PART I

Chapter 1 - Introduction

(a) Situation and Extent

The forest lies to the north and west of the village of Port Augustus and is bounded in the east by the Port Clair forest march, in the south by the River Oich, in the west by the Inverrigan burn and in the north by the watershed of the Strathoich/Glenmoriston valleys. Two outlying blocks, known as the Culachy and Straight mile sections, are located on the south side of the River Oich and are situated on either side of the Fort Augustus to Fort William road about 3 miles west of the village of Fort Augustus.

The forest office is situated within a mile of Port Augustus, the National Grid Reference being 367093.

The extent of the Working Plan area at 30th September, 1962 was:-

(a) Total Area - 9,545 acres

(b) Planted Area - 3,036 acres

(b) Civil Administration

(1) District Council - Aird.

(2) County Council - Inverness-shire.

(3) Parish - Boleskine and Abertarff.

(4) Parliamentary Constituency - Inverness-shire,

(c) Nearby Towns

The forest lies practically equidistant from Inverness and Fort William, the nearest big towns, mileages being 33-34 miles respectively.

Inverness has a population of 29,000 and Fort William 4,000.

The nearest village is Fort Augustus with a population of about 1,000.

(d) Communications and Transport

(1) Railways

The nearest railway station is Spean Bridge, lying 22 miles from the forest office.

Both passenger and goods services are available, goods facilities including a weighbridge. This weighbridge, of which British Railways has use, belongs to D. MacFarlane, Spean Bridge.

Port Augustus, though now having no railway line, still has a station yard to and from which goods may be consigned, but is confined to articles which may be easily manhandled onto a lorry calling once a day from Spean Bridge.

There is no passenger service from Port Augustus but a ticket from an outside station via Spean Bridge to Port Augustus can be bought, the remainder of the journey being covered by bus or car - the latter only when no bus is available.

Inverness station, 33 miles distant, has a goods depot with adequate facilities.

(II) Roads

There is one unclassified, tarred, single track county road from Auchterawe to Port Augustus where it joins the A82 to either Inverness or Fort William and the south. These roads either touch or pass through the forest area for a total : distance of 4^" miles.

During the winter, periods of ice and hard packed snow are locally common but the roads seldom become impassable due to drifting snow.

(III) Ports and Harbours

There are no ports or harbours in the plan area, Inverness being the nearest port of consequence.

This port is capable of dealing with vessels of up to 2,500 tons of cargo. The maximum draught is 19 feet.

(IV) Other Facilities

This covers the Caledonian Canal which, by means of a series of locks, links the lochs of the Great Glen, namely Loch Ness, Loch Oich and Loch Lochy.

The locks can accommodate vessels up to 150 feet length, 35 feet beam, and 13 feet 6 inches draught (fresh water) and if the latter is 9 feet or under the maximum length can be increased to 160 feet.

(e) Maps

The area is covered by the following O.S. sheets.

(1) 1" O.S. No. 36 (Seventh Series)

(2) 6" O.S. LXVII)
LXVIII)
LXXXII)
LXXXIII)

Chapter 2 - Site

(a) Geology

The basic geology consists of two main types of rock. Moine schists and foliated granite or gneiss. The Moine schists are located on the area which stretches from the Allt na Criche to the Allt na Graidhe and occupy about 80% of the forest area. The foliated granite or gneiss extends from the Allt na Graidhe to the western forest boundary on the Inverrigan burn and is also found in the two outlying blocks to the south of the River Oich.

The drift geology over the greater part of the planted area consists of two layers, the basal or lower layer being of boulder clay in the form of a gray, sandy, gritty till charged with schist and granite boulders. It is tough and rather impermeable to water
and is in greatest depth on the edge of the valley floor. The upper drift layer, or readvance moraine, which covers the bulk of the planted area, has its upper limit at about 900 feet. The deposits of the readvance moraine are hummocky in form and differ decidedly from the lower drift in being of a gravelly nature providing an open textured, free draining soil. Often red or fawn coloured in its upper layers; it varies in thickness, being deepest above Auchterawe and in the Culachy area and fairly shallow in the vicinity of Torr Dhuin, Lon Mor and the Inverrigan burn areas. Some extremely hummocky kettle moraine is present on a small scale in the valley bottom west of Auchterawe and these have a high sand and gravel content; outwash gravels occur locally in the vicinity of the kettle moraine and on the flat moor area which lies between the River Oich and the lower hill slopes.

(b) Soils

The soils on which the forest is established are of three main types, namely creep soils, morainic soils, and peat.

1. Creep Soils

Creep soils are found on the forest slopes where natural drainage is good and are associated with areas originally carrying deciduous crops of oak and birch and having a rich herb vegetation. These soils are of good depth on the lower slopes but become shallower as the ground rises and are located along the length of the valley from the Port Clair forest march in the east to beyond Torr Dhuin in the west and extending upwards to about the *400* feet contour and account for approximately 15% of the forest area.

2. Morainic Soils

The morainic soils, which are generally covered by a layer of peat of varying thicknesses, are dispersed over the area but are largely found at higher elevation than the creep soils; they are, however, present at lower elevation on the morainic knolls and ridges. Included in this category are the kettle moraines and outwash gravels which are found on the flats lying between the River Oich and the lower hill slopes. This soil type is found on approximately 75% of the forest area.

Deep peats are found on the flats and depressions throughout the area, the two largest areas being the Lon Mor and the flat above Auchterawe Wood. The quality of the peat is generally tough and fibrous on the flats but some good amorphous type peats are present in the flushes along burn-sides and in hollows. Peat formation varies in depth but is up to 20 feet deep in the Lon Mor area. The area of deep peat does not exceed 10% of the forest area.

(c) Topography

With the exception of the extensive flat moor between the River Oich and the Auchterawe Road and the undulating ground in the Culachy section, the ground rises in *a* series of moderate slopes and basin-like flats or shelves towards the watershed; only on Torr Dhuin and the Straight mile section does the slope become steep. There are two extensive basin-like depressions - one being the Lon Mor and the other behind Auchterawe Wood.

Aspects vary from south east to south, the former being predominant. Elevation varies from 51 feet to 1,941 feet, the former being the level of Loch Ness and the latter that of the watershed. The present plantation limit is 850 feet but a series of research plots stretch from there up to 1,350 feet. The hills surrounding vary from 2,500 feet to 3,000 feet and the forest is thus generally sheltered except from the south west gales which are funnelled up the Great Glen.

(d) Meteorology

There is a rain gauge and thermometer station at the forest. Rainfall averages 48 inches per annum and is reasonably well distributed with, on average, the driest month being May and the wettest December. The forest is fairly well sheltered from strong coastal winds but cold easterly winds, which are often experienced for weeks at a time during the spring months, cause drying out and defoliation of young plants. Windblow has not as yet been great, being confined largely to sporadic trees and one or two small patches. Frosts can be severe and protracted and have done damage to plants in both forest and nursery. Alternating frosts and thaws have the effect of causing plant lift in nursery seedbeds. Snowfalls are common and occasionally heavy but damage has so far been negligible.

(e) Vegetation

The vegetation on the creep soils consisted largely of vigorous crops of birch, oak, hazel and a few ash trees together with strong bracken, fine grasses and herbs.

On the morainic soils the vegetation varied from calluna/erica cinerea on the dry gravelly sandy sites at low elevation to bracken/ grasses on the peat free moraines in the vicinity of the creep soils: on the peat covered moraines at higher elevation vegetation consisted mainly of molinia/calluna with the former dominant in flush valleys, depressions and flats but becoming less dominant and changing to a molinia/calluna mixture on lower and middle slopes and to almost pure calluna on the drier knolls and ridges. On poorly drained sites erica tetralix and scirpus were found in association with calluna. Vegetation on the flush peats at lower elevation consisted of a mixture of juncus, myrica and molinia while on the tougher more fibrous deep peats calluna and molinia occupied flush sites but elsewhere calluna was in mixture with erica tetralix and scirpus.

(f) Site Classification

No recognised site classification is available but the following classification by vegetation types has been used as a guide in the selection of species.

1. Oak, Birch and Hazel Sites - 700 acres

This type of site is associated with the creep soils which are located as described in 2 (b) 1. These sites are normally in well sheltered situations and are capable of growing good crops of most of the common species of conifers. Ground vegetation consisted of bracken and fine grasses.

2. Calluna Heath Sites - 340 acres

Calluna heath sites are located on the outwash gravel area which lies between, the River Oich and the lower hill slopes. Calluna is predominant with some erica intermixed,

3. Grass, Bracken Sites - 730 acres

Grass, bracken sites are located on the peat free morainic soils which lie between the upper creep soils arid the peat covered moraines. The bracken weakens in vigour with elevation and some calluna is present on the drier ridges and knolls,

Molinia/Calluna Sites - 1,950 acres

This vegetation type is associated with the shallow peats overlying mineral soils. Molinia is pure in the flushes but gradually becomes dominated by calluna as peat depth and elevation increases.

5. Juncus/Molinia/Myrica Sites - 100 acres

This type of vegetation is associated with amorphous type flushed peats and is confined principally to burnsides and flush flats.

6. Calluna/Erica/Scirpus Sites - 150 acres

This vegetation is found on the deep peats of the larger flats and the more exposed knolls and ridges.

Chapter 3 - History

(a) Local- History

Inchnacardoch Forest is named after the shooting lodge at the east end of the Forest. The name is a corrupted form of 'Innis na Caerdach' which means literally "Island of the Smithy". "Innis" however has also acquired the meaning of a grassy island of land and the name Inchnacardoch means "the green grass land of the smithy".

It is generally accepted that this area in the centre of the Great Glen has been traversed if not actually settled by man since earliest times. Stevens and Carlyle state in their "Native Pinewoods" that Neolithic peoples settled in the Great Glen among other places and that the Glen was used as a route to and from Ireland in Bronze Age times.

Direct evidence of settlement in early times is given by the Gallic or Vitrified Forts one of which can be seen on Torr Dhuin within the forest. These forts could have been built in Iron Age times (Childe 1946, 1947) although they may date only from Roman times or later. Between these early times and 1745 the Great Glen has been the scene of clan feuds and has seen the passage of many armies: in 1645 Montrose pitched his camp at Leisten nan Lub which is now part of the forest area; in 1653 General Monk passed through Kilichuiman, the old name of Fort Augustus. After the rising of the clans in 1715 a barracks, capable of garrisoning 100 men, was built at Kilichuiman, In 1724 General Wade came to the Highlands and in the same year the village of Kilichuiman was renamed Fort Augustus. In 1725 the Wade road programme, which did so much to improve communications in the Highlands, was started: part of the Wade road to Bernera barracks, Glenelg, passes through the main block of the forest. In 1745 Prince Charles Edward Stuart camped his army on the estate of Aberchalder which has a common march with the forest. After the defeat of the Highlanders at Culloden in 1746 the Duke of Cumberland, who was in command of the Government forces at the battle, stayed at the barracks at Fort Augustus from the 24th May until the 17th July.

The period after the 1745 was comparatively uneventful until 1804 when work was started on the Caledonian Canal: the canal has a common boundary with the forest and was opened to shipping on the 23rd October, 1822.

In 1854 the need for a garrison at Fort Augustus was considered to be unnecessary and in 1867 the fort was sold to Lord Lovat, from whose successors the bulk of the land on which Inchnacardoch forest is now growing was acquired in 1920.

1. Books referred to in writing this chapter

The Statistical Account of Scotland - Volume 20 1798

The New Statistical Account of Scotland - Volume XIV

Inverness and Ross and Cromarty 1835

General Report of Scotland - Volume II - Sinclair 1814

The County Histories of Scotland - Inverness - J. Cameron Lees

Ordnance Gazetteer of Scotland - Volume 1

Wade in Scotland - J. B. Salmond

New Ways through the Glens - A. R. B. Haldane

Kalcumein and Fort Augustus - Blundell

West Highland Survey - Darling

Native Pinewoods - Stevens and Carlyle

Inchnacardoch Forest History - February 1951

Glen Albyn - Tales and Truths of the Central Highlands

2. Other books not referred to but believed to be useful

None known to the writer.

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

There is evidence to show that the ancient forests of the Great Glen extended over a much greater area than is at present wooded; this is seen by the numbers and size of roots which are turned up by the plough in the course of preparing the ground to meet current planting programmes. There is, however, no record of planned management until late in the Eighteenth century and it is assumed that in the time prior to this date the forests were used by the inhabitants as a source of timber for building and other domestic purposes: it is also extremely likely that felling took place to clear highly fertile areas for agricultural purposes.

On the Working Plan area, with its southerly aspect, the tree species were mainly birch, oak and hazel and there is no evidence to show that the treatment of the woods was any different from those already described.

