species were planted prior to 1950, but since then, particularly since 1955, its use has increased. Future requirements are also likely to be considerable. Rate of growth and tree form vary considerably with provenance and selection of a suitable type for the locality is obviously of importance. Of the stands now over twenty years old in the forest, the following can be distinguished with some certainty:

- P.31 - I.D. No. 26/58 - Canadian - Alberta Province - Inland Form.
- P.32 - I.D. No. 28/28 - Washington Coastal - Extreme Coastal Form.
- P.32 - I.D. No. 28/35 - Sushwap Lake, Canada (1,300-1,500') - Intermediate Form.
- P.34 - No I.D. number - Queen Charlotte Islands? - Intermediate Form.
- P.40/

P.40 - I.D. No. 37/40 - Smithers, British Columbia (2,000') -
Intermediate Form.

The P.31 lot of inland form is now in danger of suppression having been grown in mixture with Sitka spruce and Scots pine. The rate of growth does not appear to be worthy of special note although the form is fairly good.

P.32 lot of extreme coastal form is of interest, having been planted deliberately in a number of small plots on ground beyond the accepted planting limit of the period. The sites used cover the deep peat and peaty podsol types at present being planted on a fairly large scale; in fact the bare land in Compartments 37 and 38 in which the plots are located was planted in F.Y. 61. The rate of growth has been extremely fast, but form is very poor and many stems have badly windswept butts. There has been heavy windblow damage in these plots in recent years, but this is partially attributed to lack of thinning at an earlier stage in their development.

The P.32 lot of Intermediate Type from Sushwap Lake in Canada is located in Compartment 11 and forms a pure stand of 4 acres extent. Rate of growth has been fairly good, with a top height of 35 feet in twenty-nine years. The form is moderately good and the stand shows only moderate signs of wind deformation, although the crowns appear to be rather thin. A severe windblow removed about half of the crop in 1953 and occasional losses from windblow still occur.

The P.34 lot is located in Compartment 15 and forms a small plot of less than 1 acre lying in full exposure at an elevation of approximately 500 feet. By good fortune, a note describing the history of this lot was located in some old files. Sitka spruce seed of I.D. No. 28/43, Queen Charlotte Islands origin, was sown in the home nursery in 1931 and from the seed beds, some 18,000 plants of Pinus contorta were obtained amongst the spruce. Unfortunately only 1,000 plants were retained and used in the forest as 2 + 1 transplants, the remainder having been distributed to other forests and their location is now lost. The plot, presumed to be of Queen Charlotte Islands origin, has grown moderately well, being of good form and free of wind deformation. The rate of growth, however, is only slightly faster than would have been expected of Scots pine on the same site.

The P.40 planting was a beating up operation amongst partly checked Sitka spruce, but one small stand of almost half an acre appears to have been planted pure. The rate of growth has been good and form is excellent. There is no sign of wind deformation or windblow so far. Amongst the spruce, the beat up plants are now in danger of being lost, as the spruce is out of check and growing vigorously. The crowns of the pure plot are a little thin, but this appears to be partly due to lack of thinning now slightly overdue.

From the limited evidence available it would appear that neither the extreme coastal or definite inland form is likely to give satisfactory results in this locality. The best choice appears to lie in one of the more northerly coastal types or in one of the higher elevation strains from the interior of British Columbia.

(b) Preparation of Ground

(1) Treatment of birch scrub

Most/

Most of the scrub woodland areas were treated between 1932 and 1936, 250 acres being partially felled and 100 acres treated by girdling. In both cases a substantial overstorey of birch appears to have been retained.

The girdled areas were interplanted with Sitka spruce and Norway spruce, but the areas of partial felling appear to have been treated as bare land and were planted with a wider variety of species including the larches. From chance references in old reports it is deduced that some areas, which had been completely cleared of scrub, quickly produced a heavy growth of heather which resulted in checking of the spruce crops which had been planted. This trouble appears to have arisen mainly at the western end of Ardnarff where, even today, slow growth in the spruce is evident although the crops are established upon apparently fertile mineral soils.

No further scrub areas remain to be treated within the present forest boundaries, but the proposed Farnag acquisition contains some 140 acres of this type of land.

Current practice in other localities favours the minimum of cutting required for the planting and initial establishment of the new crop.

(ii) Drainage

The value of adequate drainage was recognised early in this forest and the first Working Plan contained detailed instructions on this subject. Main trap drains were to be cut and natural stream courses cleared three years ahead of planting. The following year, systematic hill drainage was to be carried out, followed a year later by intensive drainage of any wet patches remaining. Provision was also made for special drains to be cut to provide turf mounds for spruce, over roughly 25% of the area to be planted.

Actual performance fell somewhat short of the prescribed ideal in the early years, but from about 1932 onwards intensive drainage was the rule, with drains being prepared to the extent of 25 to 30 chains per acre planted. During the years following 1932, most of the areas already planted were given further drainage treatment (See Chapter 11 (c)).

(iii) Ploughing

Current practice is to plough most site types where the topography permits, using Cuthbertson single mould board ploughs for all peat areas and for drainage on wet mineral soils. On drier mineral soils the Ross/Clarke tine plough is used for cultivation effect. Any areas too broken or too steep for ploughing are drained and turfed by hand.

(c) Planting Methods

In the early years, the L or T notch methods were in general use, with a certain amount of turf planting on the wetter areas. From about 1932 onwards, all spruce were turf planted and notch planting was restricted to other species on the drier areas only. Since 1955 practically all planting has been done on ploughed sites. On tined ground, the vertical notch method has been used on the spoil thrown out by the plough. On areas ploughed by Cuthbertson drainage machines, all species have been turf planted on the upturned furrow slice. It is a general rule that no spruce may be planted, other than on turf mounds whether hand prepared or provided by ploughing.

Manuring of plants, using basic slag, was practised from about 1930 onwards on an increasing scale. In the post-war period it has become general practice to manure all spruce with 2 ounces of ground mineral phosphate/

phosphate per plant. Other species only receive manurial treatment on doubtful sites.

(d) Weeding

In recent years, weeding has been a relatively minor operation because of the small planting programme and the use of ploughing on relatively poor sites where weed growth is generally weak. In the pre-war period, this operation was of major importance, with heavy growths of grass, bracken and coppice shoots, which often required to be weeded for three or even four seasons after planting.

In the years ahead, with larger planting programmes and somewhat better quality land, this operation is bound to become important again. Areas likely to require most attention are those where a rapid and heavy flush of grass results after ploughing.

(e) Beating Up

Because of the relatively fertile ground on which most of the early plantings were established, the beating up operation was a comparatively small one. Patches of wet ground within the area of creep soils stocked with Douglas fir or larch were beaten up with Sitka spruce. Failures amongst European larch in the P.26 area were made good by introducing Sitka spruce, Thuja plicata, Japanese larch and some beech. Many of the plants used for beating up are not recorded as being part of the present crop due to the recovery and rapid growth of the European larch. The main beating up operation took place amongst the spruces which had been planted in many cases on unsuitable sites, often by notching. Norway spruce failures were largely made good with Sitka spruce, and failures amongst the Sitka spruce were eventually made good using Scots pine and Pinus contorta.

Beating up appears to have gone on fairly systematically as planting proceeded, with a major effort from 1935 to 1940 in order to complete the stocking in the early plantings. A minor interesting feature is the use of grey alder as a nurse species on wet areas of checked spruce. Few of these have survived.

Current methods of ground preparation together with a better appreciation of the site capabilities ensure a better survival of the species first planted and beating up has been much reduced. Only in exceptional years, such as the drought year of 1955, have losses been in any way significant.

Chapter 11 - Crop Maintenance

(a) Fencing

Fencing against red deer is necessary in all parts of the forest, except within the cultivated area around Strath Ascaig where stock fencing is adequate. Rabbits once fairly numerous in the area have given little trouble in recent years, but may become troublesome again. The main forest fence runs from the shores of Loch Carron in a wide arc, to the public roadside at Braeintra. This was erected as a permanent deer fence using iron standards, but heavy regular maintenance is now required in order to keep it in deer proof condition. All fences are regularly inspected by the forest trapper who reports defects, together with an estimate of materials needed for repair, to the Forester. Minor repairs are normally carried out by the trapper in the course of his inspections.

An extensive addition to the perimeter fence was made with the enclosure of Glen Udalain by a deer and rabbit proof fence. Restriction of entry for stock, particularly sheep, into Strath Ascaig is secured by the provision of cattle grids on each of the main forest road entries, as internal road boundaries in this area are unfenced to facilitate timber handling.

(b) Cleaning

This operation was started in 1939 although sometimes described as thinning or weeding in the progress reports of the time. The main operations appear to have been the removal of dead, dying and badly deformed trees in the faster growing crops, particularly amongst Japanese larch and Douglas fir, together with the removal of birch scrub overwood and coppice growth. These operations were continued with increasing tempo throughout the war-time period and by 1952 most of the birch scrub overwood had been cleared. Since that time, cleaning operations have been mainly done in conjunction with first thinnings, when patches of poorer growth than the main crop have been partially freed to facilitate movement and to keep the damage caused by defective stems to a minimum.

Cleaning or pre-thinning as a separate operation is no longer practised.

(c) Drainage

Early efforts to secure adequate drainage are discussed in Chapter 10 (b) (ii). In the period since 1948, the problem of drain maintenance in the existing plantations has grown considerably.

Whenever labour has been in short supply this operation has been the first to suffer. In recent years very considerable efforts have been made to work off arrears and, in the thinning areas, most of the drains are now in fact cleaned shortly after extraction has been completed.

In areas of partial check and in the early post war plantations, however, a fair amount of this work remains to be done.

Amongst ploughing on the moderate and poorer quality peats, a rapid invasion of plough furrows by sphagnum moss is usual. The build up of this moss community is very rapid and partial blockage of the plough drains results. With an increased programme of planting to be carried out in the coming years, this problem will certainly increase. It appears to be likely that areas of deep ploughing on peat will require at least two major drain maintenance operations before the crops reach

the thinning stage.

(d) Recking

No recking of any consequence has been done in this forest, although some partial brushing for inspection purposes was carried out from 1938 to 1940.

(e) Brushing

This operation was started in 1938 and has continued at a varying rate right up to the present time. An addition of all the areas claimed for brushing since 1938 gives a total figure of 1,076 acres. This figure is obviously too high, perhaps by as much as 200 acres. The explanation of the difference appears to lie in the early years, when only very light brushing intensities were practised; since then many of these partially brushed areas have been re-brushed and claimed again.

At present, brushing is confined to small scattered areas of slow growth adjoining the stands being thinned. In the main, about 80% of living trees in the shade tolerant species have been brushed and 50% to 60% amongst the shade intolerant species. As far as possible, areas still requiring brushing are dealt with a year ahead of thinning.

(f) Pruning

No pruning of any consequence has been done in this forest.

(g) Other operations

A few hardwoods, mainly beech, have been planted or underplanted in the forest from time to time and in many cases natural hardwoods, mainly birch, have secured a footing in old rides or other openings in the forest canopy. At present, these trees are favoured whenever possible where they are not causing undue damage to the main conifer crops. It is hoped that their leaf fall will help to enrich the forest litter and that they will provide a more varied habitat for birds and other wild life in the forest. On old rides in particular, a birch screen may well form a useful barrier to fire.