From the earliest times, until the breakdown of the clan system, cattle grazing combined with a little agriculture was the main form of land use; in the last quarter of the Eighteenth century, however, cattle were replaced by sheep, a change which, incidentally, was largely responsible for the Highland Clearances. With sheep came large scale moor burning, a reduction in the area under agriculture and a sudden halt to the regeneration of the woods by natural means.

Sheep grazing is still at the present time the main form of land utilisation carried out on areas outwith the forest enclosure.

The first planting of conifers in the Great Glen was recorded in the Statistical Account of 1798 when the planting of fir and larch was carried out at Gortuleg Estate (Gorthleck) now part of Farigaig Forest. Pines were also planted about the middle of the Eighteenth century at Glendoe Estate and along the banks of the Caledonian Canal. The first planting of conifers in the Working Plan area was carried out in 1908 when 2 acres of Scots pine were established: a further area consisting of 60 acres of Douglas fir, European larch, Japanese larch and Sitka spruce were planted in 1914.

With the start of planting by the Forestry Commission in 1920 the existing crop of hardwoods was gradually reduced to make way for pure conifer crops.

Chapter 4 - Estate Management

(d) 1. Boundaries and Fencing Liability

(a) Type of Boundary

The top boundary of the Inchnacardoch Block is rather ill defined, the original pre-acquisition fence only being visible in a few places. The east and west boundaries follow well established streams with the lower or southern boundary being the River Oich.

The Culachy section is clearly defined by fences on all sides except the east, the surveyed fence line being the definition now.

The Straight Mile section is well marked on the lower boundary and on the west by the main road and an old fence respectively, but the east and southern boundary have no natural definition. Only in this block does the top fence, for practical purposes, go outwith the acquisition boundary.

The top fence on the Inchnacardoch block is, at its nearest, 42 chains below the acquisition line.

The recently acquired sanatorium area completes the south west end of the main block and has well defined natural boundaries.

(b) Fencing Liabilities

(I) Main Inchnacardoch Block

Under the 1919 Feu Charter from Lord Lovat no fencing liabilities are imposed on the Commission,

(II) Straight Mile Block

In the disposition of 1956 from Culachy estate the following conditions are present:-

(a) Any existing fences, dykes, walls, ditches, or drains which will become the march with the said estate of Culachy will become mutual and be maintained at joint (equal) expense, the fences, dykes, and walls in stockproof condition.

(b) Either party may hang and maintain netting on any mutual fence or make it deerproof but the expense will be borne by the party so doing.

(c) March fences erected, other than in (a) above, carry no liabilities as to condition or period of maintenance and no charge can be made on the estate.

The total length of mutual fence is 10 chains and is at the west end of the block.

(III) Culachy Block

In the disposition of 1958 the terms of (II) above are repeated.

As only one side of the block adjoins the Culachy estate and this side had no fence, drain, dyke, wall, or ditch at time of acquisition then there is no factual liability.

This particular block is split by the old Fort Augustus-Spean Bridge railway line which was acquired at the same time.

In this disposition we have to erect and maintain fences on the north-north-east, and south-south-west boundaries of the strip at our sole expense. Maintenance has to be done to the satisfaction of the British Transport Commission.

Length of fence involved is 200 feet.

(IV) Sanatorium Area

In this feu of 1960 there are no fencing liabilities.

2. Restrictive Covenants and Reservations

(a) Inchnacardoch Block

(1) The right of fishing, of every description, in the River Oich and Loch Ness so far as the same lie ex adverse of the lands feued and access thereto was reserved to Lord Lovat, his heirs and successors, assignees, and those having his permission to fish for salmon, at any time.

(2) The mines, metals, minerals, stone, clay, and fossils of every description within or under the subjects disponed were reserved to Lord Lovat.

Also reserved to Lord Lovat, his heirs, assignees, or those authorised by him was full power to search for, work, win, raise, and carry away metals and minerals, but compensation would be paid to the Forestry Commission for surface disturbance, damage to houses, buildings, erections of every kind, walls, fences, pipes, water and water courses, roads, bridges, plantations, trees, crops and others or the preparations for such trees, crops and others, caused by the workings and also damage arising from smoke or fire arising from any working done on the area.

We are allowed to quarry stone, clay, sand and gravel free of all charge.

(3) We are not allowed to use any building on the land feued for the manufacture or sale of spirituous, or excisable liquors.

(4) We must make good, to the satisfaction of Lord Lovat, any damage we do to the access road past the gamekeeper's house at Inchnacardoch.

(5) Failure to comply with any of the reservations or conditions imposed can result in the land and everything on it reverting to Lord Lovat.

(b) Sanatorium Area

(I) Coal and coal mines are reserved to the National Coal Board by virtue of the Coal Industry Nationalisation Act 1946.

(II) We must use the area disponed in conjunction with the adjoining area of ground lying on the north side which area was disponed to use by Lord Lovat in 1919.

(III) Sporting is reserved to the superior for payment of 1d. per annum, if asked.

(IV) Failure to abide by conditions, and reservations, will result in the area reverting to the superior.

(c) Straight Mile Block

No restrictions present. (d) Culaohy Block

The estate reserved a right of way from the level crossing over the westmost of the two areas disponed for agricultural and all other purposes necessary for estate management, the route to be agreed between the Forestry Commission and the estate.

Maintenance liability will be based on the use either party makes of the route.

(e) Railway Strip

The British Transport Commission reserved a right of access, for ordinary purposes, along the strip disponed.

We free and relieve the British Transport Commission of all obligations to maintain any bridges, culverts, fences, drains, or other works within or connected with the said piece of land.

3. Easements. Servitudes and Licences

(a) Servitudes Contained in Forest Deeds

(I) Inchnacardoch Block

The Aird District Council have a servitude right granted in their favour but this the superior retained. The servitude covers water supplies to Fort Augustus and affects our working of the catchment area.

(II) Sanatorium Area

Nil.

(III) Straight Mile Block

We were given a servitude right to enter on the remainder of the Culachy estate for the purpose of inspection, maintenance or improvement of access routes, water supplies, and drainage systems, always provided that, before exercising this servitude right, the permission of the superior must be first obtained on each occasion.

Also granted was an unrestricted servitude right of way, including the right to construct roads, bridges and culverts, over the rectangle of ground, in the north west corner, which separates us from the main Port Augustus-Port William road.

The exercising of this right must cause the least possible interference with the superior's use and enjoyment of the land.

(IV) Culachy Block

Again we have a servitude right to enter on the remainder of the Culachy estate for inspection, maintenance,
and improvement of access routes, water supplies, and drainage systems always provided that the superior's

permission is first obtained, on each occasion, before the right is exercised.

Also granted was an unrestricted servitude right of way, including the right to construct roads, bridges, and culverts, and to improve existing roads, bridges, and culverts, over the route leading from the fort Augustus-Fort William road, to the level crossing on the railway.

Upkeep is on a user basis.

(V) Railway Strip

We accepted all existing servitudes and rights of wayleave for laying sewers, drains, pipes, cables, telegraph poles, wires, and stays, in through, or across the strip. We relieve the British Transport Commission of all claims arising under any of these servitudes or wayleaves.

(VI) Other Wayleaves and Servitudes not contained in Deeds

(a) North of Scotland Hydro-Electric Board Wayleaves

The wayleaves in operation are:-

(I) Glengarry-Fort Augustus - 132 KV Line

(II) Fort Augustus-Glengarry - 33 KV Line

(III) Fort Augustus-Glentruim - 132 KV Line

(IV) Lagganbane-Fort Augustus - 132 KV Line

(V) Fasnakyle-Fort Augustus - 132 KV Line

(b) Servitude to "Lundie"

This is really a right to take water, endures from year to year, lasts only as long as the owner or his wife live there and the right can be withdrawn at any time.

(c) Fort Augustus Water Supply

A perpetual servitude right to lay a line of pipes, or an open ditch, between Loch Carn Tarsin and Loch Carn Dubh was granted to the Inverness County Council in connection with the Fort Augustus water supply.

The working area covers a strip not exceeding 6 feet on either side of the centre line of the pipe line.

(d) North of Scotland Hydro-Electric Board - Water Supply

The Hydro-Electric Board were granted an irredeemable right to construct, maintain and operate a 730 feet pipe line from the Allt na Fearna to the switching station.

They had to build and maintain their own dam, the dam to be at a lower level than the intake to our Forest workers' Holdings Numbers 6, 7 and 8 which are supplied off this burn.

(e) G.P.0. Wayleaves

(I) Straight Mile (Railway Section)

(II) Jenkins Park to Coiltre Locks

(III) Coiltre Locks to Auchterawe House

(VII) Servitude in Glengarry Disposition File

We were granted an unrestricted servitude right of access over the estate road from Oich Bridge to the Sanatorium area.

As long as the estate use light traffic we pay all maintenance, but the standard is to suit ourselves.

Should the estate use heavy traffic over the road then cost of upkeep will be on a user basis.

4. Public Rights of Way

(a) General Wade's Military Road

This is a right of way from Jenkins Park to Glenmoriston. Where it enters and leaves the planted area gates are present and to date there has been no trouble from the general public either from fire or leaving the gates open.

(b) Auchterawe - Oich Bridge

This is the old road to the Cemetery at Auchterawe and is very rarely used by the general public.

The gate at the Sanatorium end is locked and there has been no outcry to date.

The reason for the gate being locked is a verbal agreement made with the Invergarry estate as they were having deer poached and sheep stolen, the police being of the opinion that entry was being made on the estate from the Auchterawe end of this road.

5. Sporting Interests

(a) The Main Inchnacardoch Block

This has been let yearly to D. Bisset, of Inverness and F.Y. 62 will be his last year.

(b) Sanatorium Area

Lord Lovat has the shooting rights for twenty-five years from 28th November, 1960 at a nominal rent of Id. per annum, if asked.

(c) Culachy and Straight Mile Section

Rented by the Superior, Mrs. Usher, for twenty-five years at a yearly rent of l/-d. if asked.

6. Obligations of Outside Parties to the Forestry Commission

(a) Disposition to Hydro-Electric Board

They have to:-

(I) Erect and maintain stockproof fences on the area disponed where it is bounded by forestry Commission land.

(II) Erect four gates in the fences along the access road, two on one side, and two on the other. The positions of the gates to be agreed on the site.

(III) A gate across the access road at the entrance to the sub-station, which gate they maintain in perpetuity.

(IV) Give us right of access across the access road between the gates in (II) above for agricultural purposes only.

(V) Give us a right of access along the access road.

We must, however, pay any damages done to the road, fences, or gates when exercising the rights in (IV) and (V) above.

Chapter 5 - Amenity

(a) Description of Amenities

The Great Glen with Loch Ness and its high hills on either side is one of high natural scenic value and is well patronised by the tourist trade during the summer, any major change in the landscape being critically noted.

In the early days no special attention was paid to amenity except along the sides of the Auchterawe road where Abies species, hemlock, copper beech, and Norway maple were planted. In F.Y. 59 the roadside on the Straight Mile Section was planted with amenity species using laburnum and Norway maple.

The general planting in the past has, however, created quite a pleasant aspect even with the series of rides running straight up and down the hill.

The presence of a network of Hydro-Electric Board pylon and pole lines does much to detract from the general amenity.

There are no ancient monuments within the Working Plan area.

(b) Policy and Existing Obligations

There are no local amenity bodies with whom we have to consult but the stipulation laid down by the Scottish Home Department regarding the proximity of plantations to public roadsides is adhered to.

(c) Measures adopted

Amenity planting of hardwoods is done along public roadsides and with the use of rowan as internal firebreaks the aspect will be generally improved.

The use of straight rides is avoided, the layout of these being tied in with obvious geographical features and the proposed road system.

Operations near and beside main roads are kept neat and tidy, while the high pruning of the older trees along the public roadside shows the forest to good advantage.

Chapter 6 - Growing Stock

(a)-(d) - WPs. 4, 5, 6 and 9. . -

(e) Enumeration Methods

The survey of the area and the assessment of the measurable growing stock was carried out by the Management section of the Research Branch.

Method of Survey

Chain and compass were used for the whole of the survey, an Abney level being used to estimate angle of slope to effect the reduction in measured lengths.

Crop Assessment

Standing volumes were obtained from top height/basal area charts, top height being measured by Blume Leiss or Haga hypsometer and basal area by Relascope sweeps.

Using the above data in conjunction with Forestry Commission Yield Tables the increment for each species was calculated.

(f) Growing Stock (3,3036 acres)

The forest has been developed as an even aged coniferous high forest with Scots pine as the principal species.

The performance of the main species is described below:-

Scots pine - 1,229.5 acres

Scots pine has been planted on 40% of the area at present under plantations and it has been used on a wide variety of sites at all elevations. In the early years the sites selected ranged from creep soils carrying grass/bracken to poor calluna/ molinia/scirpus covered deep peats. From about 1930 site selection became more stabilised with this species being confined to drier calluna covered sites, morainic knolls and ridges and to shallow peats where mineral soil appeared at time of ploughing or draining.