Chapter 12 - Crop Improvement

(a) Enrichment

In the period 1935 to 1941, birch and various species of alder were introduced into small areas of backward spruce in an attempt to nurse the conifers out of check. Few of the alder appear to have survived.

(b) Rehabilitation

Only small areas have been rehabilitated, although extensive areas were given additional drainage in the early years of the forest. Most of the rehabilitation work has been done on areas of spruce planted on wet peat pockets or amongst heather. In 1930, directly notched spruces were lifted over small areas and the plants complete with turfs placed on top of the soil. From 1929 onward, backward areas were frequently treated with basic slag and in later years with ground mineral phosphate. In some early cases, the effects of phosphate manuring were lost through inadequate drainage, but this was quickly appreciated and, from about 1931 onward, all areas treated were drained as well as manured.

In recent years, standard practice for rehabilitation of checked spruce areas has been as follows:- Opening of all existing drains plus cutting of additional drains on really wet areas. A year later, all surviving spruce are given 2 ounces per plant of ground mineral phosphate scattered broadcast and, where stocking is poor, an average of some 500 plants of Pinus contorta per acre are planted on large turfs.

As a result of the Working Plan survey, carried out in 1961, it was found that only 37 acres of checked plantation remain to be treated.

(c) Other Methods

None.

Working Plan Area SOUTH HILTON

(combined)

Volumes in 000's h. ft. over bark
Areas in acres• Complete as
necessary

• Section

• Working Circle

• Felling Series

Species and Species Groups

Year (1)	B.H.Q.G. Classes (2)	Total		Pines		Spruces		Larches		D.F.		Other Conifers		Oaks		Beech		Other B-leaved Species	
		Volume (3)	Area (4)	Volume (5)	Area (6)	Volume (7)	Area (8)	Volume (9)	Area (10)	Volume (11)	Area (12)	Volume (13)	Area (14)	Volume (15)	Area (16)	Volume (17)	Area (18)	Volume (19)	Area (20)
62	Total	81.0	150	"	"	59	89	13	23	13	16								
	2 1/2"-6"	27.3				48.1		5.7		3.5									
	6 1/2"-9"	26.3				10.5		5.8		8.0									
	Over 9"	3.4				"		1.5		2.5									
62	Total	54.6	90	"	"	24.6	90	"	"	"	"								
	2 1/2"-6"	28.8				26.8													
	6 1/2"-9"	19.0				19.0													
	Over 9"	6.8				6.8													
65	Total	59.6	98	3.3	1.5	56.3	96.8	"	"	"	"								
	2 1/2"-6"	28.9		1.4		27.5													
	6 1/2"-9"	26.3		1.7		24.5													
	Over 9"	4.5		.2		4.3													
64	Total	55.5	100	.9	2	54.2	92	4.8	6	"	"							.2	"
	2 1/2"-6"	28.9		.8		27.7		.8										.2	
	6 1/2"-9"	23.0		.1		19.9		3.0											
	Over 9"	7.6		"		6.6		1.0											
	Total																		
	2 1/2"-6"																		
	6 1/2"-9"																		
	Over 9"																		

Record of Past Yields from Thinning/Felling

(combined)

Working Plan Area South EasternVolumes in 000's h. ft. over bark
Areas in acres

* Complete as necessary

* Section

* Working Circle

* Felling Series

Species and Species Groups

Year (1)	B.H.Q.G. Classes (2)	Total		Pines		Spruces		Larches		D.F.		Other Conifers		Oaks		Beech		O
		Volume (3)	Area (4)	Volume (5)	Area (6)	Volume (7)	Area (8)	Volume (9)	Area (10)	Volume (11)	Area (12)	Volume (13)	Area (14)	Volume (15)	Area (16)	Volume (17)	Area (18)	
51	Total	26.7	82	-	-	7.2	19	19.5	61	-	-	-	-	-	-	-	-	-
	2 1/2"-6"	24.2				6.4		18.5										
	6 1/2"-9"	1.8				.8		1.0										
	Over 9"																	
52	Total	27.0	70	-	-	11.1	32	.8	2	15.1	36							
	2 1/2"-6"	21.4				10.2		.8		10.4								
	6 1/2"-9"	5.6				.9				4.7								
	Over 9"																	
53	Total	20.7	48.5	.8	4	5.7	30	6.1	14.5	8.1	-							
	2 1/2"-6"	14.6		.6		3.9		4.6		5.5								
	6 1/2"-9"	6.1		.2		1.8		1.5		2.6								
	Over 9"																	
54	Total	20.6	96.9	-	-	7.4	33	12.5	63.5	.7	-							
	2 1/2"-6"	11.4				5.0		6.2		.2								
	6 1/2"-9"	9.2				2.4		6.3		.5								
	Over 9"																	
55	Total	41.5	107	-	-	20.1	59	4.7	19	12.7	29							
	2 1/2"-6"	30.4				20.4		3.8		6.2								
	6 1/2"-9"	11.1				3.7		.9		6.5								
	Over 9"																	

Record of Past Yields from Thinning/Felling
(combined)

For

Working Plan Area **South Stream**Volumes in 000's h. ft. over bark
Areas in acres* Complete as
necessary

* Section

* Working Circle

* Felling Series

Species and Species Groups

Year (1)	B.H.Q.G. Classes (2)	Total		Pines		Spruces		Larches		D.F.		Other Conifers		Oaks		Beech		O
		Volume (3)	Area (4)	Volume (5)	Area (6)	Volume (7)	Area (8)	Volume (9)	Area (10)	Volume (11)	Area (12)	Volume (13)	Area (14)	Volume (15)	Area (16)	Volume (17)	Area (18)	
46	Total	4.7	72															
	2 1/2" - 6"																	
	6 1/2" - 9"																	
	Over 9"																	
47	Total	5.0	63.5															
	2 1/2" - 6"																	
	6 1/2" - 9"																	
	Over 9"																	
48	Total	7.6	67.5															
	2 1/2" - 6"																	
	6 1/2" - 9"																	
	Over 9"																	
49	Total	26.5	62.5															
	2 1/2" - 6"																	
	6 1/2" - 9"																	
	Over 9"																	
50	Total	29.8	78															
	2 1/2" - 6"																	
	6 1/2" - 9"																	
	Over 9"																	

Notes Vol. in '49 includes output from 3 1/2 acres of windrow.
Approx. if area thinned in 1950 was covered by a Standing Cole contract.

Record of Past Yields from Thinning/Felling

For

Working Plan Area **South Stone**Volumes in 000's h. ft. over bark
Areas in acres* Complete as
necessary

* Section

* Working Circle

* Felling Series

Species and Species Groups

Year (1)	B.H.Q.G. Classes (2)	Total		Pines		Spruces		Larches		D.F.		Other Conifers		Oaks		Beech		0
		Volume (3)	Area (4)	Volume (5)	Area (6)	Volume (7)	Area (8)	Volume (9)	Area (10)	Volume (11)	Area (12)	Volume (13)	Area (14)	Volume (15)	Area (16)	Volume (17)	Area (18)	
62	Total	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	2 1/2" - 6"																	
	6 1/2" - 9"																	
	Over 9"																	
63	Total	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	2 1/2" - 6"	3.5	2.5	3.5	1.5	-	-	-	-	-	-	-	-	-	-	-	-	
	6 1/2" - 9"	2.4		2.4														
	Over 9"	2.7		2.7														
64	Total	.2	-	.2	-	-	-	-	-	-	-	-	-	-	-	-	-	
	2 1/2" - 6"																	
	6 1/2" - 9"																	
	Over 9"																	
	Total	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	2 1/2" - 6"																	
	6 1/2" - 9"																	
	Over 9"																	

Record of Past Yields from Thinning/Felling

For

Working Plan Area SOVER STROOKVolumes in 000's h. ft. over bark
Areas in acres* Complete as
necessary

* Section

* Working Circle

* Felling Series

Species and Species Groups

Species and Species Groups																		
Year (1)	B.H.Q.G. Classes (2)	Total Volume (3)	Area (4)	Pines		Spruces		Larches		D.F.		Other Conifers		Oaks		Beech		Ot
				Volume (5)	Area (6)	Volume (7)	Area (8)	Volume (9)	Area (10)	Volume (11)	Area (12)	Volume (13)	Area (14)	Volume (15)	Area (16)	Volume (17)	Area (18)	
	Total	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	2 1/2"-6"																	
	6 1/2"-9"																	
	Over 9"																	
56	Total	5.5	-	-	-	-	-	3.3	-	2.2	-							
	2 1/2"-6"	3.7						2.2		1.5								
	6 1/2"-9"	1.8						1.1		0.7								
	Over 9"																	
57	Total	-	-	-	-	-	-	-	-	-	-							
	2 1/2"-6"																	
	6 1/2"-9"																	
	Over 9"																	
58	Total	15.0	-	-	-	9.5	-	4.3	-	1.2	-							
	2 1/2"-6"	10.3				6.7		3.0		0.6								
	6 1/2"-9"	4.3				2.5		1.2		0.6								
	Over 9"	0.4				0.3		0.1		-								
59	Total	21.2		0.4		20.8		-		-								
	2 1/2"-6"	9.5		0.2		9.3												
	6 1/2"-9"	9.0		0.2		8.8												
	Over 9"	2.7		-		2.7												
60	Total																	
	2 1/2"-6"																	
	6 1/2"-9"																	
	Over 9"																	

Working Plan Area South StroneRecord of Past Yields from **Thinning/Felling**
(Mainly roadside clearance and windblows)*Volumes in 000's h. ft. over bark
Areas in acres* Complete as
necessary

* Section

* Working Circle

* Felling Series

Species and Species Groups

Year (1)	B.H.Q.G. Classes (2)	Total		Pines		Spruces		Larches		D.F.		Other Conifers		Oaks		Beech	
		Volume (3)	Area (4)	Volume (5)	Area (6)	Volume (7)	Area (8)	Volume (9)	Area (10)	Volume (11)	Area (12)	Volume (13)	Area (14)	Volume (15)	Area (16)	Volume (17)	Area (18)
51	Total	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	2 1/2"-6"																
	6 1/2"-9"																
	Over 9"																
52	Total	1.8	-	-	-	-	-	-	-	1.8	-	-	-	-	-	-	-
	2 1/2"-6"	1.1								1.1							
	6 1/2"-9"	0.7								0.7							
	Over 9"																
53	Total	8.7	-	-	-	0.6	-	-	-	8.1	-	-	-	-	-	-	-
	2 1/2"-6"	5.8				0.3				5.5							
	6 1/2"-9"	2.9				0.3				2.6							
	Over 9"																
54	Total	2.1	-	-	-	1.4	-	-	-	0.7	-	-	-	-	-	-	-
	2 1/2"-6"	0.9				0.7				0.2							
	6 1/2"-9"	1.2				0.7				0.5							
	Over 9"																
55	Total	0.6	-	-	-	0.6	-	-	-	-	-	-	-	-	-	-	-
	2 1/2"-6"	0.3				0.3											
	6 1/2"-9"	0.3				0.3											
	Over 9"																

Record of Past Yields from Thinning/~~Felling~~

For

Working Plan Area South ElmwoodVolumes in 000's h. ft. over bark
Areas in acres

* Complete as necessary

* Section

* Working Circle

* Felling Series

Year (1)	B.H.Q.G. Classes (2)	Total		Pines		Spruces		Larches		D.F.		Other Conifers		Oaks		Beech		O
		Volume (3)	Area (4)	Volume (5)	Area (6)	Volume (7)	Area (8)	Volume (9)	Area (10)	Volume (11)	Area (12)	Volume (13)	Area (14)	Volume (15)	Area (16)	Volume (17)	Area (18)	
61	Total	85.0	139	-	-	59.9	89	13.0	25	13.0	16							
	2 1/2"-6"	57.3				48.1		5.7		3.5								
	6 1/2"-9"	24.3				10.5		5.8		8.0								
	Over 9"	3.4				.4		1.5		1.5								
62	Total	24.6	30	-	-	54.6	90	-	-	-	-							
	2 1/2"-6"	28.8				28.8												
	6 1/2"-9"	19.0				19.0												
	Over 9"	6.8				6.8												
63	Total	56.3	96.5	-	-	56.3	96.5	-	-	-	-							
	2 1/2"-6"	27.5				27.5												
	6 1/2"-9"	24.5				24.5												
	Over 9"	4.3				4.3												
64	Total	59.5	100	.9	2	54.2	92	4.2	6	-	-							
	2 1/2"-6"	28.9		.8		27.7		.2										
	6 1/2"-9"	21.0		.1		19.9		3.0										
	Over 9"	7.6		-		6.6		1.0										
	Total																	
	2 1/2"-6"																	
	6 1/2"-9"																	
	Over 9"																	

Record of Past Yields from Thinning/Felling

Fo

Working Plan Area South StroneVolumes in 000's h. ft. over bark
Areas in acres* Complete as
necessary

* Section

* Working Circle

* Felling Series

Species and Species Groups

Year (1)	8.H.Q.G. Classes (2)	Total		Pines		Spruces		Larches		D.F.		Other Conifers		Oak		Beech		O
		Volume (3)	Area (4)	Volume (5)	Area (6)	Volume (7)	Area (8)	Volume (9)	Area (10)	Volume (11)	Area (12)	Volume (13)	Area (14)	Volume (15)	Area (16)	Volume (17)	Area (18)	
56	Total	65.7	94	-	-	34.5	43	25.8	45	2.0	4	1.4	2					
	2 1/2"-6"	39.6				20.4		16.9		1.0		1.3						
	6 1/2"-9"	24.1				14.1		8.9		1.0		.2						
	Over 9"	-				-		-		-		-						
57	Total	47.7	57	.2	1	25.4	30	3.5	8	18.6	18	-	-					
	2 1/2"-6"	21.6		.1		18.1		2.1		11.3								
	6 1/2"-9"	16.1		.1		7.3		1.4		7.3								
	Over 9"	-		-		-		-		-								
58	Total	47.4	73	1.2	4	42.4	63	2.0	2	-	-	1.8	4					
	2 1/2"-6"	36.1		.9		35.9		.4				.9						
	6 1/2"-9"	11.3		.3		8.5		1.6				.9						
	Over 9"	-		-		-		-		-		-						
59	Total	69.7	103	.6	3	55.8	77	13.3	23	-	-	-	-					
	2 1/2"-6"	40.0		.5		35.7		3.8										
	6 1/2"-9"	26.8		.1		19.0		7.7										
	Over 9"	2.9		-		1.1		1.8										
60	Total	70.2	95	-	-	24.5	37	45.7	38	-	-	-	-					
	2 1/2"-6"	39.9				19.9		20.0										
	6 1/2"-9"	27.5				4.2		23.3										
	Over 9"	2.8				.4		2.4										

Record of Past Yields from Thinning/~~Felling~~

Fo

Working Plan Area **South Ffynnon**Volumes in 000's h. ft. over bark
Areas in acres* Complete as
necessary

* Section

* Working Circle

* Felling Series

Species and Species Groups

Year (1)	B.H.Q.G. Classes (2)	Total		Pines		Spruces		Larches		D.F.		Other Conifers		Oaks		Beech		O
		Volume (3)	Area (4)	Volume (5)	Area (6)	Volume (7)	Area (8)	Volume (9)	Area (10)	Volume (11)	Area (12)	Volume (13)	Area (14)	Volume (15)	Area (16)	Volume (17)	Area (18)	
51	Total	26.7	80	-	-	7.2	19	19.5	61	-	-							
	2 1/2"-6"	24.9				6.4		18.5										
	6 1/2"-9"	1.8				.8		1.0										
	Over 9"	-				-		-										
52	Total	25.2	70	-	-	11.1	32	.8	2	13.3	36							
	2 1/2"-6"	20.3				10.2		.8		9.3								
	6 1/2"-9"	4.9				.9		4.0		-								
	Over 9"	-				-		-		-								
2. Volume breakdown																		
partly estimated.																		
55	Total	12.0	48.5	.8	4	5.1	30	6.1	14.5	-	-							
	2 1/2"-6"	8.8		.6		3.6		4.6										
	6 1/2"-9"	3.2		.2		1.5		1.5										
	Over 9"	-		-		-		-		-								
54	Total	18.5	96.9	-	-	6.0	33	12.5	63.5	-	-							
	2 1/2"-6"	10.5				4.3		6.2										
	6 1/2"-9"	8.0				1.7		6.3										
	Over 9"	-				-		-										
55	Total	40.9	107	-	-	23.3	59	4.7	19	12.7	29							
	2 1/2"-6"	30.1				20.1		3.8		6.2								
	6 1/2"-9"	10.8				3.4		0.9		6.5								
	Over 9"	-				-		-		-								

Chapter 13 - Regulation of Yield

(b) Methods of Yield Regulation

Past yields have not been subject to any systematic regulation or control beyond the thinning of areas prescribed in periodic plans of operations. At each plan revision, all the areas adjudged to be in need of thinning and which were reasonably accessible were brought into the plan. A total yield for these areas was calculated by allocating an average yield per acre for each species. The gross possible yield (so obtained) was then divided by four, corresponding to the chosen thinning cycle, to obtain the desirable annual cut. Areas were then allocated to each year of the plan of operations period so as to provide an approximation to the desired annual cut. In practice, a variety of factors gave rise to considerable fluctuation in the actual yields obtained e.g. poor marketing conditions often caused a slow down in production; cutting for road lines and labour shortage caused reductions in the thinning achieved; underestimation of possible yield frequently led to production targets being passed before the whole prescribed area had in fact been thinned.

In recent years, some attempt has been made to arrive at a reasonable estimate of thinning potential using past data as a guide. The most recent estimate gave a figure for the annual yield from thinnings only of 75,000 to 80,000 hoppus feet per annum.

From statistics on volume production recently provided by the Directorate Survey team it appears that the annual thinning programme for the next few years should be of the order of 80,000 hoppus feet per annum.

Average yields per acre from thinnings over the past eighteen years have been:

46-50	-	205 hoppus feet/acre
51-55	-	305 hoppus feet/acre
56-60	-	708 hoppus feet/acre
61-63	-	619 hoppus feet/acre.

Chapter 14 - Forest Roads and Access

(a) Construction

From 1946 to 1956, construction of roads proceeded erratically as resources were available. A serious attempt had been made in 1948 to devise a master road plan which was intended to provide an extraction system covering the whole forest. The plan was based upon the concept of a limited number of well made all-weather roads, to which a system of low specification feeder tracks would be linked.

Altering methods of working and difficulties with maintenance of steep tracks in a high rainfall area led to a reappraisal of the situation. Since 1956 a heavy programme of reconstruction and new construction has been carried out with the aim of forming a system based on the principles outlined below.

The road lay-out should provide a system of parallel all-weather routes aligned as near the contour as conditions permit and linked to the public road system by the minimum number of connecting roads. The parallel extraction roads should be as far apart as ground conditions and efficient extraction methods will permit. The specification for the roads is as follows:-

- (i) Width of carriageway - 10 feet, with widening on bends.
- (ii) Maximum gradient 1 in 10, although in special cases over short distances the gradient may be increased to 1 in 8.
- (iii) Minimum radius of curvature on bends - 35 feet.
- (iv) Spacing of passing places - 80 yards to 180 yards.
- (v) Formation, bridges and surfacing designed for loads of 20 tons.

The cost of construction varies considerably with the quantity of rock cutting required and with the haulage distance of surfacing material. Recent costs in this area vary from £4,000 to £6,000 per mile. Excellent rock quarries of shattered Lewisian gneiss are of frequent occurrence in the forest and have been used exclusively for road making in recent years.

During the main period of road construction, the spacing of roads considered necessary was of the order of 200 to 250 yards. Present practice would indicate much wider spacing so that the older plantations tend to be over-roaded by today's standards. The position is also aggravated by the presence of a number of old feeder tracks which are only partially useful for extraction. At the end of 1964, 21 miles of road construction had been completed, of which 15.7 miles are to full standard. The 5.3 miles of substandard road are mainly old feeder tracks of limited value for extraction purposes, but 2 miles of road still requires to be brought to full standard.

Most of the pre-war plantations have been adequately roaded for extraction, but some 2 miles of feeder spurs are still required.

(b) Maintenance

This is the responsibility of the forest staff for all roads not currently under construction. The work involved consists mainly in cleaning drains and culverts together with filling of pot holes. For more advanced work such as grading, the specialist engineer staff may be asked to assist. At present one man is engaged upon road maintenance on a full time basis.

(c)/

(c) Access

On the whole motor access can now be obtained to all parts of the forest, except for the isolated remnant of the acquired plantation in Strone Wood. The present phase of construction to be completed by 1968 will bring all existing access routes to full standard specification.

Chapter 15 - Powered Vehicles and Machines

(a) Local Transport

A long wheel base 5 ton lorry with timber hoist has been allocated to the forest for transport of men, plants, stores, timber etc. A 7 cwt. Ford van is allocated to the Forester for supervision purposes and for occasional transport of men and light stores. A B.S.A. Bantam Motor Cycle has been allocated to the Assistant Forester for supervisory work.

A wheeled Ferguson tractor with double drum winch is held for extraction work.

A wheeled Fordson tractor with winch is held in common with North Strome and Achnashellach forests and is used for extraction in difficult areas and for miscellaneous haulage work.

This allocation of transport is considered to be adequate for the efficient and economical management of the forest at the present time.

(b) Other Mechanical Equipment

A Hathaway Fire Pump is held as part of the forest's fire fighting equipment.

Ploughing equipment is drawn from a Conservancy pool of tractors under the control of the Divisional Officer.

Road making machinery is either drawn from the pool held by the Conservancy Engineer or is hired by him.

Mechanical saws have replaced the conventional hand tools in the forest. Three saws have been allocated by Conservancy, mainly intended for instructional and training purposes. It is likely that regular production workers will in future supply their own power tools.