Best results have been obtained on the more fertile of the calluna covered mineral soils on both the gravelly area to the east of Torr Dhuin and on the deeper soils found at the bottom of morainic knolls and ridges. Poorest results are found where the planting strayed onto areas of deep peat. Suffers from defoliation on exposed sites.

The average Quality Class is III and stem form generally is satisfactory but inclined to be heavy branched in some of the faster growing stands.

Much of the better soil sites could have been successfully stocked with Douglas fir or Sitka spruce.

Pinus contorta - 353 acres

Pinus contorta occupies some 12% of the planted area and has been planted on the poorest of the gravel soils on the moor area, on the shallower morainic ridges and on deep peat. Up to the end of F.Y. 50 the total area planted extended to 74 acres but in recent years it has, along with Sitka spruce, been largely used to stock the deep peats at high elevation.

Rate of growth and tree form on the less exposed gravels has been good and Sample Plot figures indicate volume production to be equal to that of Quality Class II Scots pine. Stem form is if anything, better than Scots pine in that the trees as a rule are finer branched. Both inland and coastal varieties have been used and they have been planted pure and in mixture with other conifers, principally Scots pine, Sitka spruce and Japanese larch. The coastal variety appears to give best results.

European larch - 62 acres

European larch has not been widely planted and occupies some *2%* of the forest area; it has been planted on some of the most fertile creep soil sites with a grass/bracken vegetation. Results have been poor, there being considerable butt sway present in most stems and larch canker has invariably been active and has added to the imperfections of the timber. Recent plantings have been mainly in mixture with Scots pine on suitable sites.

These creep soils would have grown good quality class stands of Douglas fir and Sitka spruce.

Japanese larch - 170.5 acres

Japanese larch accounts for about 5% of the planted acreage and up to 1940 was, like European larch, planted on the lower slope creep soil sites: from 1940 onwards it was planted on shallow stony soils on the middle and upper slopes where calluna was becoming dominant. In more recent years it has been used to form fire protection belts on a wide variety of sites.

The average Quality Class is III and while stem form is good in some of the stands the general standard is only moderate, because of butt sway, in the poorer stands.

Sites planted prior to P40 would have been more productive if stocked with Douglas fir and Sitka spruce.

Douglas fir - 227 acres

Douglas fir has been planted on approximately *8%* of the planted area and, apart from some 13 acres which can be discounted because of age, all of it has reached an average of Quality Class III standard. The sites shown for this species were among the most fertile in the forest and ranged from moist flats and hollows, hardwood scrub areas to moderately shallow mineral soil sites on steep slopes.

Apart from some disappointing butt sway and roughness on the moister sites stem form is excellent, particularly so on the steep slopes in the vicinity of Torr Dhuin,

Sitka spruce would have produced high quality timber on the moist stands where the Douglas fir stem form is so poor.

Norway spruce – 387.5 acres

Norway spruce occupies some *13%* of the planted area. In the formation of the early plantations it was used on a variety of sites, but extensively on poorly drained morainic soils and deep peats at high elevation. Results on deep peats and the poorer moraines were so poor that in 1938, 325 acres were written off as failed. On mineral soil sites and flushed peats results have been better and this accounts for the area of 117 acres recorded on WP6 against the P21-P25 period. As more

became known of the species requirements, more suitable sites were chosen including deep moist mineral soil and such sites and improved results were obtained.

The average Quality Class is III but there are 33 acres of Quality Class I and 43 acres of Quality Class II. Stem form is on the whole good, being straight and not too heavily branched but marred to some extent by fluting of the lower stems and to a small degree by the incidence of Fomes damage.

The best sites would have grown heavy volumes of high quality Sitka spruce.

Sitka spruce - 522 acres

Sitka spruce has been planted on 17% of the planted area and like Norway spruce it was initially direct planted into inadequately drained peats and morainic soils where calluna was dominant. Much of the under Quality Class V stands were established during the P21-P30 period when out of 187 acres planted only 40 acres have attained quality class rate of growth and this failure is largely due to a combination of the direct method of planting employed, the poor initial standard of drainage and the checking effect of calluna which became exceedingly dominant after the area was enclosed.

Post war plantations have been mainly established on ground prepared by ploughing and most plants have been given an application of ground mineral phosphate at the time of planting and in these circumstances development has been more normal.

The average of the present Quality Class stands is V but it should be noted that, of the 223 acres established prior to 1940, only 61 acres have reached quality class standard whereas out of the 297 acres of comparatively young plantations established since 1941 some 71 acres have already reached this standard.

Stem form is good and the incidence of heart rot is small.

Chapter 7 - Organisation

(a) Previous Plans

Working Plans were prepared for the periods 1920-30, 1931-35, and Plans of Operations from 1950 onwards.

The earlier plans were quite comprehensive covering all the then necessary operations with details of money, labour, and housing estimates. Planting and beating up were detailed with estimates of numbers of plants and species required, and it appears from the surviving records that programmes were achieved.

The Working Plan for 1931-35 was comprehensive with much stress being laid on the correct choice of species for beating up the earlier, unsuccessful, P. years.

The Plans of Operations, from 1950 onwards, covered the main forest operations such as planting, crashing, cleaning, and thinning.

These plans have taught no special lessons beyond the need for flexibility and the need for gauging results over a period, rather than annually.

(b) Administrative Subdivisions

1. Districts

The forest is under the control of one District Officer.

2. Forests

One forest only -Inchnacardoch.

3. Sections

Nil

4. Beats

The forest is not divided into beats. The staff assisting the Forester are employed on a functional basis.

5. Working blocks

Working blocks have been in operation for the thinning area, there being five blocks in all.

6. Compartments

Compartments, until recently, were laid out with parallel rides up and down and across the hill. P 56 onwards followed the projected road system and burns and all areas prior to that have now been recompartmented by the Directorate surveyors using roads and burns with a few of the old rides where necessary.

(c) Management Subdivisions

There is one working circle with one felling series in operation. When the Directorate surveyors recompartmented the area, sub-compartments were altered and fixed according to P. Year, quality Class, and species or species mixtures.

Chapter 8 – Planting Rate and resumption of Land

(a) The P. year acreages are as shown below.

PYear	Area planted
14-20	151.0
21	135.0
22	445.0
23	272.0
24	164.0
25	123.0
26	150.0
27	128.5
28	138.0
29	108.5
30	143.0
31	97.0
32	101.0
33	74.0
34	88.0
35	6.0
36	5.0
37	17.5 (Replant of 7 acres)
38	5.0
39	5.0
40	12.0
41	15.0
42	11.5
43	15.0 Afforest
43	8.0 Re afforest
44	-
45	-
46	-
47	51.0 Re afforest FY42 Fire
48	95.5 Re afforest FY42 Fire
49	4.5
49	145.5 Re afforest FY42 Fire
50	16.0
50	129.0 Re afforest FY42 Fire
51	-
51	63.0 Re afforest FY42 Fire
52	62.0
53	43.4
54	-
55	60.1
56	62.0
57	101.0
58	100.0
59	106.2
60	108.0
61	113.0
62	200.0
Total	**3,878.2**

The total P.year area, including the Research Branch Plantations of 79.6 acres, is 3957.8 acres but of this figure 499 acres refers to the replanting of the area lost to the fire of 1942, 406.3 acres which have been written off as failed and 16.5 acres which have been cleared to make way for Hydro- Electric line, in all a total of 921.8 acres which, when deducted from the gross total of 3,957.8, leaves the area at present under plantations viz. 3036 acres

The planting rate originally prescribed was 144 acres for 30 years, the total area then thought plantable being 4,320 acres, later reduced in 1923 to 2,062 acres. In 1927 a plan revision was made and the rate reduced to 142 acres per annum.

From 1931 to 1946 planting was on a reduced scale but increased between 1947 and 1951 when replanting of 484 acres destroyed in the fire of 1942 was completed. Since 1951 planting has gone according to plan, the increase in programme from 1957 onwards being to plant land acquired from Culachy Estate and unplantable land which was reclassified as plantable in F.Y. 60.

Future planting rate is 250 acres per annum at which rate all the available plantable land will be utilised by 1966.

Further expansion beyond the land already acquired is rather unlikely as long as the agricultural demand remains a strong competitor.

(b) Resumption

The land in hand at the end of F.Y« 62 is 900 acres and no further resumptions are likely, the end balance being either arable land or land at present classified as unplantable.

Should resumption action be necessary, however, it would be taken in accordance with the Directorate instruction on the subject dated 25th March, 1958.

Chapter 9 Silviculture

(a) Silvicultural Systems

The method of establishment of a forest crop has been by planting only.

(b) Thinning

Thinning was started on a small scale in 1934 in the acquired P14 Douglas fir plantation and was repeated in 1938. In 1940 the first light thinnings of Commission planted Japanese larch and Douglas fir plantations took place to remove wolf and suppressed trees. In 1942 a more conventional type of thinning was given to some 40 acres of Douglas fir; the grade applied being a light B-C grade.

Between 1941 and 1949 stands in or approaching the thinning stage were given a light thinning or cleaning according to stage of development: the cleaning operation was aimed at the removal of birch together with the cutting down of some rough Scots pine and Pinus contorta nurse trees which had served their purpose in the establishment of small areas of Norway and Sitka spruce. Poles from these cleanings *were* sold to the British Aluminium Company at Fort William, while heavier timber was despatched as pitwood.

After 1951, when road construction began, the thinning programme was planned in a more orderly and systematic manner but with fluctuating market demand the programmes accomplished were irregular, which to some extent had an effect on the intensity of grade of thinning.

From 1960 to date thinnings have been sold on a five year contract which has done much to stabilise the C-D grade of thinning prescribed. Yields per acre have been 250-300 hoppus feet for Scots pine and between 400-500 hoppus feet for Douglas fir and spruce. Thinnings have been done on a five year cycle.

Chapter 10 - Crop Establishment

(a) Choice of Species

In 1920 when planting began, there were few older plantations from which accurate guidance could be drawn.

The acquired woods were confined to:-

1. 2 acres P8 Scots pine on low ground.

2. 70 acres P14 Douglas fir, Japanese larch, European larch, Norway spruce, Sitka spruce on lower slopes.

3. Old European larch of 40 hoppus feet average, scattered through old hardwood.

The other woods without the area were:-

1. Neglected Scots pine with some Norway spruce on Glendoe Estate.

2. 56 year old European larch plantation at 700' elevation on Port clair.

3. Some spruce on the lower slopes of the Glenmoriston Estate.

The acquisition report quotes the European larch as being of good growth but swept and the spruce in Glenmoriston as growing extremely well.

Creep Soils

These soils were mainly planted with Douglas fir, European larch, Japanese larch and, to a lesser extent, with Scots pine, Norway spruce, Sitka spruce and a small quantity of Abies species.

Scots pine was selected for dry knolls and the shallower ridges, while European and Japanese larches were planted on the drier slopes but here and there strayed onto moister ground. Douglas fir was selected for the better hardwood areas and on steep less moist areas where the rock was nearer the surface. It was also on occasion used to stock rather moist flats and depressions, Norway spruce was planted on every gradation within the soil type and on degenerated birch scrub areas. Sitka spruce was planted on a small scale only and then on the moistest of sites. Abies species were mainly planted along roadsides for amenity purposes.

Mprainic Soils

In the early years the peat covered morainic soils were freely planted with Norway spruce and some Scots pine. About 1926, when it became fairly obvious that the spruces were not developing normally on the calluna covered undrained moraines, the choice for these sites swung to Scots pine which had showed up better in the pre P26 plantings. Results with Norway spruce on the peat free moraines were better but even on these sites Scots pine was largely used after 1926. On the deeper molinia areas, where the initial drainage was more intensively carried out, both Norway and Sitka spruce developed normally. In the late Twenties Japanese larch was introduced on some of the drier ridges and knolls and grew moderately well: in 1928 Pinus contorta was first planted on a wide variety of sites including knolls and ridges and on

the poorest of the gravels on the moor area with good results. From 1930 onwards Norway

spruce was restricted to mineral soil sites at lower elevation with Scots pine, Pinus contorta and small quantities of Sitka spruce being planted on molinia/ calluna sites at high elevation: Sitka spruce was, as far as possible, confined to the molinia sites although there is evidence of it straying onto the calluna sites where it went into check.

Deep Peat

These areas have been planted with Norway spruce, Sitka spruce, Scots pine and Pinus contorta and where the peat was of the scirpus/erica variety the spruces have checked or failed completely.

Norway spruce was carried on right through these fibrous high elevation peats as it was thought to be a hardy species capable of high volume production in areas of fairly heavy rainfall.

Failure of the pines, and in some measure of the spruces on these soils, was due to inadequate ground preparation of the early planting eras.

In later years only Sitka spruce was used and confined to flushes with Scots pine and Pinus contorta on the other areas, the latter being on the deeper fibrous peat.