(c) Availability of Equipment from Other Sources

Hired plant of all types is readily available from a number of local and national contracting firms. Such hires are normally arranged by Conservancy Engineer staff. A small number of vehicles is held in a Conservancy pool for temporary replacement of forest vehicles withdrawn for repair.

(d) Maintenance and Repair

Day to day maintenance of machinery is the responsibility of the driver or of the Forester. A Conservancy Inspection Mechanist makes regular inspections of all mechanical equipment held at the forest. Inspection reports are forwarded to the Conservancy Mechanical Engineer for action where required. Breakdowns or defects in the interval between regular inspections are recorded on a defect report which is submitted to the Conservancy Mechanical Engineer.

Action on such reports by the Mechanical Engineer, depending on the nature and extent of the repair required, is as follows:-

- (i) For minor repairs, a mechanic from the Conservancy Workshop is sent to the forest to effect the repair.
- (ii) For repairs costing around £5 or less which cannot be undertaken at the unit, the vehicle may be towed or driven to a local garage.
- (iii) For relatively large or expensive repairs, the work is carried out either at the Directorate Workshops at Chapelhall or at the Conservancy Workshop.

Chapter 16 - Marketing and Exploitation

(a) Marketing

General

The outlet for forest produce in this area is limited, mainly because of haulage costs. Small sized material has at present two main outlets, as pulpwood for Scottish Pulp and Paper Mills, or as raw material for the Particle Board Factory at Inverness. Sawmill sized logs have a slightly greater variety of markets, but in the main there are three principal outlets; sawn mining timber, building timber (boards and battens) and fencing material. Of the three, the latter is the most profitable at present, but is limited by a small total consumption in the area.

1. Standing Sales

There has only been one standing sale of thinnings in this forest, in 1950, which amounted to some 12,000 hoppus feet mainly of Japanese larch. The buyer was Mr. Adam Wilson, Troon and the price was 6¹/₂d. per hoppus foot. The average value for recent standing sales in some other West Coast forests is about 9d. per hoppus foot. The cost of marking, measuring and supervision together with overheads appears to be about 3d. per hoppus foot.

2. Commission Working

Since 1951, all timber at this forest has been felled and extracted to roadside by Forestry Commission labour or by contractors employed by the Forestry Commission. Up to the end of 1961, the timber was mainly sold in the length at roadside. Small quantities were sold after conversion as mining timber and for experimental pulping. During this period the price obtained for roadside sales was very low and often failed to cover the total cost of production.

Since 1962, efforts have been concentrated on the development of more efficient methods of working and on training of workers. Most of the timber is now crosscut at stump into pulpwood and sawlogs. During the period 1962 to 1964 the smallwood was sold to the Particle Board Factory at Inverness or to Timberbuyers Limited for shipment to pulpworks outwith the area. The prices obtained for this material were low. The sawlog production, however, attracted a keen demand with a satisfactory increase in prices at roadside.

The new pulp mill at Fort William is expected to open during 1965 and should provide a steady market for the smallwood at a good price.

(b) Exploitation

1. Standing Sales

With no sales of this type since 1950, there are no valid data on merchants' working methods available. It is perhaps significant, that a number of merchants in the Conservancy are now adopting the methods of working developed at this forest.

There has been no clear felling to date.

2. Commission Working

This forest has been designated as one of two "Production" forests in Scotland, with the aim of providing data on working methods and costs and for experimental work in developing new techniques./

techniques. At present, a team from the Work Study Section is stationed in the area and has been making a special study of production methods and costs since 1961.

All marking and measuring is done by the local staff. Standing volume is ascertained by means of the Tariff method.

Felling and extraction are almost entirely carried out on a piecework basis by the local labour force. Felling and crosscutting by power saw is now the regular practice. For extraction a variety of methods are employed. The principal method is by Isachsen double drum winch using techniques developed at this forest. A secondary method under development is by horse using specially designed sledges to achieve large outputs. A Fordson tractor with a heavy single drum winch is used for the extraction of heavy sawlogs.

All stumps are treated with creosote immediately after felling, as a precaution against the spread of fungal infection.

(c) Observations on the Relative Merits of Standing Sales and Departmental Working

Although in the past it may have been, under the present accounting system, more profitable to sell timber standing to a merchant than to work it with Forestry Commission labour, with improved techniques and greater efficiency and a steady outlet for the produce as pulpwood and sawlogs; it is doubtful today if the Trade could work the timber more profitably. There has been no opportunity of late to compare the two methods of working.

Chapter 17 - Risks

(a) Animals

Lying in an area devoted to sheep farming and deer forest, protection against both sheep and red deer is essential. The latter are not numerous within the forest area, but require to be continuously controlled. Roe deer are common, but not unduly numerous at present.

Rabbits are present in the forest area, but only in small numbers. Myxomatosis in 1955 virtually cleared the forest of these pests, but small breeding pockets appear to have survived and have been increasing recently despite active trapping.

A few foxes breed within the forest boundaries each year and are killed as an obligation towards adjoining proprietors.

The average annual kill of these animals during the past five years has been:

Red deer	-	7
Roe deer	-	15
Rabbits	-	20
Foxes	-	4

Wildcats are occasionally seen and killed within the forest.

(b) Birds

Damage to plantations by birds is rare in this forest. Capercaillie and Black game are not known to be present.

(c) Insects

There are no injurious insect populations of any consequence. Pockets of Larch Sawfly, Pine Sawfly, Pine Weevil and Pine Shoot Beetle have been seen from time to time, but occurrence has been purely localised.

(d) Weeds

No abnormal weeds are present and no unusual control measures are necessary.

(e) Fungi

Occasional stems are found to be infected by rot fungi, most probably by *Fomes annosus*, but there are no signs of widespread or increasing infection. As a standard hygiene measure, all stumps are treated with creosote or Sodium nitrite within twenty minutes of felling.

(f) Climate

There are no undue climatic risks. Snowfall is rarely heavy and frosts are seldom severe or of prolonged duration. Late spring frosts cause occasional damage to new growth.

Heavy rainfall may cause drain erosion at any season of the year although serious damage has been avoided to date. Care has, however, to be taken at all times with road drains and culverts to avoid scour and washouts. Minor landslides on road cuttings have given trouble on occasions.

Short periods of spring drought associated with drying easterly winds may occasionally hold up planting operations.

(g)/

(g) Trespass

Damage by trespassers has been insignificant to date, although litter dumping has been a source of annoyance. Recent road construction may tempt more tourists in to the forest, although from current experience it appears that most people will ask for permission before making use of Forestry Commission roads.

(h) Atmospheric Pollution

None.

(i) Fire

There is nothing abnormal to record. Belts of Japanese larch or hybrid larch are usually planted on the periphery of newly formed plantations where the ground is suitable for these species. Internal breaks of these larches or of hardwood species are planted on suitable sites to create blocks of not more than 200 acres between fire belts.

Chapter 18 - Nurseries

The forest nursery of some 2 acres was closed in 1946 and let as a grazing tenancy. Plants for present day requirements are normally supplied from the main Conservancy nurseries in the Black Isle.

Chapter 19 - Staff and Labour(a) Staff

The forest was managed in conjunction with North Strome forest from 1925 until 1950. Since that time it has been managed as a separate accounting unit. The following officers have been in charge of the forest from 1925 up to the present time.

(1) Conservators and Divisional Officers

<u>Name</u>	<u>Rank</u>	<u>Date</u>
F. Scott	Divisional Officer	1925
J. Fraser	" "	1931
D. Spraggan	" "	1939
A. Watt	" "	1942
J. Fraser	Conservator	1945*
J. T. Fitzherbert	Divisional Officer	1948
J. A. Dickson	" "	1949
R. A. Innes	" "	1956
J. A. Dickson	Conservator	1956
H. A. Maxwell	"	1963

*There was no Divisional Officer between 1945 and 1948.

(2) District Officers

J. W. Mackay	1925
J. Meldrum	1927
D. Spraggan	1931
T. A. Robbie	1936
A. M. Fraser	1938
A. Orr Ewing	1946
R. A. Innes	1947
D. Graham Campbell	1950
D. MacLeod	1956
G. Taylor	1960

(3) Foresters, Assistant Foresters and Foremen

W. Murray	Foreman	1925
W. Murray	Forester	1926
D. MacDonald	"	1929
A. MacRae	Foreman	1936
	(one year only)	
A. MacLennan	Forester	1947
W. Lawson	Foreman	1951
F. McAllan	Forester	1952
J. Denholm	Foreman	1958

(4) Present Staff

Conservator	H. A. Maxwell
Divisional Officer	R. A. Innes
District Officer	G. G. M. Taylor
Forester	F. McAllan
Assistant Forester	J. Denholm

The current arrangement is that the forest is managed as a single unit by one Forester and one Assistant Forester. This appears to be adequate at present.

(b) Labour

The/

The present (September, 1964) age class structure of the labour force is analysed below.

Age Group Years	Total	Gangers	S.F.W.	F.W.	T.F.W.	Others
20 & under	2	-	-	-	1	1 Juvenile
21-30	5	-	1	1	1	2 Drivers
31-40	7	1	2	-	1	3 Driver, Clerk, Handyman.
41-50	3	-	3	-	-	-
51-60	3	1	1	-	-	1 Horseman
over 60	3	1	1	-	-	1 Trapper
Totals	23	3	8	1	3	8

39% of the men are established and the average wastage rate is two men per year.

Quality of Labour

In general, the quality of the labour is good but there are two distinct groups

- (a) Regular pieceworkers of very good quality.
- (b) Non piecework men, of only average quality.

Most of the latter are in the older age groups and have given good service over many years.

At the present time the number of men in each category suits the programme of essential work fairly well, as expenditure on maintenance, brashing, cleaning and miscellaneous jobs provides sufficient useful employment for the older men. In production work and other jobs requiring a high degree of fitness there is rather more to be done than the present piecework squad can handle alone, but contract labour is readily available and is used to supplement the labour force at peak periods.

Recruitment Possibilities

The local labour pool is now virtually exhausted. An adequate force has so far been obtained without recourse to transporting men from outside a three mile radius of the forest.

Additional men could be obtained in two ways:

- (i) by transporting from further afield
- (ii) by adding new houses to the forest village.

Recourse to (i) above would only be justified if a fairly substantial addition to the labour force was to be made at one time, say five or more men.

Recruitment of additional men if houses were available would not be unduly difficult as there are some casual labourers trying to settle more permanently each year, who would be attracted by a house together with the opportunity for regular piecework.

At present there are other jobs available for manual labour in the area, /

area, mainly short term construction projects such as new roads, hydro-electric work etc. To date, the forest has not lost men to this type of work mainly because of the long term security offered, together with the chance of reasonably high earnings for younger men. Regular work in the area is to a very large extent non-competitive with forestry being provided mainly in agriculture and in public services e.g. railway, ferries and County Council roadmen.

Wages in these employment categories are less attractive to the younger men than in forestry, while older men appear to find forest conditions of service more congenial.