General

The original practice was to favour Norway spruce and, of 891 acres planted in 1920-23, 750 acres was of this species. It was planted on good land as well as bad but principally on the latter.

In 1926 the species was seen to be badly in cheek over a large part of the area and a swing towards Scots pine for the drier knolls, and for the fibrous scirpus peats was made.

Sitka spruce was confined originally to the low lying moist areas on the creep soils but gradually it was moved up to the higher flushes containing molinia and bog myrtle. The reason for its being restricted to low ground was that it was thought to be tender to cold blasts.

Douglas fir was confined to the fertile old hardwood creep soil areas and to mineral soil sites where the rock was fairly near the surface.

Larches were first used in the P26-30 period and were generally planted on creep soil sites but, in some cases, they were planted on sheltered calluna covered morainic knolls.

By 1930 the choice of species had been fairly well resolved and conformed reasonably well with current practice.

The planting experiments on the deep peat of the Lon Mor are, summarised in Chapter 21.

Current Practice

Opinions of today differ greatly from the early years but little from those after 1930.

Some of the Scots pine planted on the more fertile creep and morainic soils would be replaced with Douglas fir or Sitka spruce according/

according to the moistness of the soil. Norway spruce, which is now scarcely planted, at all, would be replaced on the creep soils and better quality morainic soils by Douglas fir and Sitka spruce with the latter on the moister sites: larches would also, apart from those planted to form fire traces, be replaced by the same two species. The species used to stock the exposed moraines and peats at high elevation would be Pinus contorta on the deeper calluna covered peats, Scots pine on the more sheltered of the shallow peat covered soils and Sitka spruce on the molinia, covered flush peats.

Larches would continue to be planted to form fire protection belts around the perimeter of the forest and occasionally planted as a pioneer species on the better morainic soils.

Provenances

Virtually no records exist of the provenances of plants used in the pre-war years but it is believed that:-

1. The Sitka spruce came from Queen Charlotte Island.

2. Much of the Douglas fir came from the Fraser River, British Columbia, The provenance present on the Torr Dhuin area is one of the best.

3. The European larch came from the continent of Europe.

4. The Scots pine is of local or regional origin.

The Pinus contorta shows four identifiable provenances with some others rather doubtful and are:-

1. Washington Coast.

2. Alberta.

3. Mount Ida.

4. Alaska.

The provenances of post war plantings are definite.

(b) Preparation of Ground

7~"

1. Draining and Turfing

Initially ground preparation was limited to burning of calluna, sometimes three years ahead, and then draining on a limited scale.

The first few years saw very little draining and not till 1927 was turf planting tried and then only on 3½ acres: from then, until 1930, very little turfing was done even though it promised success and helped drainage.

Turfing as an experimental practice had been done in 1924 on the Lon Mor. In 1926 a crude form of plough was used on the same area but abandoned pending development of a suitable tractor.

When the Plan of Operations was revised in 1930 emphasis was laid on the need for much more intensive draining and turfing, both in the rehabilitation of past P. years and future plantings.

Preparation/

Preparation of ground followed this pattern until 1948 when ploughing with Guthbertson drainer and tine plough became common practice.

2. Scrub Clearing

Up to 1962 approximately 275 acres of scrub have been dealt with, the method being to cut and burn birch generally, with girdling of selected areas on a small scale. Girdling was first done in 1924 when 70 acres of oak woodland on the Torr Dhuin area were so treated.

In the early years scrub was cut as many as three years before planting which, with lack of drainage, resulted in re-wetting of the area and consequent poor growth after planting.

3. Weeding

The flats and lower slopes carried bracken/'grass and were weeded once or twice per year depending on the intensity of the growth. In the early years advance cutting of the bracken was done two years before planting to help reduce its vigour and weeding cost after planting.

4. Ploughing

As stated earlier an abortive attempt was made at ploughing in 1926 and nothing further was done until 1948 when a Cuthbertson plough was used on the moor area.

Since that time ploughing, wherever possible, using either the Cuthbertson single furrow draining plough or the Clark tine plough is standard practice.

5« Planting Methods

Direct planting using Schlich, Mansfield, or garden spades was standard practice for direct notching into peat covered soils. On harder sites, or where big plants were available, a little pit planting was carried out. About 1924 pit planting had gained in popularity and in that year 50?i of the plants were so treated. In 1925 most of the planting was done with the planting mattock, in an attempt to get shallow planting, but without the use of turves.

In 1927, turf planting was tried for the first time on 3½ acres but in spite of the improved results very little more was done till the start of the Thirties.

In the Thirties, some pits were dug in advance and the soil and peat mixed, and then the pine notched into this. Wet areas were drained and turf planted. Some direct notching was done and planting of Douglas fir and Norway spruce was done with mattocks, the Norway spruce being shallow pitted, the Douglas fir deep pitted.

Since the advent of ploughing in P.Y. 48 the amount of direct planting has dropped: where ploughing has not been possible the practice has generally been to screef and then notch.

The only underplanting on record was done in 1931, when 8 acres of P20 Japanese larch were underplanted with Norway spruce, the result being suppression of the Norway spruce when the Japanese larch finally decided to grow fast.

6. Beating up This/

This operation varied in intensity over the years and the 1930-37 period is the most important in this respect.

From 1921-24 all dead trees were replaced with the original species but in 1925 Scots pine and Sitka spruce were used to beat up the P22 Norway spruce areas and beech, of which little remains, was interspersed through P20 Norway spruce over an area of 43 acres.

In 1929, Scots pine was the main species used in beating up and deaths in some 50 acres of P23 Norway spruce were replaced with this species.

In the consolidation, period 1930-37, drainage intensity and turfing were much increased and all plants received an application of basic slag; the use of basic slag was discontinued for 1934 and 1935, Semsol being used as a substitute.

This consolidation work was carried out systematically, the working plan for the period stating that "dry slopes and knolls where spruce have failed will be planted with Scots pine by ordinary methods with some Japanese larch on lowest slopes" and "the better types of flats and hollows be drained intensively, turfed, and planted with Sitka spruce with an application of slag."

Prom 1938 to date beating up has continued on a small acceptable scale, number of plants replaced is as per current instructions. The type of fertiliser now in use is ground mineral phosphate and the doze 2 ounces per plant.

Chapter 11 - Crop Maintenance

(a) Fencing

Up to 1923, P year areas were enclosed separately by temporary deer fences and it was not until 1927 that a continuous perimeter fence was in position around the main acquisition. Early fences were constructed of home grown cleft oak posts at 5 to 8 yards intervals carrying 10 wires and rabbit netting and strengthened by the addition of larch droppers at 5 feet to 6 feet apart.

Similar type deer fences using sawn softwood posts were erected around the Culachy and Straight Mile sections in 1958 and 1959.

Perimeter fences, apart from a short period after the war, have been maintained in a deer and stockproof condition. A major repair, which included the erection of a new length of fence between Port Clair and Inchnacardoch forests, was undertaken in 1956 the work being done by contractors.

Roadside fences, which are no longer necessary for protection purposes, have been dismantled to facilitate timber operations.

(b) Cleaning

Cleaning operations, in the form of removing wolf trees, dead and suppressed trees were started in the acquired woods in the early Thirties when some brashing and a little high pruning were also done. Later in the Thirties this type of treatment, less pruning, was given to the most advanced stands of P20 Norway and Sitka spruce.

From 1940-46 cleaning was confined mainly to the removal of birch from the P22-30 areas together with the cutting out of some rough Douglas fir and Scots pine wolf type trees.

Cleaning in European larch areas consisted of the removal of unhealthy and deformed stems resulting from larch canker attack. In the Fifties cleanings were confined to the removal of hardwoods which were damaging conifer crops and to the cutting out of suppressed conifer stems for sale as pokers to the North British Aluminium Company.

(c) Draining

In the early planting years the intensity of drainage necessary for satisfactory tree growth was inadequate although less so on the creep soils. In the period 1930-37 considerable quantities of additional new drains were cut as part of the rehabilitation programme undertaken during this period.

Drain cleaning demands attention on the flatter areas in both the thinning and pre-thinning stages but is nowhere seriously in arrears.

(d) Racking

Virtually no racking as such has been carried out, any forest path being formed prior to or at time of planting.

(e) Brashing

The first brashing was done in 1935 when the acquired plantations were brashed up to a height of six feet. The species concerned were Douglas fir, Japanese larch and European larch. The intensity was heavy, only the poorest stems being left untouched. Later, due to reasons of economy only the best trees were brashed,

Current practice is to brash 75%-80% of the stems of Douglas fir and spruces and about 60% in the pines and larches.

(f) Pruning

No high pruning has been done as such but an odd tree, so treated, is present in the acquired woods.

(g) Other Operations Nil.

Chapter 12 - Crop Enrichment

(a) Enrichment

No enrichment has been done, the 1951 underplanting of Japanese larch being designed to produce a pure Norway spruce crop.

(b) Rehabilitation.

Rehabilitation work has consisted entirely of improving the drainage on the earlier formed plantations. New drains were cut, the originals deepened, and resulting turves used in planting. Manuring of original and newly beat up plants was carried out on a large scale on checked and redrained areas as part of the consolidation programme of 1930-37.

Results have varied considerably and as might be expected have been best where fertility of the soil was not the limiting factor e.g. flush peat conditions where Sitka spruce responded to improved drainage; on this type of site the improvement has been maintained. On the other hand, redraining and manuring of infertile sites carrying Norway spruce and Sitka spruce resulted only in a temporary improvement with a later settling back to slow growth and checking. This applies to the calluna/scirpus clad peats and lower drift hard knolls and is probably due to the rank calluna growth following initial burning and enclosure.

Chapter 13 - Regulation of Yield.

(a) Form WP 13 - Record of Yields from Thinning and Felling

As will be seen from the WP 13s thinning yields on the average have been below 500 hoppus feet per acre. It would appear from F.Y. 57 and F.Y. 58 figures that this was not so but the reason for the apparently high yield in these years was due to the clearing of scattered windblown trees and no acreage was recorded against windblown volumes on the R.O. (a)s.

Since F.Y. 59 the yields per acre have averaged well below 500 hoppus feet per acre and this is due to the fact that there have been a lot of first thinnings in Scots pine yielding about 250 hoppus feet per acre.

(b) Methods of Yield Regulation

The yields from thinnings as shown on the IP 13s for the past five years show no marked regularity.

Thinning plans have in the past been based on the thinnable acreage of the forest with an estimation of the yield per acre.

The actual volume removed, however, has been dependent not so much on thinning plan prescriptions as on the demands of the timber trade and the accessibility of the thinnings. Demands have fluctuated greatly and it is only in the past year that all thinning areas have been tapped by roads.

The area in the thinning stage is at present approximately 1,100 acres and the thinning plan stipulates that this be worked through on a five year cycle; the five thinning blocks are equi-productive. The prescribed grade has been a C-D one but because of lack in demand the volumes removed per acre have in fact been uneven in an endeavour to work through the areas in the thinning stage.

WP 4 shows the C.A.I, to be 207,000 hoppus feet so that ideally some 70,000 to 80,000 hoppus feet should be removed annually in thinnings, a figure which has so far not been attained: the highest thinning volume removed to date was in P.Y. 55 when just over 60,000 hoppus feet was cut down.

With a steady and more permanent market in the shape of the pulp mill yields from F.Y. 65 onwards should be in accordance with the yields prescribed in the plan.

Chapter 14 - Forest Roads and Access

(a) Construction

When road construction started in 1951 the mileage of roads considered necessary to serve the potential 4,000 acres of plantations was estimated at some 50 miles, this mileage being based on the requirement of 1 mile of road to serve 80 acres of plantation. To date 16 miles have been constructed by Forestry Commission and a further 5 miles of public roads serve the area; this leaves an outstanding mileage of 29 miles but due to recent developments in timber extraction equipment, Conservancy instructions have been issued (1962) to the effect that spacing between roads be extended from 200 yards to around j>00 yards. This increase in espacement has the effect of reducing future requirements from 29 miles to just under 20 miles.

Costs of construction have varied according to terrain, quantity of rock encountered, number of bridges and culverts required etc. and have ranged from £5,800 to £4,500. The average cost per mile for the 2.14- miles completed in 1962 was approximately £4,300.

The earliest construction work carried out between 1951 and 1956 was to a low specification when compared with present day standards and consisted of bulldozing tracks without too much regard to gradient or curvature of bend. From 1956 onwards, however, work has proceeded in accordance with an overall road plan to an approved set of standards.

Road making materials have been obtained locally from morainic deposits and these have, so far, stood up to the weight of traffic using the roads.

Bridges are of tramrail and concrete construction, while cement pipes of varying diameters are being used to conduct lesser streams and ditches under roadways.

(b) Maintenance

This is the responsibility of the forest staff and the work chiefly involved is the maintenance of drains and attention to ensure that culverts and bridges are not obstructed. Minor surface repairs are carried out by hand but any major repairs employ mechanical equipment, principally graders.

(c) Access

Access to all areas is good, with local estates granting extra accesses over their ground on special occasions.

Chapter 15 - Powered Vehicles and Machines

1. Transport

Supervisory transport is limited to one long wheelbase Land Rover.

Transport of workers is done by the supervisory vehicle together with a 5 ton Thames Trader which is also used for haulage of stores, timber, plants, nursery grit etc. in and out of the forest.

For work in the nursery, there are two Ferguson 35 tractors with one trailer and all necessary implements for mechanical cultivation and weed control operations.

2. Other Mechanical Equipment

There is one Liner Cross-cut bench used to cut firewood for the hostel and local orders.

For fire protection purposes there are two pumps, a Wajax and a Hathaway.

3. Availability of Equipment from Other Sources

Bulldozers, excavators, Crawler tractors, Cuthbertson and tine ploughs are available from the Conservancy pool as required. Hired transport for the long distance haulage of timber has occasionally been provided by Highland Haulage of Inverness, while tipper lorries for haulage of roadmaking materials have been hired from contractors in Invergarry, Fort Augustus, Invermoriston, Allt Saigh, Drumnadrochit and Elgin.

4. Maintenance and Repair

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 necessary. Breakdown in the interval between inspections are recorded on a defect report which is submitted by the Forester to the Conservancy Mechanical Engineer whose action, depending on the nature and extent of the repair, is:-

(I) For small repairs a mechanic is sent from a Conservancy workshop to effect the repair.

(II) For repairs costing up to about £5 which cannot be undertaken at the forest, the vehicle may be towed or driven to the local garage.

(III) If the repairs are relatively big and expensive, involving crawlers or diggers, the work is executed in the Directorate workshops at Chapelhall unless overhauled replacement parts are available e.g. engines and track assemblies, in which case the Conservancy workshops fit these.

Major repairs to other mechanical equipment are carried out in Conservancy workshops and so far as possible the balance, if any, sent to the Ministry of Supply workshop in Inverness. If repairs are likely to take more than a week, a replacement machine is normally available from Directorate workshops in the case of crawlers and from Conservancy workshops in the case of lorries or vans.

The forest is normally served for repairs by the Mobile Mechanist from Culloden, and the workshop at Longman, Inverness.

(IV) The present holding of equipment is adequate and suitable for present commitments.

Chapter 16 - Marketing and Exploitation

(a) Marketing

1. Standing Sales

The first standing sale of 45,000 hoppus feet was made in 1952 and was the forerunner of a series of annual sales which were concluded in I960 when the thinnings for the period 1960-1962 were sold on a five year contract.

Prices during this period 1952-1962 have varied considerably, ranging from 6d. per hoppus foot in 1953 to 1/8d. per hoppus foot in 1955. Prices paid for the first three years of the long term contract i.e. I960, 1961 and 1962 were 1/-d., 1/-d., and 11½d. respectively.

Variation in prices paid have been partly due to fluctuation in National Coal Board prices and partly to the species, volume of the trees, quality of the timber and accessibility. Volumes have ranged from 1 hoppus foot to 4 hoppus feet, the latter being the average volume of the lot sold in P.Y. 62. The following merchants have bought standing thinnings at the forest.

Z. Glass & Son Ltd., Inverness	-	1952 & 1953
C. Anderson & Sons, Grantown on Spey	-	1955, 1956, 1957 & 1958
J. MacKay, Golspie	-	1956 & 1957
P. McAinsh Ltd., Crieff	-	1960, 1961 & 1962

2. Departmental Working

Thinning by Forestry Commission started in the acquired plantations in 1934 and was continued in a desultory manner treating the faster developed stands until 1950 when thinning to a more systematic plan was started. The produce from thinnings from 1950 until the present time (1962) have been sold in length at roadside. Prices obtained again fluctuated largely according to the prices being paid by the National Goal Board, and to the quality of timber and species; highest prices being generally obtained for spruce. Prices have ranged from 1/7½d. per hoppus foot in 1950 to 2/5¼d.in 1952. Current roadside price is between 1/8d. and 2/-d. per hoppus foot.

(b) Exploitation

1. Standing Sales

In the early sales coupes consisted of homogenous blocks varying in size from 40 to 100 acres the variation being due to the demand of the timber trade, and in the early pre-forest road period, to the accessibility of the timber. Volumes have varied from 15,000 to 40,000 hoppus feet.

First sales were measured by basal area method but since the introduction of the tariff method all sales have been enumerated in accordance with this instruction.

The Forester and his staff ensure that the conditions of sale, in so far as they relate to the merchants working in the forest, are carried out; these normally refer to the maintenance of main drains and streams in a free running condition, protection of the standing crop from debarking and the timeous application of creosote to stumps to minimise the spread of fomes annosus.

Methods/

Methods of working the thinnings have changed little over the years except that felling is now commonly accomplished by the use of power driven chain saws as against two man hand saws in the early years. Extraction over the years has been done by horse with the occasional use of a winch to extract from some of the steeper slopes.

Method of conversion has varied with the merchant working the timber. Some have favoured central conversion depots complete with sawmill, while others have converted the small roundwood into props at roadside and removed the sawtimber to be converted elsewhere.

The timber sold to date has largely found its way to the National Coal Board in the form of round props or sawn mining timber.

2. Departmental Working

In recent years departmental working has been almost entirely confined to the felling of roadlines and the clearance of windblow areas if these were outwith the standing sale area and amounted to say some 6,293 hoppus feet in F.Y. 62.

(c) Observations on the relative merits of Standing Sales and Departmental Working

Actual working costs i.e. felling, snedding, extraction and crosscutting vary little whether these operations were carried out by Timber Merchants labour, Contractors or Forestry Commission labour, but because of the high overheads which the Forestry Commission labour charge attracts, the sale of trees standing shows the greater surplus.

Chapter 17 — Risks

(a) Animals

Rabbits are well nigh absent following the original attack of myxomatosis in 1956. Control is achieved by a combination of trapping, shooting, and snaring.

Deer

Red deer are common outwith the enclosures but are only found within the forest on odd occasions, A measure of their scarcity is that in F.Y. 60 only eleven were shot and ten of these had been fenced in on a new enclosure.

Roe deer are however more numerous and do damage to the trees by rubbing and browsing, Pinus contorta being preferred. Planting of windblown gaps with Sitka spruce, without fencing, has been done and escaped damage. Twenty to thirty roe deer are killed annually, by shooting.

Voles

Voles are always present, bad attacks being experienced in calluna areas where adjoining scrub has been cleared. In F.Y. 60 there was a bad attack on Scots pine, in calluna, on the Straight Mile area.

Foxes

Foxes are found within the forest and, in the interests of crofting and farming, their numbers are kept down by trapping and shooting.

Wild Cats

These animals are seen from time to time and kills are on average one per year. Once again action is taken to aid crofting and farming interests, but the killing of these rare animals is not encouraged.

Squirrels

An occasional red squirrel is seen on the area but no damage is evident. One was shot in F.Y, 60.

(b) Birds

Damage to pine from black game is common and their numbers appear to be on the increase. Capercailzie are also present but are very few in numbers. Cross-bills occasionally do a little damage to cones.

(c) Insects

The important insects are Pine Weevil and Pine Shoot Beetle, both of which are active at present. Future plantings above the present top tree line will be treated with Didimac to combat weevil attack but otherwise no other action will be taken unless circumstances warrant it. Sitka spruce has suffered defoliation from Nepmyjsaphis abietina but not sufficiently severe to cause death. Chermes cooleyii appears annually on the Douglas fir but do little harm on the adult trees. However the Douglas fir surrounding the Golf Course nursery infect the Douglas fir beds and spraying of the seedlings is necessary.

Cockchafer population in the nursery is now practically nil although, in the earlier years, it was a serious menace. Cultivation of fallow land in the egg laying season and elimination of green crop from certain areas has produced and maintained this low level.

(d) Weeds

Weeds or weed sources requiring special treatment are present only within or surrounding the nursery. Weed control in beds and lines is by means of white spirit, mineral oil, and simazine compound sprays.

(e) Fungi

The fungi present on the area can be divided into those affecting the nursery and those in the plantations.

(i) The Nursery

Meria laricis is present and European larch requires regular spraying with sulphur emulsion sprays to combat attack.

Keithia thujina is active in the nursery hedges and no thuya is therefore grown in the nursery.

Botrytis has occurred only spasmodically but a watch is kept for any reappearance.

(ii) The Plantations

Fomes annosus is present and the forest is treated as a research unit as far as this fungus is concerned with only selected stands having stumps creosoted at time of felling.

Armillaria mellea has made spasmodic attacks but is not regarded as constituting a menace. It was most active in the period 1920-30 and present day attacks are virtually nil.

Dasyscypha calycina, affects all the European larch crops in the pole stage re suiting in many deformed stems.

Keithia thujina is found on all thuya but no deaths have occurred or serious defoliation.

(f) Climate

The climate is well suited to the growth of trees and the main dangers are from frost and gales. Late spring frosts have caused extensive browning both in the plantations and the nursery, the latter sometimes being the worst affected. The main winter frosts usually cause some frost lift of seed beds, losses varying with the severity of the frosts and the number of the frosts and thaws.

Seed beds of spruce and larches are protected with lath shelter from October of their first year to the third week of June of their second year.

Gales funnelled from the south west by the Great Glen cause some windblow but nothing extensive. Some snap occurs in Sitka spruce, generally on freely drained sites, and Douglas fir on knolls with thin soil overlying rock.

Snow damage is negligible at the present plantation limit but some may be expected as the proposed planting nears the top limit.

Drought crack occurs only in very dry years, the species so far affected being Abies grandis, Abies nobilis, and Sitka spruce.

(g) Trespass

No damage directly attributable to trespass has occurred but with the ever increasing use of Wade's road and the extension of the forest road system some increase in danger from this source may be

(h) Atmospheric Pollution

There is no atmospheric pollution.

(i) Fire

The danger from fire is on the whole moderate and confined chiefly to the spring months. The sources of danger are from muirburn, passing traffic and members of the public walking through the forest.

Roadsides are kept clean, and in the older roadside stands brashing is done to one chain depth and the brash hauled back. In new plantations, one chain perimeter belts of Japanese larch are planted where it is certain that the larch will grow satisfactorily.

Chapter 18 - Nurseries

The nursery at Inchnacardoch was started in the year following acquisition and was rapidly built up until in F.Y. 28 it extended to some 45 acres. The area under cultivation has since fluctuated according to the plant requirements of the Conservancy and the intention now is to gradually close it down altogether.

In F.Y, 63 it is intended to start this process by closing down some 15 acres of the Auchterawe section: the falling plant requirement and the supply of better plants from more favourably situated nurseries has hastened the decision in this respect.

Chapter 19 - Staff and Labour

(a) Staff

Details of officers in charge and assistants are as follows:-

Year	District Officer	Divisional Officer	Conservator
1919	G. Home	F. Scott	
1928	J. W. Mackay	-	
1929	H. G. Beresford-Peirse	-	
1931	-	J. Eraser	
1937	D. S. Spraggan	-	
1940	-	D. S. Spraggan	
1942	-	A. Watt	
1945	-	-	J. Fraser
1948	-	J. T. Fitzherbert	
1949	R. 0. Drummond	J. A. Dickson	
1952	R. A. Innes	-	
1956	G. F. D. Savage	J. Chrystall	J. A. Dickson
1958	J. A. Drummond		
1962	A. Ray		

Head Foresters, and Foresters in Charge

1920-31	J. Cameron	Head forester
1931-34	W. Anderson	Grade I Forester
1934-49	W. Anderson	Head Forester
1949	D. MacDonald	Grade I Forester
1950-60	D. MacDonald	Head Forester
1962	J. Frater	Head Forester

Assistants - Foresters, Foremen and &angers

1921-1925	J. Gunn	Foreman
1925-1931	J. Gunn	Grade II Forester
1929-1938	H. Pennet	Foreman
1938-1939	H. Pennet	Grade II Forester
1943-1946	T. Fraser	Ganger
1947-1953	T. Fraser	Foreman
1947-1948	D. D. C. Robertson	Foreman
1948	C. 0. McIntosh	Foreman
1948-1949	C. 0. McIntosh	Grade II Forester
1949	D. R. Smith	Foreman
1949-1950	D. R. Smith	&rade II Forester
1949-1951	W. E. C. Beattie	Foreman
1952-1955	E. Saunders	Ganger
1955-1959	E. Saunders	Asst. Forester
1959-1961	E. Saunders	Forester
1955-1960	H. Thom.	Asst. Forester
1960-1961	D. Coutts	Asst. Forester
1961 to date	J. Chree	Forester

Staff at 30th September. 1962		Present Staff
Conservator	J. A. Dickson	H. A. Maxwell
Divisional Officer	J. Chrystall	J. Chrystall
District Officer	J. A. Drummond	A. Ray
Head Forester	J. Frater	J. Frater
Forester	J. Chree	J.Chree

Due to its wide range of operations this unit is ideal for training of young assistant foresters and increasing the experience of those recently reaching forester grade as is the position at present.