There is a fairly large number of young boys becoming available for employment, mainly from the Loch Carron area. Some of them have been employed at Achnashehallach forest, but transport handicaps at present preclude their employment at South Strone.

Training Schemes

Temporarily, a Work Study party consisting of a District Officer and Forester was based on this forest. In addition to specialised studies on work and methods, the party devoted a certain amount of time to training. During prolonged wet weather, instruction on tool maintenance was given, while in the field, practical demonstration and guidance on methods and use of equipment was also given.

Conservancy tool instructors now conduct courses of instruction in a variety of subjects as required.

All members of the labour force are instructed and trained in fire fighting and the use of fire equipment.

Recruitment of Gangers

At present the ganger requirement is adequately filled and suitable replacements are available. Training consists primarily of ensuring adequate experience in all facets of the forest work, together with some simple instruction e.g. on choice of species, completion of time sheets and so on.

Piecework and Bonus Schemes

The principal limitation upon a wider use of piecework is the ability of the men in the squad, as many of the older men are now incapable of undertaking such work and of earning a reasonable wage.

All principal operations and a variety of miscellaneous jobs have been given on a piecework basis during the course of the last few years.

Whenever sufficient able men are available for a job of reasonable duration, they are given the opportunity to do it on a piecework basis. The Work Study party are mainly concerned at present with the production of a piecework scheme based on local conditions for timber production operations. In the interim, a provisional piecework scheme based on Work Study results elsewhere is in force and appears to be working reasonably satisfactorily.

There are no bonus schemes. Piecework rates other than for production operations are set by the Forester from experience and approved by the District and Divisional Officers.

Existing Houses and Transport

There are eight workers' houses and five Forest Workers' holdings at Achmore all of which are occupied. A sixth worker's holding also occupied is situated at the eastern end of Ardnariff. There are two farms at Achmore; both are let but do not supply any forest labour.

All of the men employed live within 8 miles of Achmore village and no transport is provided to bring them to the reporting point there. The lorry and van are used to transport the men to their various working points from Achmore as required. Many of the men on piecework use their own transport in order to save time.

Chapter 20 - Houses and Holdings, Other Buildings and Special Installations

(a) Houses and Holdings

There are eight post-war Swedish pattern timber houses at Achmore with full mains services. Each house has three bedrooms, living room, kitchen and bathroom together with a garden and hen run. This pattern of house was widely used in North Scotland in the immediate post-war period by local County Councils as well as by the Forestry Commission. The standard of accommodation is good, but the house pattern has proved to be costly to maintain, particularly in the wetter districts. Additional weather proofing is being applied at present.

There were originally seven Forest Workers' Holdings, but one of these, No. 3, had a very poor house when acquired and is now unlet and uninhabitable. Of the six holdings let, four have brick built houses dating from about 1930 and two have old stone built houses acquired with the forest area.

The standard of accommodation in all of these houses leaves much to be desired because of their small sized rooms and inadequate damp courses. All but three (Nos. 4, 5 and 6) have electricity and all have an adequate water supply with reasonable toilet facilities. Only one house, No. 7 Achmore is so far below standard as to merit early replacement.

The present land allocated to each of the holdings is:

No. 1	-	19 acres
" 2	-	22 acres
" 4	-	8 acres
" 5	-	18 acres
" 6	-	13 acres
" 7	-	5 acres

The land of No. 3 holding is now let as a separate grazing subject; No. 1 holding has at present an additional 2 acres, formerly the nursery.

The Forester and Assistant Forester are accommodated in substantial three bedroomed houses at Achmore and Dailfearn nearby. The Assistant Forester's house at Achmore suffers badly from damp but is otherwise suitable for its purpose.

In addition to the housing used by Commission staff, there are the farms of Achbeg and Achmore both of which are let. Neither farm provides housing for forest staff.

Due to the need for additional labour, three additional houses have been planned and are under construction. One of the houses will be occupied by the Assistant Forester, the present house being freed for occupation by a worker. The new houses comprise a detached bungalow and a block of two semi-detached bungalows. The houses are sited near the existing village nucleus at Achmore. This additional accommodation should provide for an adequate labour force during the period of this plan.

(b) Other Buildings

During 1963 a new administrative block was constructed at Achmore. The forest office is located in this building.

There are sheds at Dailfearn, Achmore and in Strath Ascaig used for storage of tools and stores, workshops, garaging and stabling. Wet weather shelter is at present provided by tarpaulins for use on the hill.

The/

The administrative centre at Achmore has eliminated the need for several of these older buildings and will provide a more convenient site for wet weather working. Tarpaulin shelters will continue in use on the hill, but plans are in hand for the erection of a number of small semi-permanent wet weather sheds at strategic points within the forest.

Briefly, when completed present plans envisage the following:-

- (i) 1 Garage at Dailfearn - Forester's van.
- (ii) 1 Garage near Achmore - Lorry, tractor, motor cycle, plus fuel supplies nearby.
- (iii) 1 Permanent Stable near Achmore.
- (iv) 1 Mobile Stable - Placed as required on permanent foundations at one of several pre-selected sites within the forest.
- (v) Administrative Centre at Achmore - Comprising office, tool store, fire shed, workshop, toilet.
- (vi) 4 Wet Weather Sheds - Placed at convenient points within the forest as required, similar to the mobile stable.

(c) Special Installations

A field of approximately 2 acres near Achmore formerly used as a horse-park has been roaded and is reserved for use as a produce depot.

Chapter 21 - Research and Experiment

(a) Research Branch Work

There are no Research Branch interests at present within the forest.

(b) Investigations by Local Staff

The forest has been designated a Production Forest and has until recently been host to a Work Study Team.

Long Term objectives have been defined by Director (Scotland) as

(i) To provide material for fair comparison between Forestry Commission working and standing sales and to serve as a standard for Forestry Commission working.

(ii) To preserve a tradition of timber working in all ranks of the Forestry Commission so that a skilled nucleus is always available to provide demonstration areas for neighbouring forests where standing sales were the rule.

(iii) To provide grounds for the investigation of new techniques, particularly mechanisation, where full benefit can be obtained only by close co-operation between user and grower on a large scale operation.

Short term objectives are at present concerned with development work for the pulp mill near Fort William.

Chapter 22 - Other Factors

Present Government proposals envisage a new by-pass road through the forest at Ardnariff which will provide unhindered flow of traffic east to Dingwall. Construction has been delayed owing to the uncertainty over the future of the railway to Kyle of Lochalsh.

The provision of this road will undoubtedly lead to an increased traffic flow through the forest and permanent timber lay-byes on the public roadside will probably be required, together with additional fire precautions.

Forestry Commission

Annual Control Summary

Working Plan area: South Devon

Operation (1)	Unit of Measurement (2)	F.Y. 61		F.Y. 62		F.Y. 63		F.Y. 64		F.Y. (11)
		Programme (3)	Actual (4)	Programme (5)	Actual (6)	Programme (7)	Actual (8)	Programme (9)	Actual (10)	
Prep. Ground - Ploughing	Acres	150	313	220	220	300	250	150	148	
Prep. Ground - Other	"	-	-	-	-	-	-	-	-	
Planting	"	150	156	250	252	300	300	230	205	
Drains New	Chains	310	601	1,000	829	1,200	696	750	639	
Fences New - Stock	"	-	-	-	-	-	-	-	-	
" " - Deer	"	350	177	-	208	100	75	160	285	
Planting Up	H. plants	16	8.5	20	10	20	84	80	88	
Seedling	Acres	40	23	100	85	150	135	200	99	
Cleaning - Brushing	"	45	398	44	16	40	18	30	8	
" " - Other	"	68	411	40	-	40	-	20	-	
Drains, Maintenance	Chains	910	142	1,000	1,010	1,000	506	1,000	1,344	
Fences, "	"	160	30	240	34	250	666	250	302	
Roads New, Formation	Miles	34	18 approx.	31	-	-	-	-	-	
Roads New, Metalling	"	34	34	34	34	-	-	-	-	
Roads, Maintenance	"	124	-	15	19	19	19	19	19	
Protection	Acres	Whole Forest	✓	Whole Forest	✓	Whole Forest	✓	411	✓	

* F.Y. 62 - Fencing - erection to be done by contractors - erection actually done by F.Y. 63, labour, balance C/Fed to F.Y. 62
 * F.Y. 63 - Ploughing - programme cut to conform to reduced planting programme for F.Y. 64
 * F.Y. 64 - Fencing - back log from F.Y. 63 completed in F.Y. 64.

Forestry Commission

Annual Control Summary

Working Plan area: **South of**

[illegible]

Y.T. 61 - Extraction to be partly done by Contract Labor.

Chapter 23 - Working Plan Annual Report

(a) Form WP 20 - Annual Control Summary - F.Y. 61

(b) A brief account of the Year's Work

(1) Planting

156 acres were planted against a prescribed programme of 150 acres. The excess planting was carried out to balance a shortage at North Strone forest. The work was mainly carried out on piecework in the area lying above the older plantation limits. Almost the entire planting area had been prepared by ploughing with a combination of Cuthbertson single mould board plough and Clarke/Ross tine.

Planting was completed by the end of April and a good "take" of plants has been observed.

(2) Beating Up

A total of 8,500 Sitka spruce plants were used to make good red deer damage to Pinus contorta in the P.58 area which was originally planted with a mixture of both species.

(3) Plantation Maintenance

Weeding was carried out over 23 acres of the P.58 plantation, mainly in areas with a heavy growth of Molinia. Brashing was carried out over 39½ acres and cleaning over 41 acres mainly in conjunction with the thinning programme. The prescribed programme of cleaning was 68 acres, intended to free patches of slow growth within stands being thinned; on advice given by the Work Study team, this practice was ended during the year as being of doubtful economic advantage. Brashing within the thinnable areas of the forest is now virtually complete, with the exception of small pockets of slow growth.

Clearing of drains following thinning was badly held up during the year because of extraction difficulties.

(4) Thinning

Production operations during the year were badly hampered because of labour and equipment shortages particularly for extraction. A total of approximately 85,000 hoppus feet was felled against an estimate of 100,000 hoppus feet, but only 60,000 hoppus feet was extracted during the year. Removal of produce by merchants continued to be much slower than the rate of production and many of the roads within the forest are now badly cluttered with timber.

During the year, Work Study operations were mainly concerned with method study on current practice and with preparations for intensive development work during F.Y. 62.

(5) Acquisition

The acquisition of 408 acres of land from Fernaig Estate was approved during the year, but the case has not as yet been legally completed. The agreement includes the disposition of 37 acres of forest land to Fernaig and the net gain of plantable land is 296 acres.

Chapter 23 - Working Plan Annual Report

- (a) Form WP 20 - Annual Control Summary - F.Y. 62
- (b) A brief account of the Year's Work

(1) Planting

252 acres were planted against a prescribed programme of 250 acres. The work was mainly carried out on a piecework basis in the Glen Udalain area. Almost the entire planting area had been prepared by ploughing with a combination of Cuthbertson single mould board plough and Clarke/Ross tine.

Planting was somewhat delayed by prolonged spells of severe frost, but the take of plants appears to be good.

(2) Beating Up

A total of 10,000 plants were used to make good damage in the P.60 area caused by grazing. During part of the year, the boundary fence was open due to road making activity and sheep and red deer entered the area in some numbers. The plants used were Sitka spruce and Pinus contorta in equal proportions. Further damage remains to be made good in F.Y. 63.

(3) Plantation Maintenance

Weeding was carried out over 85 acres, mainly in the P.60 area. The principal weed species was Molinia. Brushing was carried out over only 16 acres against a prescribed programme of 44 acres. The areas remaining to brush are mainly in small pockets of slow growth. Following advice given by the Work Study section last year, no cleaning was done during the year.

Drain maintenance arrears were reduced considerably and a total of over 1,000 chains of drain were repaired.

(4) Thinning

Production operations during the year were handicapped to some extent by the uncertain state of the timber market. In all, approximately 55,000 hoppus feet was felled against a target of 88,000 hoppus feet. Extraction arrears were largely worked off and a total of 72,000 hoppus feet were brought to the despatch point.

During the year, many new techniques and pieces of new equipment were tested under the direction of the Work Study team. Very satisfactory results were obtained towards the end of the year despite many frustrations and handicaps at an earlier stage.

After completing the last roadside sale of timber in the length, a start was made with conversion at forest for sale in two categories, logs and pulpwood. In all, some 40,000 hoppus feet of timber was processed at forest and substantial volumes were delivered to the Particle Board Factory in Inverness using Forestry Commission transport.

(5) Acquisition

The acquisition of 408 acres of land from Pernaig Estate was completed during the year.

Chapter 23 - Working Plan Annual Report

- (a) Form WP 20 - Annual Control Summary - F.Y. 63
- (b) A brief account of the Year's Work

(1) Planting

300 acres were planted against a prescribed programme of 300 acres. The work was carried out in the Glen Udelsin area by contract and piecework squads. Some 90 acres were planted during the back-end period and suffered very severely from frost and exposure. Almost the entire planting area had been ploughed by a combination of Guthbertson single mould board plough and Clarke/Ross tines.

Apart from the heavy losses amongst the back-end planting, the take of plants has been good.

(2) Beating Up

A total of 84,000 plants were used to make good damage in the P.59, P.60 and P.61 areas caused by sheep and deer. The old boundary fence was repaired and animals were driven out. Further work will be required in F.Y. 64 to complete the restocking of this area.

(3) Plantation Maintenance

Weeding was carried out over 135 acres, most of the work being done by contract labour. Brushing was carried out over only 18 acres against a prescribed programme of 40 acres due to shortage of labour.

For the same reason, drain maintenance fell somewhat in arrears with only 306 chains achieved against a target of 1,000 chains.

(4) Thinning

Production operations during the year were badly handicapped by the partial closure of the Particle Board Factory at Inverness. In all, approximately 57,000 hoppus feet were felled and extracted. The new extraction equipment and techniques were further developed and the time lag between felling and extraction reduced.

The greater part of the volume felled was processed at forest and despatched by Forestry Commission transport equipped with power loading. In all, some 20,000 hoppus feet of logs and 27,000 hoppus feet of chipboard were despatched.

(5) Acquisition

Agreement has been reached with Fernaig Estate for the acquisition of a further 80 acres of land of which 64 acres are plantable. Negotiation is in progress for a small block of land at Auchtertyre containing 58 acres of plantable land.

(6) Other

During the year the new administrative centre at Achmore was completed and has provided excellent office accommodation together with storage facilities and a tool maintenance room. In order to provide for essential new recruits it has been agreed that three new houses will be built at Achmore during F.Y. 64.

Chapter 25 - Working Plan Annual Report

- (a) Form WP 20 - Annual Control Summary - F.Y. 64
- (b) A brief account of the Year's Work

(1) Planting

205 acres were planted against a prescribed programme of 210 acres. The work was carried out in the Glen Udalain area without the use of contractors. Only two plant species were used, Sitka spruce on 124 acres and Lodgepole pine on 81 acres. Planting was completed in good time and the take of plants was good.

(2) Beating Up

A total of 88,000 plants were used to complete the restocking of the P.61 area damaged by deer and sheep, plus some of the frost damaged areas in P.62 and P.63. The frost damaged area will require some further attention in F.Y. 65.

(3) Plantation Maintenance

Labour shortages again caused some reduction in achievement against prescribed programmes, but a large part of the arrears of drain maintenance were made good. In all, 1,344 chains of drains were cleaned against a prescribed target of 1,000 chains.

(4) Thinning

Production operations were again hampered by marketing difficulties, but some 59,000 hoppus feet were felled and 61,000 hoppus feet extracted against a prescribed target of 65,000 hoppus feet. The production of sawlogs amounted to some 40% of the total and 24,759 hoppus feet of log material was sold during the year. Of the smallwood, some 11,000 hoppus feet was sold to the Particle Board Factory at Inverness and 24,000 hoppus feet was sold at roadside for export as pulpwood. Of the pulpwood, some 20,000 hoppus feet was peeled before delivery to the merchant.

Log prices were satisfactory on the whole and firmed during the year, but smallwood prices remained low. Despite this a working surplus of approximately 2d. per hoppus foot was achieved.

(5) Acquisition

Negotiations for the additional area on Fernaig Estate and the small block at Auchtertyre were satisfactory and these cases are awaiting legal completion.

(6) Other

Three new houses were constructed during the year and are nearing completion. The buildings comprise a detached Dorran bungalow for the Assistant Forester and a block of two semi-detached Dorran houses for forest workers. With the old house formerly occupied by the Assistant Forester accommodation is now available for three additional recruits.

An additional Assistant Forester was sent to the forest during the year: he has only just completed his studies at the Forester training school and will be under instruction for most of F.Y. 65.

(a) Form WP 20 - Annual Control Summary - F.Y. 64

(b) A brief account of the Year's Work

(1) Planting

205 acres were planted against a prescribed programme of 210 acres. The work was carried out in the Glen Udalain area without the use of contractors. Only two plant species were used, Sitka spruce on 124 acres and Lodgepole pine on 81 acres. Planting was completed in good time and the take of plants was good.

(2) Beating Up

A total of 88,000 plants were used to complete the restocking of the P.61 area damaged by deer and sheep, plus some of the frost damaged areas in P.62 and P.63. The frost damaged area will require some further attention in F.Y. 65.

(3) Plantation Maintenance

Labour shortages again caused some reduction in achievement against prescribed programmes, but a large part of the arrears of drain maintenance were made good. In all, 1,344 chains of drains were cleaned against a prescribed target of 1,000 chains.

(4) Thinning

Production operations were again hampered by marketing difficulties, but some 59,000 hoppus feet were felled and 61,000 hoppus feet extracted against a prescribed target of 65,000 hoppus feet. The production of sawlogs amounted to some 40% of the total and 24,759 hoppus feet of log material was sold during the year. Of the smallwood, some 11,000 hoppus feet was sold to the Particle Board Factory at Inverness and 24,000 hoppus feet was sold at roadside for export as pulpwood. Of the pulpwood, some 20,000 hoppus feet was peeled before delivery to the merchant.

Log prices were satisfactory on the whole and firmed during the year, but smallwood prices remained low. Despite this a working surplus of approximately 2d. per hoppus foot was achieved.

(5) Acquisition

Negotiations for the additional area on Fernaig Estate and the small block at Auchtertyre were satisfactory and these cases are awaiting legal completion.

(6) Other

Three new houses were constructed during the year and are nearing completion. The buildings comprise a detached Dorran bungalow for the Assistant Forester and a block of two semi-detached Dorran houses for forest workers. With the old house formerly occupied by the Assistant Forester accommodation is now available for three additional recruits.

An additional Assistant Forester was sent to the forest during the year: he has only just completed his studies at the Forester training school and will be under instruction for most of F.Y. 65.

During the year the Work Study team completed its term of service and was broken up. The replacement team is now based in the Great Glen, but development work on production methods is continuing at South Strome.

CALCULATION OF OPTIMUM REPLACEMENT DATE

A. CALCULATION OF DISCOUNTED REVENUE FROM EXISTING CROP

Years from Start	0 Fell* Thin	10 Fell* Thin	20 Fell* Thin	30 Fell* Thin	40 Fell* Thin	Remarks
(1)	(2)	(3)	(4)	(5)	(6)	(7)
A(i) Volume Yield H.ft. per acre	2045 592	2,70 600	3100			
A(ii) B.H.Q.G. inches	6½ 5½	8 7½	9½			
A(iii) Price	11 10	14 11	16			
A(iv) Value Yield = (i) x (iii)	85 25	144 27	206			
A(v) Discounting factor, 3½%	1.000	.709	.503	.356	.253	
A(vi) Discounted revenue £ per acre = (iv) x (v)	85 26	102 19	104			
A(vii) Insert final value for DR to present day in column appropriate to replacement date.	85	128	149			

*Fell to exclude thinning production of the period.

**B. CALCULATION OF DISCOUNTED REVENUE FROM SUCCESSOR CROP,
NET OF DISCOUNTED EXPENDITURES VARYING WITH DATE OF REPLACEMENT**

Replace at	0	10	20	30	40	Remarks
(1)	(2)	(3)	(4)	(5)	(6)	(7)
B(i) DR successor crop 260 * discounted = DR x discounted factors A(v)	260	185	130			
B(ii) Discounting factor 5%, for costs.	1.000	.614	.377	.231	.142	
B(iii) Cost of silvicultural operations existing crop, discounted to present day and entered in appropriate column.	-	-	-	-	-	Crop already brushed
B(iv) Cost of roads (£) similarly treated.	-	-	-	-	-	Area already roaded
B(v) Establishment plus brushing cost (55 for successor crop similarly treated.	55	34	21			
B(vi) Sum of discounted expenditure (=DE) = B(iii) + (iv) + (v)	55	34	21			
B(vii) DR successor net of DE = B(i) - B(vi)	205	151	109			

C. CALCULATION OF OVERALL NET DISCOUNTED REVENUE

Replace at	0	10	20	30	40
C(i) DR existing crop (from A(vii))	85	128	149		
C(ii) DR successor net of DE (from B(vii))	205	151	109		
C(iii) Overall NDR = C(i) + C(ii)					
Optimum replacement date	290	279	258		

* Extra haul + extraction difficulties taken
into account.

DATE:

COMPILED BY:

Part II

Chapter 24 - Summary of Facts on which to base Proposals

(a) Forest Conditions and Potential

Forest Conditions

South Strone forest is a rather isolated unit situated on the side slopes of a series of small hills to the south of Lochearron and to the west of the main mountain mass in south-west Ross-shire. The forest is about 90 miles distant from the pulpmill at Fort William and from the Inverness/Beauly district, where a number of sawmills and a particle board factory are located. The public road system to both centres is poor for almost two-thirds of the distance. Improvements to these road systems are in progress and two-lane traffic should be possible over both routes within the next decade.