(b)/

(b) Labour

The follow1ng table gives the workers by age group and grade.

Age Group Years	Total		Ganger	GI	GII	GIII	Others
	Male	Female					
Under 20	1	-	-	-	-	1	-
21-30	2	2	-	-	-	4	
31-40	6	-	-	4	-	1	1
41-50	8	-	3	2	1	-	2
51-60	6	-			*2*	1	3
Over 60	7	2	-	4		4	1
	30	4	3	10	3	11	7

Of the total staff employed eleven or 33% are established.

Wastage

Up to 1951 when the houses were built in Jenkins Park there was little turnover in permanent labour, as all employees were resident either in the village or the Forestry Commission holdings. Thereafter, amongst the Jenkins Park tenants there has been a slow movement which, in recent years, has extended to the holdings. This movement is steady and is likely to remain so at its present figure of two men per annum. The average wastage rate over the last five years including retirals, trainees, and limited temporary nursery staff has been sixty-nine. Figures for a period extending beyond the last five years give an erroneous impression as they would include a large number of temporary nursery staff which are no longer necessary due to the extensive methods of mechanisation and chemical weed control and to the steady reduction in the size of the nursery.

Quality of Labour

The quality of labour is generally satisfactory but the age structure leaves room for improvement, there being 66% aged 41 or over with nine impending retirals within the next five years. A fair proportion of the employees are local men but there is no difference in working ability between them and those who have come from outside sources.

Recruitment Possibilities

This has varied little over the last ten years, availability of men being governed somewhat by the requirements of local public works schemes. Other competitive sources for labour are local estates, farms, and the British Transport Commission Authority which operates the Caledonian Canal.

Until 1962 there were no recognised training schemes in operation, each new recruit learning the work under supervision in the course of the normal forest operations.

Recruitment of Gangers

Gangers are recruited normally from the squad, only one of the present three coming in this grade from another forest. Finding men of the right calibre is difficult as no local man, even though possessing all the necessary experience, wishes to boss his neighbour. Suitable men have refused the grade for this reason.

Piecework and Bonus Schemes/

Piecework and Bonus Schemes

Piecework is used on all operations lending themselves to this method of payment viz. felling, extraction, ploughing, planting, and nursery work. Not all the men have the ability nor the desire to accept it but nevertheless the amount of piecework done is high.

No bonus schemes have been or are in operation.

Existing Houses and Transport

Of the 34 workers employed on the forest, 13 are Forestry Commission tenants and 7 are housed in the hostel. The other 14 live in the village.

Jenkins Park housing site lies within a half mile of the administrative centre with the other houses, holdings, and the hostel some 2 miles further along the Auchterawe road.

There are two reporting points, one at the office and the other at the Auchterawe steading. Travelling from the reporting points to other parts of the forest is done in Commission time by the forest vehicles.

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

Details of buildings in the Working Plan area are as follows:-

(a) Houses and Holdings

Forest Workers' Holdings: There are eight forest workers' holdings detailed hereunder.

(i) F.W.H. Nos. 1 and 2 - Stone built semi-detached houses each with a barn/byre, henhouse, and shared wooden wash-house. They are occupied by a Grade I worker and tractorman respectively.

(ii) F.W.H. No. 3 - Stone built detached house. Outbuildings are one henhouse. Occupied by a Grade III worker.

(iii) F.W.H. Nos, 4 and 5 - Stone built semi-detached houses each with a henhouse and shared wooden wash-house. F.W.H. No. 4 is occupied by an Assistant Forester from the Research Branch and No, 5 by a forest ganger.

(iv) F.W.H. Nos, 6 and 7 - Stone built semi-detached houses. No, 6 has a henhouse and No. 7 a wooden barn/byre. A wooden wash-house is shared by the tenants. Occupants of 6 and 7 are a Grade II and Grade I worker respectively.

(v) F.W.H. No. 8 - Stone built detached house with a wooden barn/byre as outbuilding. Occupied by a tractorman.

Holdings are allocated as far as possible to key workers.

Houses

The main body of the houses are at the Jenkins Park housing site, the remainder being distributed along the Auchterawe road apart from Achadnandarroch which is isolated at the west end of the forest.

(i) Jenkins Park - Details of the houses here are:-

A - 8 semi-detached two storey, brick built 3 bedroom houses.

B - 4 semi-detached, single storey, brick built, 2 bedroom houses.

C - 4 semi-detached, two storey, brick built, 2 bedroom houses.

D - 2 detached, two storey, brick built, 3 bedroom houses.

Types A to C are occupied by forest and roads supervisory staff, and workers.

Type D are occupied by the Head Forester and the Research Branch Head Forester.

(ii) Other Houses - These number six and are:-

A. Woodlands - Timber house, corrugated iron clad, 3 bedrooms. Occupied by a ganger who acts as forest clerk.

B. Auchterawe Hostel Houses - Two semi-detached timber houses, corrugated iron clad, 2 bedrooms. Occupied by civil engineering gangers.

C. Whinhill - Timber house, corrugated iron clad, 2 bedrooms. Occupied by a District Officer.

B. Auchterawe House - Stone built, three storey, 3 main bedrooms and two attic bedrooms. Occupied by a District Officer.

E. Achadnandarroch House - Stone built, two storey, 2 bedroom house. Occupied by an archaeologist.

Farms

There is one farm, Auchterawe, on the forest. The tenant recently moved into Fort Augustus leaving the Forestry Commission house empty. The house is of timber, corrugated iron clad, 2 bedrooms, and in very poor condition.

The land extends to 32 acres of arable and 3&g- acres of rough pasture.

Outbuildings are of wood and comprise barn, byre, and implement shed. All now in very poor condition.

(b) Other Buildings

The other buildings on the forest are:-

A. Golf Course Nursery and Office Area - Ten wooden sheds serving respective uses as lorry garage, Land Rover garage, fire shed, tool maintenance shed, tool stores, wet weather shelters and work sheds.

The District and Forest office is a single storied building of brick construction with a slate roof and comprises seven offices and a stationery store. The building is centrally heated by a 3 K.W. Nightstore Heater in each of the offices and two 1½ K.W. Nightstore Heaters in the corridors: this system works in the 'off peak[1] hours and is supplemented by twin bar electric fires in each of the main offices.

The seven offices are at present occupied by two District Officers, one Area Civil Engineer, one Head Forester, two Superintendents of Works, Surveyors and the general forest office.

B. Hostel Area - In this area are the Forestry Commission hostel and two large huts which are used as carpenter's shop and hostel equipment store respectively. The hostel is of timber, corrugated iron clad, and comprises, kitchen, dining room, cook's bedroom, ablutions, and two large dormitories. It has accommodation for up to twenty men.

C. Auchterawe Nursery - Two stone buildings one with a loft, the single storey one being used as a tractor shed and coal store for the hostel.

The two storey building comprises implement shed, stable, hay and manure store with the loft space embracing seed and tool stores.

(c) Special Installations

In the earlier years of the nursery a pump house and irrigation system was laid out in the Golf Course nursery, the pump house being situated on the banks of the River Oich. Water was first pumped to a header tank, and then distributed by iron pipe throughout the nursery.

The engine, petrol/paraffin, header tank, and pipe system, blocked and corroded, are still present, the engine being run occasionally to keep it in working condition.

Chapter 21 - Research and Experiment

(a) Research Branch Work

Inchnacardoch has been the scene of continuous research work since 1922. Experiments can be divided into two classes, field and nursery.

In the field the main research area has been the Lon Mor with its extensive area of deep basin peat. Experiments have covered a wide range of subjects but are all connected in one way or another with the problems of successfully afforestating deep peats. Research has been broadly aimed at finding out the best methods of ground preparation, the species most suited to the conditions and the most effective type of fertiliser.

Nursery experiments have also been largely connected with soil nutritional problems.

A list of experiments is given below, the letters F.R. and W.O. signifying Final Report and Written Off respectively. No entry in the final column means experiment is still operative.

Expt. No.	P. Yr	Nature of Experiment	F R., W.O., or Burnt
1	21	Effect of calluna burning on Norway spruce	W.O .
2	22	Pitting and notching of pines and spruces	W.O.
3	22	Age and type of Norway spruce	W.O.
4	22	Season of planting Sitka spruce	F.R. Ex 16
5	23	Pitting, notching etc. of various species on shallow peat	Burnt
6	23	Various planting methods on deep peat - Sitka spruce	W.O.
7	24	Various methods of shallow planting on deep peat	W.O.
8	25	Effect of shelter and basic slag on checked Sitka spruce on shallow peat	W.O.
9	25	Effect of shelter on. transplants and seedlings of Norway spruce	F.R.
10	25	Various methods of notching into turves	F.R.
11	25	Effect of 1, 2 and 3 years[1] decomposition of turves	W.O.
12	25	Effect of application of mineral matter to plants inserted in upturned turf with circular spade and with cross notch and roots spread on the surface	F.R.
13	25	Norway spruce and Sitka spruce on shallow turves. Age and type.	F.R.
14	26	Norway spruce on good ground. Age and type	W.O.
15	26	Field planting of widely and closely spaced Norway spruce. (Completed 1930 and utilised for Experiment 89. P.30)	F.R.
16	26	Introduction of various Pines into Sitka spruce - 4/22	F.R.
17	26	Manuring of Norway spruce. Rowan and Birch (includes Kainit)	F.R.
18	26	Pines, Rowan, and Birch on shallow peat mounds .	
19	26	Costing of one acre of side notched Scots pine. Dressings against black game.	
19A	26	Final of species on peat (extension to 19/26)	F.R.
20	26	Scots pine under netting (Black game protection)	W.O.
21	26	Raising of plants in peat nursery with slag for planting out	W.O.
22/			

Expt. No.	P. Yr.	Nature of 'Experiment	F.R., W.0., or Burnt
22	27	Planting of pines and spruces on same turf In 6/.	Burnt
23	27	Covering of roots of Norway spruce and Sitka spruce with canvas	Burnt
24	27	Treatment of checked Sitka spruce in rank calluna	Burnt
25	27	High elevation nursery - planting of various species	F.R.
25A	29	Extension of planting of various species at high elevation	
26	27	Treatment of backward Sitka spruce by Lifting etc. See 8/25.	F.R.
27	27	Field extension of density of sowing European larch	F.R.
28	27	Field extension of graded seedlings of European larch	P.R.
29	27	Field extension of graded seedlings of Sitka spruce	F.R.
30	27	Pot Nursery Extension	W.O.
31	27	Spruces grown in pots and planted out in shallow peat	W.O.
31A	27	Completion of pot nursery	¥.0.
32	27	Screef turf method with Norway spruce on shallow peat	W.O .
33	27	Direct sowing of Sitka spruce, Norway spruce, and Scots pine on peat turves.	W.O.
34	27	Effect of 1, 2, and 3 years' decomposition of shallow turves	W.O.
35	27	Use of Magnesium manures on peat. Extension *12/25*	W.O.
36	27	Various species on peat	F.R.
37	27	Root aeration on peat	¥.0.
38	27	Direct planting control on peat on Lon Mor	¥.0.
39	27	Costing experiment on peat with manures - Sitka spruce	
40	27	Trial of Sitka spruce and Norway spruce in deep and shallow layers of drain turves	W.O.
41	27	Planting on shallow turves from deep and shallow peat layers	W.O .
42	27	Root and shoot pruning of plants on peat	¥.0.
43	28	Manuring of Sitka spruce on peat	F.R.
44	28	Isolation and stripping experiment	W.O .
45	28	T. K. Fraser's Peat Isolation Experiment	
46	28	Species on Belgian turves (Peat)	
47	28	Sitka spruce and Pinus contorta on same turf .Peat)	
48	28	Age and type of Sitka spruce on Belgian turf	F.R.
49	28	Comparison of Belgian and Thin Turf Methods	
50	28	Field Trial of manured Scots pine seedlings	P.R.
51	28	Field trial of manured Scots pine seedlings ex Beaufort	F.R.
52	28	Draining with Belgian method of turfing	
53	28	Method of double turf planting	W.O.
54	28	Reversed and unreversed shallow turves	W.O .
55	28	Three year draining and turfing experiment	F.R.
56	28	Field trial of graded Scots pine ex Beaufort	F.R.
57	28	Sitka spruce in trenches with Scots pine notched between them	F.R.
58	28	Races of Scots pine (Race and Type)	
59	28	Sowing of Scots pine on peat	F.R.
60	28	Treatment of moraine knolls	F.R.
61	28	Introduction of Pinus contorta into Sitka spruce in Belgian planting	F.R.
62/			