The bulk of the plantations lie between sea level and the 750 foot contour but small areas extend upwards to about the 1,100 foot contour. The average annual rainfall is 64 inches, fairly evenly distributed throughout the year. Exposure is nowhere severe, and only moderately so on the higher ground during the winter and early spring. Side slope is very steep in places and several of the larger streams have cut deep gullies, especially on the lower slopes. These factors have influenced road alignments and have made construction difficult and expensive.

The total area of the forest at 30th September, 1964, was 3,926 acres. 2,314 acres are stocked and 441 acres remain to plant. About half of the stocked area was planted before the war, mainly between 1926 and 1936. Of the remainder, the greater part has been planted since 1955.

No soil survey has been carried out but three broad types may be distinguished; creep soils, podsollic soils, and peat soils. Soils in the second category vary greatly in profile, texture, depth and fertility and all overlie glacial drift. They occur at all elevations within the forest and much of the older plantation area has been established on them. There are approximately 450 acres of creep soils judged to be capable of carrying suitable crops of Yield Class 180 or better. There are approximately 700 acres of podsollic soils which appear to be capable of carrying crops with an average Yield Class of 160. The area of peat soils amounts to some 1,150 acres but is unlikely to sustain crops with a higher average Yield Class than 100.

Forest Potential

The plantations on the whole are healthy, vigorous and well stocked. The following table gives details of the area by species together with the area and average yield class of the species planted before the war. Virtually all of the plantations established before 1940 are in the thinning stage, apart from about 190 acres of Sitka spruce which has emerged from check and is in the process of closing canopy.

Species	Area (Acres)	% of total area	Area of pre-war Plantations P26-P40	Weighted Average Yield Class	Remarks
SS/					

Species	Area (Acres)	% of total area	Area of pre-war Plantations P26-P40	Weighted Average Yield Class	Remarks
SS	1,228	55	681	160	Little planted on the most fertile sites.
LP	526	21	11	100	
JL	141	6	112	120	Mainly confined to creep soil areas.
NS	116	5	108	160	
HL	99	4	85	100	Do.
DF	79	3½	79	140	Do.
SP	67	3	47	60	
HL	21	2½	5	160	
O.C.	57		16	-	
Totals	2,514	100	1,142	-	

The most fertile soils have been planted with the larches, mainly Japanese larch and European larch in about equal proportions. Douglas fir and Norway spruce have been mainly planted on sites of high fertility. Relatively little Sitka spruce has been planted on the creep soils. Where this species has been planted on these soils, it has made rapid and excellent growth and clearly demonstrates the high productivity of the species on these fertile sites. The relatively low average Yield Class rating for Sitka spruce can be attributed to the fact that the species was mainly planted on the less fertile sites, particularly the extensive areas of poor peat soils. On some of the shallower peat soils the use of pine rather than spruce would have given better results, particularly in the period before ploughing was available for ground preparation. The stands of Douglas fir are of poor form and have suffered fairly severe windblow due to the moist nature of the sites selected.

(b) Existing Crops, Volumes and Increments

The following tables show the area distribution by age classes and details of Yield Class, Increments and Volumes by species.

Classification	Area Acres	1-10 yrs.	11-20 yrs.	21-30 yrs.	31-40 yrs.	Over 40 yrs.
High Forest						
Conifer	2,514	1,108	47	167	976	16
Mixed						
Broadleaved						
Total	2,514	1,108	47	167	976	16
Plantable Reserve	441					
Other	1,171					
Total	3,926					

Species/

Species	Total Area	Average Yield Class & Quality Class	Measurable Volume Class	G.A.I. 000's h.ft.	Remarks												
SP	67	60(IV)	36.4	2.4	<table><tr><th colspan="2">Classification of Measurable Volume</th></tr><tr><th>B.H.Q.G.</th><th>% of Volume</th></tr><tr><td>2"-5"</td><td>41</td></tr><tr><td>6"-9"</td><td>46</td></tr><tr><td>9"-12"</td><td>11</td></tr><tr><td>over 12"</td><td>2</td></tr></table>	Classification of Measurable Volume		B.H.Q.G.	% of Volume	2"-5"	41	6"-9"	46	9"-12"	11	over 12"	2
Classification of Measurable Volume																	
B.H.Q.G.	% of Volume																
2"-5"	41																
6"-9"	46																
9"-12"	11																
over 12"	2																
LP	559	100(-)	7.5	0.6													
EL	99	100(II)	184.2	8.0													
JL/HL	162	120(II/III)	233.2	16.0													
DF	79	140(IV)	152.9	15.8													
NS	116	160(II)	194.5	18.0													
SS	1,195	160(IV/V)	927.8	114.2													
O.C.	37	-	13.3	1.0													
Totals	2,314	-	1,779.8	176.0													

(c) Choice of species and techniques

Before the war the creep soils were mainly planted with the larches, Douglas fir and Norway spruce. Of the 450 acres of creep soils planted then, some 200 acres were planted with European larch and Japanese larch in about equal proportions. Although both species grew well on the rich soils, their volume production compares unfavourably with that of Sitka spruce on similar sites. Norway spruce and Douglas fir also grew well on these sites, although the Douglas fir tended to be rather coarsely branched. Only 11 acres of lodgepole pine was planted before the war, but sufficient to indicate the superiority of this species over Sitka spruce and Scots pine on the poorer soils. Since the war, Sitka spruce has been planted extensively as a pure crop on all the more fertile peat soils after ploughing and in mixture with lodgepole pine where there was some fear that the species would check if planted pure. Pure crops of a coastal provenance of lodgepole pine have been planted on tough morainic knolls and ridges. The use of larch has been restricted to the creation of fire belts and only minor amounts of other species have been used. In the pre-war plantings, the transplants were notched directly into the creep soils. Elsewhere on the harder ground, the same method was adopted. On the wetter sites some hand draining and turfing were done. This technique became the standard practice from about 1950 onwards. Virtually all the land planted since the war has been ploughed. Current practice is to use a Guthbertson single mould board plough on peat and a Ross (Parkgate) tine plough on mineral soils.

(d) Reserves of Plantable Land

The reserve of plantable land at the end of F.Y. 64 was 441 acres. An additional 122 acres of plantable land is in the process of acquisition. Estates and farms in the locality have considerable areas of potential forest land of good quality and further acquisitions are possible.

(e) Produce and Markets

Before 1962, thinnings were sold in length at roadside. Only one minor sale has been purchased standing, in 1950. Up to 1962, the main outlet for small sized timber was the mining industry, as a consequence of the long haulage distances involved, timber prices were usually low.

Since 1962 it has been possible to sell smallwood directly to the particle board factory at Inverness and from 1965 a pulpwood market will exist at Fort William. In 1960 the forest was designated a production unit and all timber felled since that date has been produced by Forestry Commission/

Commission labour. From 1960 to 1964 a Work study team was stationed at South Strome. Initially concerned with the general field of production methods, their main function has been the development of new techniques for pulpwood production.

The pattern of working now established, is to fell and crosscut at stump using power saws. The timber is trimmed and piled by the fellers to await extraction. Extraction is now mainly achieved with the aid of double drum winches but a limited amount is still extracted by horse. At roadside the produce is sorted into smallwood and sawlogs. The smallwood will be mainly sold as pulpwood at roadside, but until recently has had to be delivered to the particle board factory at Inverness. Sawlogs have found a ready sale at roadside and this is likely to continue.

(f) Staff and Employment

The staff of one Forester and one Assistant Forester is adequate for the immediate needs of the forest. The local labour force numbers twenty-three and is relatively well balanced as regards age classes. With retirements and increasing programmes more men are required. Present forecasts indicate a need for three additional men during the period 1966 to 1970.

(g) Houses and Holdings

At the present time there are two supervisors' houses, six Forest Workers' Holdings and eight workers' houses. Three additional houses were under construction during 1964, one for the junior supervisor whose existing house will be let to a forest worker and two for forest workers. This total should be adequate for the requirements of the forest up to 1970.

Two small farms are in hand, both are tenanted but neither provides a source of forest labour.

(h) Roads

An adequate road system has been constructed in the pre-war plantation area, most of which is in the production stage. In all, 21 miles of roads exist, of which 15.7 miles have been constructed to full standard. Of the substandard roads only some 2 miles requires to be completed to full standard, the remainder being old feeder spurs of limited value for extraction purposes. Only some 2 miles of new feeder roads are required in the near future. The post war plantation area should not require additional roads before 1975. Reconstruction of some of the older roads has been delayed pending a decision on the construction and location of the proposed Strome ferry by-pass road at Ardnarff.

No roads have been built at South Strome since 1962. In that year road construction cost £6,000 per mile against the average Conservancy cost of £4,500 per mile. Current road density in the pre-war plantations which are virtually all in the production stage is 8.7 miles per square mile.

Chapter 25

(a) Discussion on possible courses of action

Like many of the early Commission forests, the site potential of South Strone has not been fully realized and this has been largely due to the selection of species in favour at the time coupled with inadequate ground preparation. It is mainly on the performance of these early plantations that the recommendations proposed to achieve greater productivity are based.

The tables indicate that the most productive species are the spruces although the average Yield Class rating for Sitka spruce is relatively low (Y.C. 160). The Yield Class range however varies from 100 to 260. Norway spruce only constitutes a tenth of the total area planted with spruce before the war. The low Yield Class rating for Sitka spruce is largely due to the fact that only a small acreage has been planted on the most fertile sites in the early plantings. Most of it was confined to the area of peat soils lying immediately above the creep soil zone. Its growth there has been variable. On the deeper flushed peat, it has grown well and its volume production is just about as great as in those stands growing on the creep soils. There is however a progressive deterioration in growth and in volume production as the species has been carried on to the thinner peats overlying the shallow convex ridges. On the Calluna dominated ridges it went into check and stayed in check until the surrounding trees on the better peats had grown to a height where they furnished an increasing amount of side shelter. At the present time there are virtually no areas still in complete check. Most of the trees which previously had been in check are now on the move and many are growing vigorously.

There is enough evidence in the forest to demonstrate the high productivity of Sitka spruce on the creep soils. There are some excellent stands, giving a high volume yield per acre of good quality timber. It is unfortunate that such a limited area of these fertile soils was originally planted with Sitka spruce. Increased yield and profitability would therefore be achieved by planting Sitka spruce on all the creep soils.

Although Norway spruce has grown well on the creep soils, Sitka spruce has produced a greater volume in the same time and there is no strong case for persisting with Norway spruce.

Modern methods of ground preparation and manuring would substantially increase the productivity of the peat sites. Had the peats in the pre-war plantings been ploughed, there is no doubt that the area and period of check of the Sitka spruce would have been considerably reduced if not eliminated. There is some evidence in the West Coast forests that an acceptable crop of spruce can be grown in mixture with pine on the more fertile of the harder sites which have been ploughed.

Lodgepole pine has already demonstrated its superiority over Scots pine on the harder ground at all elevations. At the higher elevations, the difference in production is quite marked.

The larches which have been confined mainly to the creep soils have made good growth. There are some excellent stands of European, Japanese and hybrid larch, one of the latter being registered as a seed stand. Tree form on the whole is good, but volume production and value are so far below the site's potential that future planting should be confined to the formation of shelter belts. Some hybrid larch should be planted through the main species to maintain and improve amenity.