Expt. No.	P. Yr.	Nature of Experiment	F.R., W.O., or Burnt
62	28	Introduction of turf planting into 5/23 on Shallow peat	Burnt
63	28	Season of cutting turves	¥.0.
64	28	Suppression of calluna round Sitka spruce	w.o.
65	28	Introduction of Scots pine between Sitka spruce	Burnt
66	28	Trial of Rowan seedlings on shallow peat	W.O.
67	28	Introduction of Sitka spruce into Pinus contorta	W.O .
68	28	Planting of turves reversed in the hole whence cut	W.0 .
69	28	Trial of species on ploughed ground (Calluna)	F.R.
70	28	Re-lining of checked Norway spruce in the nursery	W.O.
71	28	Measurement of peat shrinkage	w.o.
72	28	Surface dressings of slag (peat)	
73	28	Growth of Sitka spruce on peat turves from various depths	w.o .
74	29	Top dressing with basic slag at intervals	F.R.
75	29	Two acre group method of intensive planting - costed	
75A	30	Placing of moss between turves in groups	
75B	30	Sowing of molinia seed amongst group	
76	29	Effect of advance slag applications in the nursery	F.R.
77	*23*	Application of various quantities of Basic slag	W.O .
78	31	Comparative values of 2+1, 2+2, and 2+1+1, Douglas fir for planting on loose, calluna clad, glacial sand and gravel	w.o.
79	31	Effect of Basic Slag on Pinus contorta, Japanese larch, and Scots pine, notched into loose, calluna clad, glacial sand and gravel	F.R.
80	31	Test and cost on a semi-field scale method of close planting - Douglas fir, Scots pine and Japanese larch	F.R.
81	31	Strip ploughing on loose, calluna clad, glacial gravel - Douglas fir and Japanese larch	F.R.
82	31	Strip ploughing - Scots pine and Pinus contorta	F.R.
83	29	Growth of Sitka spruce transplants on basin peat -with manure mixtures	P.R.
84	29	Comparison of growth of Scots pine lots of different origins	
85	30	Inoculation with decaying peat	w.o .
86	30	Ten acre field trial of experimental methods	
87	30	Effect of various phosphatic manures on growth of Sitka spruce	F.R.
88	30	Effect of mixed manures on growth of Sitka spruce	W.0.
89	30	Group planting of Norway spruce	W.O.
90	3d	Trial of Abies balsamea	
91	30	Top dressing of Sitka spruce (Contains also Norway spruce)	F.R.
92	31	Scots pine races	
93	31	Species on peat	
94	31	Lifting experiments	F.R.
95	32	Methods of planting - species	
96	32	Methods of planting - species	
97	32	Alder on turves	
98/			

Expt, No.	P. Yr.	Nature of Experiment	F.R., W.O., or Burnt
98	32	Methods of planting Sitka spruce	F.R.
99	32	Methods of planting Sitka spruce	F.R.
100	32	Season of lifting	F.R.
101	32	Alder on turves	
102	32	Aider species on silt and gravel covered peat	
103	33	Planting on poor peat slopes (field scale)	F.R.
104	33	Flushing experiment	F.R.
105	33	Trial of Japanese larch and Hybrid, larch on Belgian turves	
106	34	Planting into various well defined soil horizons in a podsol area	F.R.
107	34	Races of Alder on undulating morainic peat lands	F.R.
108	34	Birch and Alder races for peat lands	F.R.
109	34	Alder and Sitka spruce in mixture	Burnt
110	34	Beating up Japanese larch on calluna/ grass	
		(Beating up Japanese larch, Douglas fir, Beech)	
111	34	Beating up Japanese larch on calluna/ grass	
		(Beating up Japanese larch, Douglas fir, Beech)	Burnt
112	35	Top dressing of Sitka spruce and Pinus contorta	
113	35	Top dressing of Sitka spruce and MJIUJB contorta	
114	35	Top dressing of Japanese larch and Sitka spruce	F.R.
115	35	Various phosphatic manures (Semi-field scale)	F.R.
116	35	Corsican pine on peat types	
117	35	Tough peat covered knolls	F.R.
118	36	Tough peat covered knolls experiment repeated	F.R.
119	36	Dates of planting and turfing Japanese larch	F.R.
120	38	Group planting, intensive draining and turfing	
121	38	Tough peat knoll inoculation	Burnt & F.R.
122	39	Peat (Slope Type)	
123	39	Trial of Chamae cyparis nootkatensis	Burnt & F.R.
124	39	Peat and manuring. Japanese larch and Sitka spruce	*
125	39	Complete manuring - comparison of fertilisers. Sitka spruce and Japanese larch	
126	39	Peat and mycorrliza. Direct sowings with	
		G5 Compost and manures - Scots pine, Pinus contorta and Sitka spruce	Burnt & F.R.
127	42	Test effect of planting Sitka spruce on turves among brash	F.R.
128	46	Field scale trial of afforesting poor types of peat moorlands	
129	46	Field scale trial of afforesting poor types of peat moorlands	
130	,46	Extension into field of 1 year Sitka spruce and Scots pine reared on compost treated wasteland soil	F.R.
131	46	Extension into field of 1 year Sitka spruce and Scots pine reared on compost treated wasteland soil	F.R.
132	46	Small scale trial of various conifers, pure and in mixture on single furrow ploughed peat land	
133/			

Expt. No.	P. Yr.	Nature of Experiment	F.R., W.O., or Burnt
133	47	Trial of Betuta japonica on shallow completely ploughed land	
134	46	Trial of various conifers, pure and in mixture, on shallow, completely ploughed peat land.	
135	47	To extend and further investigate, in the light of improved soil preparation methods, the positive results which have accrued from existing experiments	
136	50	Species trial (in 120)	
137	51	Heavy manuring	
138	51	Species trial	
139	52	Trial high elevation plantation	
140	52	Technique of phosphate fertilisers	
141	52	Race and provenance trials	
142	54	High elevation	
143	54	Technique of phosphate fertilisers	
144	55	Exposure flags	
145	55	Technique of phosphates and fertilisers	W.O. & F.R.
146	56	Exposure flags	
147	57	Trial of alder	
148	57	Fertiliser experiment in deep peat	
149	58	Demonstration plots of Pinus contorta	
150		Nursery extension - undercutting	
151		Measurement of peat shrinkage	
152		Nursery extension grading	
153		Top dressing Pinus contorta - MKMg	
154		Nursery extension - grading	
155		Exposure flags	
156		Species trial - Chamae cyparis nootkatensis	
157		Trial of minute doses of phosphate	
158		Species trial - Pinus peuce	

Chapter 22– Other Factors

There are no other factors.

Chapter 23 - Working Plan Annual Report

As will be seen from the WP 20 work during F.Y. 63 went very much as planned.

Exceptions were new drains where the opportunity was taken to do some advance work made possible by the early ploughing of the F.Y, 64 area.

The 300 acres against preparation of ground (other) referred to burning which, because of adverse weather conditions, was not completed.

Forestry Commission

Acquisitions and Disposals

Form WP 10

Schedule of Information from Conveyances, Dispositions, Leases and Feus

Working Plan Area Inchnacardoch

Number (1)	Date (2)	Name of other party (3)	Property (4)	How acquired or disposed of (5)	Area (acres)			Compartment Number(s) (9)	Reservations (10)
					Classified as plantable on acquisition (6)	Total acquired or disposed of (7)	Net Total to date (8)		
1	1922	Lord Lovat	Inchnacardoch Auchterawe Farm	Feu	4,000	9,168	9,168	C.1-C.130 C.146 - onwards	
2	1952	North of Scotland Hydro-Electric Board	Pt. Auchterawe Farm	Purchase	-	23	9,145		
3	1956	Neil Usher	Culachy	Purchase	186	206	9,351	C.138-C.145	
4	1957	British Transport Commission	Invergarry-Fort Augustus Railway Line	Purchase	-	4	9,355	Pt. C.136 and C.137	
5	1958	Mrs. Dorothy Usher	Culachy	Purchase	110	172	9,527	C.131-C.137	
6	1961	Lord Lovat	Invergarry Sanatorium	Feu	18	18	9,545	C.93	
Sold 7	14.5.71	Mr & Mrs I. Lawton	No. 9. Auchterawe.	Sale	-	-	9545		

2669. Wt.P79005. Bm. 4/60. C.P.C55842. Gp.773.

Forestry Commission **Statement of Land Utilisation** Form WP 11

Working Plan Area Inchnacardoch

Areas in acres

As at 30.9.19 (1)	Plantations				Land to be planted					Nurseries (11)	Agricultural and Grazing Land (12)	Holdings (13)	Unplantable (14)	Other (15)	Total (16)
		Planted by F.C.			For Afforestation		For Replanting								
	Acquired (2)	Before 30.9.1946 (3)	Since 30.9.1946 Afforested (4)	Since 30.9.1946 Replanted (5)	In hand (6)	Tenanted (7)	In hand (8)	Tenanted (9)	Total (10)						
F.Y. 60	63	1,598	623	539	164	-	8	-	172	32	4,899	86	1,580	35	9,527
61	63	1,598	634	541	53	-	6	-	59	32	4,899	86	1,512	35	9,527
F.Y. 62	63	1,598	634	541	876	-	24	-	900	32	4,376	86	1,012	35	9,545
+ P 63.			255												
AT 63	63	1548	1089	541											
+ P64			323												
AT 64	63	1548	1412	541											
		3614.													

2669. Wt.P79005. 8M. 4/60. C.P.C55842. Gp.773.

Forestry Commission Form WP 12

Schedule of Plantable Land

Working Plan Area Inchnacardoch

Areas in acres

Property, Compartment or Sub-compartment (1)	As at 30.9. 62 (2)	As at 30.9. 63 (3)	As at 30.9. (4)	As at 30.9. (5)	As at 30.9. (6)	Remarks (7)
Culachy	30	-				P.63 Cpt. 137
Windblow C.124	4	4				
Invergarry Sanatorium C.93	18	18				
Main Block High Elevation C.146 onwards	848	625				P.63 Cpts. 154 & 155, 160-163 and 165-167.
Nursery	-	1				This area was taken out of nursery on WP 11 to balance with Director's figures.
	900	648				

Forestry Commission

Form WP 4

Summary Statement of Growing Stock

as at 30.9.1962.

Working Plan Area Inchnacardoch

Complete as necessary

Section .....

Working Circle .....

Felling Series .....

Type (1)		Area (acres) (2)	Volume (h. ft.) (3)	Current Annual Increment (h. ft.) (4)
High Forest	Coniferous	3,026	2,587.5	207.7
	Mixed	10		
	Broadleaved	-		
Total High Forest		3,036	2,587.5	207.7
Coppice with Standards				
Coppice				
Partially Felled				
Reserved Timber				
Scrub		20		
Felled		4		
Other Plantable		876		
Other Land (incl. Nursery)		5,609		
TOTAL		9,545		

Signature A. Ray

Date of Compilation 1962

Forestry Commission

Form WP 5

Area Statement of Growing Stock as at 30.9.19 62

Working Plan Area Inchnacardoch

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: 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)	Uneven-aged: Pre 1900 (18)	Post 1900 (19)	† Pre and Post 1900 (20)	Total (21)
S.P.			77	225	68	281	31	25	201	157	131									1,196
S.P.*						2					19									21
Total S.P.			77	225	68	283	31	25	201	157	150									1,217
P.C.			127	101	52	18	3	4	29	9										343
M.P.			4								2									6
M.P.*											1									1
Total M.P.			4								3									7
E.L.			11	24	1				9			17								62
J.L.			29	32	10	22		1	19	27	16	10								166
J.L.*									1											1
Total J.L.			29	32	10	22		1	20	27	16	10								167
H.L.			24	6							6									36
D.F.			1	6	2	6			30	76	80	23								224

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

Signature ..... Date of Compilation .....

2572. Wt.P.69260. 10,000. 4/59. C.P.C49211. Gp.773.

Forestry Commission

Form WP 5

Area Statement of Growing Stock as at 30.9.1962

Working Plan Area Inchnacardoch

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)	
N.S.				1	17	28	1	1	76	76	108	55								363
N.S.*											9									9
Total N.S.				1	17	28	1	1	76	76	117	55								372
S.S.			34.5	85	83	83	5	3	15	88	87	12								495.5
S.S.*						5				2										7
Total S.S.			34.5	85	83	88	5	3	15	90	87	12								502.5
O.S.			3		1						1									5
Ab. gr.									4	2	1									7
Ab. nob.				1					1		1									3
L.C.									4											4
Ts.			2	1																3
SP/PC						3			8											11
SP/NS									7											7

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

Signature .....

Date of Compilation .....