The small amount of Douglas fir which has been planted has not done well. The main reason for this may be provenance. However there could be a limited place for the right provenance of this species on the drier sheltered ridges within the creep soil zone but its use should be strictly limited.

As regards the rotation to which Sitka spruce crops are to be grown, profitability assessments for this species made at similar type forests indicate that the optimum rotation is about 55 years. At that age the average tree will have a B.H.Q.G. of 12 inches and an average volume in the region of 30 to 35 hoppus feet. The larches and Douglas fir in the pre-war plantings (average age 35 years) are scheduled for replacement during the currency of this plan.

The prescribed thinning grade in the past has been a C-D grade, but this was rarely attained because of fluctuating market demands. With a steady and regular market for timber in pulpwood and sawlogs, thinning can be carried out on a planned and systematic basis. Regular and timeous thinning will allow optimum development of the stands and this in turn will have a beneficial effect on N.D.R. The thinning cycle will be five years and the volume to be removed annually will be about 50% of the C.A.I.

The Working Plan area has a pulpwood commitment of 108,000 hoppus feet annually to P.Y. 69. To obtain this volume it will be necessary to work about 150,000 hoppus feet annually. Based on the C.A.I. for the productive part of the forest, 80,000 hoppus feet will come from thinnings. An additional 30,000 hoppus feet will come from heavy thinning in the larch stands prior to underplanting, and from clear felling of the poor stands of Douglas fir.

(b) Objects of Management

Part I - General Objects of Management

The Commission's policy is:-

(i) To increase the production of wood as a raw material for industry by expanding the area of its forests at a steady rate, in accordance with sound land use; and by making each forest as productive as possible.

Further acquisitions of plantable land of a better quality generally than that already afforested within a workable distance from the forest are a distinct possibility. In an acquisition currently being negotiated the calculated rate of interest on capital invested is 6½%; it is quite possible that soils of a similar quality might be offered for afforestation. The aim should therefore be to acquire as great an acreage of high quality land as possible, at the same time not ignoring the acquisition of less profitable areas, if by so doing it will lead to an increase in employment in this rather sparsely populated area in the west coast of Ross-shire.

(ii) Within the limits set by its other objectives to manage the forest estate as profitably as possible.

This is the primary object of management. In this connection the supply of pulpwood to Scottish Pulp Limited will be borne in mind. In the first period, the pulpwood will be mainly obtained from thinnings and enrichment fellings and a little clear felling of unsatisfactory stands. Where stands are of good quality and the species is suited to the site, the work of tending these will be directed to the production of a final crop of high quality sawlogs.

(iii) To provide employment in rural areas especially those most affected by depopulation and in so doing to maintain a skilled labour force.

This/

This is of great importance. The aim should be to maintain and if possible to increase the permanent labour force and to give employment to young people especially those who have just left school who would be compelled to seek work away from the area had the forest not been in existence. There is a great need to improve the age class structure of the Highland communities by retaining in local employment a greater percentage of young people.

(iv) To help in maintaining an efficient home timber trade.

The forest's main contribution will be a steady increase in the production of sawlogs for sale to the trade at roadside.

The continuation of development work on production methods may be of value to the timber trade in providing a testing ground for new equipment.

(v) To give due attention to the aesthetic and protective roles of the forest and to encourage open air recreation.

The forest is situated in an area of high scenic beauty, visited by many tourists each year. All forest work will be designed so that there will be the minimum of disturbance to the existing scene.

(vi) To foster industrial and social development ancillary to forestry.

The outlet for all small round wood (pulpwood) in the foreseeable future will be the pulp mill at Fort William. Sawlogs will be sold to the trade. No new wood using industries are needed. The aim for the time being should therefore be to give close attention to the welfare and interests of employees, tenants and neighbours.

(vii) To encourage the orderly development of private forestry and specifically to assist in creating conditions in which produce from private as well as Commission forests can be marketed to best advantage.

Local objects of management

(a) Short term

To produce 108,000 heppus feet of pulpwood annually till 1970 when the supply position will be reviewed, the material to come from normal thinnings mainly with a limited quantity from enrichment and clear felling and to offer to the Trade sawlogs of a minimum top diameter of 7 inches for spruce and 9 inches for other conifers produced in the course of pulpwood working.

(b) Long Term

To establish a predominantly coniferous forest, composed mainly of Sitka spruce and Lodgepole pine.

To grow crops on the rotation likely to yield the highest nett discounted revenue. For Sitka spruce (average Yield Class 180) the rotation of maximum N.D.R. is 55 years.

To produce final crops of sawtimber of about 10 inches B.H.Q.C. and upwards whenever site conditions permit with pulpwood as an intermediate product.

To provide continuing employment for highly skilled forest workers.

To pay due regard to amenity at all times.

Chapter 26 - Outline of Prescriptions

(a) Amenity (Chapter 28)

The forest is situated in an area of typical west highland scenery, visited by many tourists each year. The plantations now constitute an important part of the scenic beauty of the district. Amenity therefore will be given due consideration in all future planning. Harvesting operations will be planned to cause as little disturbance to the existing scene as possible. Clear felling scheduled in the next five years will be confined to relatively small areas (5 to 15 acres) in any one place. No special measures will be designed to improve amenity apart from the introduction of small groups of hybrid larch scattered throughout the matrices of the main species.

Forest walks will be laid out if there is a demand for such facilities.

(b) Organisation (Chapter 29)

The forest will continue to be administered as one accounting unit in charge of a senior forester aided by an assistant forester. It is not proposed to divide the forest into beats or sections.

The Working Plan area will comprise one Felling Series within one Working Circle.

(c) Planting Rate (Chapter 30)

The present reserve of plantable land will be planted at approximately 125 acres per annum. In addition restocking of heavily thinned and clear felled areas will be carried out the year following heavy thinning and clear felling. Between F.Y. 66 and F.Y. 70, 124 acres of larch will be heavily thinned and 39 acres of unsatisfactory Douglas fir clear felled.

(d) Silvicultural operations

(i) Silvicultural systems (Chapter 31)

The current practice of creating even-aged stands by planting and underplanting will be continued and the present even-aged structure of the forest will be maintained.

A form of crown thinning will be practised on a cycle of five years. Selected crop trees will be marked and thinning will be designed to favour these in subsequent thinnings.

No rotational felling will be done during the period of this plan. Felling of unsatisfactory stands to fulfil pulpwood commitments will be restricted to coupes not exceeding 15 acres in extent. Coupe boundaries will be designed to provide windfirm edges as far as possible.

(ii) Crop Establishment (Chapter 32)

In this West Coast forest, Sitka spruce will be planted on all creep soils, and on all flushed peats of 4 inches and over even if the flushing is relatively weak. Lodgepole pine will be confined to the hard morainic knolls and ridges where the compacted mineral soils are covered with a thin peat less than 4 inches in depth and on unflushed deep peats. Sitka spruce and Lodgepole pine will be mixed on sites which have the potential to ultimately produce a satisfactory crop of spruce, but where the spruce is likely to suffer a period of check if planted pure.

In a few places amenity considerations will make it desirable that/

that some larch be planted, preferably hybrid larch.

Normal Conservancy practice will be followed for establishment operations.

(iii) Crop Maintenance (Chapter 33)

The present boundary fences will be maintained so as to exclude red deer, sheep and cattle. These fences will be regularly inspected.

No cleaning will be done other than the removal of hardwood scrub which is interfering with the normal development of the coniferous crops.

Where the pattern of drains in areas scheduled for clear felling and replanting is unsatisfactory steps will be taken to improve the lay-out of drains before replanting takes place. All new drains will be sited and prepared in accordance with the principles given in Research Branch Paper No. 26.

The ground from which thinnings have been removed will be left adequately drained. This in every case will entail the cleaning of only a proportion of the drains originally dug.

Racking will be employed for extraction purposes only. Lay-out and frequency will be designed to suit the best extraction methods available.

Brashing generally will be discontinued in accordance with the instruction on line thinning contained in SM.136. Brashing may, however, still be practised where it is necessary for the marking of extraction racks and for the maintenance of essential drains after thinning.

(iv) Crop Improvement (Chapter 34)

124 acres of larch crops mainly growing on the creep soils will be heavily thinned and underplanted during the period 1965 to 1969. The heavy thinning will produce a ready source of pulpwood which is required to meet the pulpwood quota for the forest, at the same time the opportunity will be created for replacing the existing crops with more productive species. The larch crops will be heavily thinned, leaving about 150 trees per acre, before underplanting and the final removal will take place about five years after underplanting.

Other unsatisfactory stands to be felled for additional pulpwood supplies comprise 39 acres of partially blown Douglas fir of poor form. These crops will be replaced by Sitka spruce.

(e) Regulation of the Yield (Chapter 35)

The yield will be regulated by volume to conform with the forecast of allowable cut. During the period 1965 to 1970 the allowable cut is approximately 130,000 hoppus feet per annum. Annual programmes will be based on block working for concentration of effort and resources.

(f) Roads (Chapter 36)

No new roads will be required during the period of the plan. Some tracks may be required to deal with the extraction of timber from areas at present inaccessible, but the mileage of these is unlikely to exceed $1\frac{1}{2}$ miles. If the County Council's plans for the use of the main road through the Ardara section as a county highway mature, then an additional $1\frac{1}{2}$ miles of new forest road will be needed in this section of the forest and about the same mileage of substandard roads improved, all/

all at the expense of the Highway Authority.

The maintenance of the existing road system will be the responsibility of the Forest Staff who may call for advice and help from the Civil Engineer Staff when required.

(g) Marketing (Chapter 38)

All production will continue to be carried out by Forestry Commission labour. Produce will be converted into two main categories, pulpwood and sawlogs. Pulpwood will be brought to roadside and stacked for uplifting by Scottish Pulp and Paper Limited. Sawlogs will be sold at roadside by competitive tender or public auction.

(h) Protection (Chapter 39)

Red deer in the forest enclosures will be shot and the venison marketed when in season. Roe deer will be controlled by selective shooting and limited to a population where the damage caused to young plantations is insignificant and can be accepted. Rabbits and foxes will be exterminated. No special measures are required against fungal and insect pests.

(i) Staff and Labour (Chapter 41)

There will be no change in the complement of forest staff. The forest will be in charge of a Head Forester (New Style) assisted by a Forester (New Style). As the forest is at present a training forest, there may be on occasions a junior Forester under training in addition.

Additional labour will be recruited as required to keep pace with the expansion of the forest and the increased scale of production work. The emphasis will be on the recruitment of young men. Some twenty-five men are required annually to meet the needs of the forest.

(j) Houses and Holdings

The three houses under construction in 1964 have been completed and no additional housing will be required before 1970.

The tenant of Achbeg holding died in 1965 but his son has accepted the tenancy. The son has now been employed as a forest worker and is prepared to relinquish his claim to the rough grazing of the holding comprising some 150 acres of plantable land.

The number of holdings will be reduced as tenancies are given up and the land will be added to Achmore Farm. As each tenancy expires the position will be reviewed in the light of the needs at the time, but the ultimate aim will be to reduce the number of holdings to four.