2572. Wt.P.69260. 10,000. 4/59. C.P.C49211. Gp.773.

Forestry Commission

Form WP 5

Area Statement of Growing Stock as at 30.9.1962

Working Plan Area Inchnacardoch

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: 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)	Uneven-aged: Pre 1900 (18)	Post 1900 (19)	† Pre and Post 1900 (20)	Total (21)
SP/SS						4				3										7
PC/JL									2											2
PC/SS									1	2	4									7
PC/Mix.con.										2										2
MP/SS						1				2										3
JL/HL						1														1
JL/SS								1	1	2										4
DF/NS									6											6
NS/SS						2		9		7										18
Mixed con.			1.5							4										5.5
PC/Alder				10																10
																			Total	3,036

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

Signature A. Ray

Date of Compilation 1962

2572. Wt.P.69260. 10,000. 4/59. C.P.C49211. Gp.773.

Area Analysis by Quality Class as at 30.9.1962.

Working Plan Area Inchnacardoch * Working Circle .....

*Section ..... * Felling Series .....

*Complete as necessary

Areas in acres

Species (1)	P.Yr. Class (2)	Quality Class I (3)	II (4)	III (5)	IV (6)	V (7)	below V (8)	Not Classifiable (9)	Total Area (10)	Remarks (11)
S.P.	21-25		21	87	25		17		150	
	26-30	4	131	20.5	2		1		158.5	
	31-35	3	193	9	3.5				208.5	
	36-40		3	8	14				25	
	41-45		4	1	24		2		31	
	46-50		10	3.5	272		1		286.5	
	51-55				20			48	68	
	56-60							225	225	
	61-65							77	77	
Total SP		7	362	129	360.5		21	350	1229.5	
P.C.	21-25							2	2	
	26-30							11	11	
	31-35							34.5	34.5	
	36-40							4	4	
	41-45							3	3	
	46-50							19.5	19.5	
	51-55							52	52	
	56-60							106	106	
	61-65							127	127	
Total PC								359	359	
M.P.	21-25							3	3	
	26-30							1	1	
	46-50							0.5	0.5	
	61-65							4	4	
Total MP								8.5	8.5	
E.L.	01-20		17						17	
	31-35		2	7					9	
	51-55							1	1	
	56-60							24	24	

Signature .....

Area Analysis by Quality Class as at 30.9.1962

Working Plan Area Inchnacardoch * Working Circle .....

*Section ..... * Felling Series .....

*Complete as necessary

Areas in acres

Species (1)	P.Yr. Class (2)	Quality Class I (3)	II (4)	III (5)	IV (6)	V (7)	below V (8)	Not Classifiable (9)	Total Area (10)	Remarks (11)
E.L.	61-65							11	11	
Total EL			19	7				36	62	
J.L.	01-20		6	4					10	
	21-25		5	10	1				16	
	26-30		15	10	2		1		28	
	31-35	2	6	7	2	1.5	2.5		21	
	36-40					2			2	
	46-50				7	13	2.5		22.5	
	51-55					2		8	10	
	56-60							32	32	
	61-65							29	29	
Total JL		2	32	31	12	18.5	6	69	170.5	
H.L.	21-25							6	6	
	46-50							0.5	0.5	
	56-60							6	6	
	61-65							24	24	
Total HL								36.5	36.5	
D.F.	01-20				23				23	
	21-25			46	34				80	
	26-30		23	52	1				76	
	31-35		1	6	18	8			33	
	46-50					2	4		6	
	51-55							2	2	
	56-60							6	6	
	61-65							1	1	
Total DF			24	104	76	10	4	9	227	
N.S.	01-20		1	52	1		1		55	
	21-25	3	17	59	14		24		117	
	26-30		15	16	16		32.5		79.5	

Signature .....

Area Analysis by Quality Class as at 30.9.1962.

Working Plan Area Inchnacardoch * Working Circle .....

*Section ..... * Felling Series .....

*Complete as necessary

Areas in acres

Species (1)	P.Yr. Class (2)	Quality Class I (3)	II (4)	III (5)	IV (6)	V (7)	below V (8)	Not Classifiable (9)	Total Area (10)	Remarks (11)
N.S.	31-35	30	9	28.5	11		4		82.5	
	36-40				1		4.5		5.5	
	41-45		1						1	
	46-50				18		11		29	
	51-55						1	16	17	
	56-60							1	1	
Total NS		33	43	155.5	61		78	17	387.5	
S.S.	01-20		1		9	1	1		12	
	21-25				11	17	61		89	
	26-30			2	1	9	86		98	
	31-35			3	7		6		16	
	36-40						8		8	
	41-45				5				5	
	46-50					68.5	23		91.5	
	51-55							83	83	
	56-60							85	85	
	61-65							34.5	34.5	
Total SS			1	5	33	95.5	185	202.5	522.0	
O.S.	21-25							1	1	
	51-55							1	1	
	61-65							3	3	
Total OS								5	5	
Ab.gr.	21-25							1	1	
	26-30							2	2	
	31-35							4	4	
Total Ab.gr.								7	7	

Signature .....

Area Analysis by Quality Class as at 30.9.1962.

Working Plan Area Inchnacardoch * Working Circle .....

*Section ..... * Felling Series .....

*Complete as necessary

Areas in acres

Species (1)	P.Yr. Class (2)	Quality Class I (3)	II (4)	III (5)	IV (6)	V (7)	below V (8)	Not Classifiable (9)	Total Area (10)	Remarks (11)
Ab. nob.	21-25			1					1	
	31-35	1							1	
	56-60							1	1	
Total Ab. nob.		1		1				1	3	
L.C.	31-35							4	4	
Ts. het.	56-60							1	1	
	61-65							2	2	
Total Ts. het.								3	3	
Mixed Cons.	26-30							5	5	
	61-65							1.5	1.5	
Total Mixed Cons.								6.5	6.5	
Alder								5	5	
							Total		3,036	

Signature A. Ray

Date of Compilation 1962

DB 39872/2/2572 10m 2/59 DL

Volume Statement of Growing Stock as at 30.9.1962

Working Plan Area Inchnacardoch

Complete as necessary: Section ..... Working Circle ..... Felling Series .....

Volumes in thous. hoppus feet

Species or Species Groups (1)	"P" Year Class (2)	Volumes by Size Classes (B.H.Q.G.) 2½-6" (3)	6½-9" (4)	9½-12" (5)	12½-15" (6)	15½-18" (7)	18"+ (8)	Total Volume (9)	Precision (10)	Current Annual Increment (11)
S.P.	21-30	369.1	86.6					455.7		41.8
	31-40	297.0	18.7					315.7		32.3
	41-45	2.5						2.5		0.2
Total S.P.		668.6	105.3					773.9		74.3
P.C.	26-30	2.3	5.1					7.4		0.6
	31-40	8.9	20.0					28.9		4.7
	41-45	0.1						0.1		-
Total P.C.		11.3	25.1					36.4		5.3
E.L.	01-20	7.6	8.5	26.2				42.3		1.5
	31-40	8.0	2.6					10.6		0.8
Total E.L.		15.6	11.1	26.2				52.9		2.3
J.L.	01-20	0.7	9.5	15.1	9.9			35.2		1.3
	21-30	39.4	50.9	5.7				96.0		6.0
	31-40	2.2	34.1					36.3		3.2
Total J.L.		42.3	94.5	20.8	9.9			167.5		10.5
H.L.	21-30	1.6	0.6					2.2		0.2
D.F.	01-20	7.5	43.2	23.8				74.5		4.3
	21-30	105.0	260.1	147.8	29.4			542.3		36.8
	31-40	56.0	9.9					65.9		6.3
Total D.F.		168.5	313.2	171.6	29.4			682.7		47.4
N.S.	01-20	110.3	34.9					145.2		8.7
	21-30	212.0	83.9	26.3				322.2		22.0
	31-40	84.7	57.7	14.0				156.4		10.0
	41-45	0.9						0.9		0.1
Total N.S.		407.9	176.5	40.3				624.7		40.8
S.S.	01-20	6.8	33.3					40.1		2.4
	21-30	63.1	67.0	6.7				136.8		17.3
	31-40	9.8	15.9	1.6				27.3		3.7
	41-45	4.0						4.0		0.4
Total S.S.		83.7	116.2	8.3				208.2		23.8

Signature ..... Date of Compilation .....

OS 39872/3/2572 10m 2/59 DL

Forestry Commission

Form WP 9

Volume Statement of Growing Stock as at 30.9.1962.

Working Plan Area ..... Inchnacardoch .....

Complete as necessary: Section ..... Working Circle ..... Felling Series .....

Volumes in thous. hoppus feet

Species or Species Groups (1)	Year Class (2)	Volumes by Size Classes (B.H.Q.G.) 2½-6" (3)	6½-9" (4)	9½-12" (5)	12½-15" (6)	15½-18" (7)	18"+ (8)	Total Volume (9)	Precision (10)	Current Annual Increment (11)
O.S.	21-30	1.3	0.5	0.2				2.0		0.2
Ab. gr.	21-30	1.0	4.5	3.4	1.5			10.4		0.8
	31-40	1.5	6.4	4.9	2.0			14.8		1.0
Total Ab. gr.		2.5	10.9	8.3	3.5			25.2		1.8
Ab. nob.	21-30	0.2	0.9	0.7	0.3			2.1		0.2
	31-40	0.4	1.6	1.3	0.5			3.8		0.4
Total Ab. nob.		0.6	2.5	2.0	0.8			5.9		0.6
L.C.	31-40	3.9	1.5	0.5				5.9		0.5
						Total		2,587.5		207.7

Signature A. Ray Date of Compilation 1962

OS 39872/3/2572 10m 2/59 DL

Forestry Commission

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

For

Working Plan Area Inchnacardoch

Volumes in ~~000's~~ h. ft. over bark

Areas in acres

* Complete as necessary

* Section ..... * Working Circle ..... * Felling Series .....

Year	B.H.Q.G. Classes	Total		Species and Species Groups														Ot
				Pines		Spruces		Larches		D.F.		Other Conifers		Oaks		Beech		
		Volume	Area	Volume	Area	Volume	Area	Volume	Area	Volume	Area	Volume	Area	Volume	Area	Volume	Area	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	
61	Total	52,939	135.0	17,481	62.0	20,879	43.7	617	2.2	13,962	27.1	-	-	-	-	-	-	
	2½"—6"	40,339		16,132		17,192		386		6,629								
	6¼"—9"	11,704		1,349		3,548		231		6,576								
	Over 9"	896		-		139		-		757								
62	Total	14,658	47.0	7,194	23.5	7,464	23.5	-	-	-	-	-	-	-	-	-	-	
	2½"—6"	11,896		6,241		5,655												
	6¼"—9"	2,289		953		1,336												
	Over 9"	473		-		473												
	Total																	
	2½"—6"																	
	6¼"—9"																	
	Over 9"																	
	Total																	
	2½"—6"																	
	6¼"—9"																	
	Over 9"																	
	Total																	
	2½"—6"																	
	6¼"—9"																	
	Over 9"																	

2685. Wt. F79406. 10,000 4/60

Forestry Commission

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

For

Working Plan Area Inchnacardoch

Volumes 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		Species and Species Groups														Ot
				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)	
61	Total	7,867	-	1,371	-	-	-	-	-	6,496	-	-	-	-	-	-	-	
	2½"—6"	3,334		1,326						2,008								
	6¼"—9"	3,496		45						3,451								
	Over 9"	1,037		-						1,037								
62	Total	10,755	2.0	5,431	2.0	1,799	-	1,035	-	2,107	-	383	-	-	-	-	-	
	2½"—6"	5,047		3,092		700		470		522		263						
	6¼"—9"	4,678		2,339		762		543		914		120						
	Over 9"	1,030		-		337		22		671		-						
	Total																	
	2½"—6"																	
	6¼"—9"																	
	Over 9"																	
	Total																	
	2½"—6"																	
	6¼"—9"																	
	Over 9"																	
	Total																	
	2½"—6"																	
	6¼"—9"																	
	Over 9"																	

2685. Wt. P79406. 10,000 4/60

Forestry Commission

Record of Past Yields from Thinning/Felling

Working Plan Area Inchnacardoch

Volumes in 000's h. ft. over bark

Areas in acres

* Complete as necessary

* Section ..... * Working Circle ..... * Felling Series .....

Year	B.H.Q.G. Classes	Total		Species and Species Groups													
				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)
(1)	(2)																
61	Total	60,806	135.0	18,852	62.0	20,879	43.7	617	2.2	20,458	-	-	-	-	-	-	-
	2½"—6"	43,673		17,458		17,192		386		8,637							
	6½"—9"	15,200		1,394		3,548		231		10,027							
	Over 9"	1,933		-		139		-		1,794							
62	Total	25,413	49.0	12,625	25.5	9,263	23.5	1,035	-	2,107	-	383	-	-	-	-	-
	2½"—6"	16,943		9,333		6,355		470		522		263					
	6½"—9"	6,967		3,292		2,098		543		914		120					
	Over 9"	1,503		-		810		22		671		-					
	Total																
	2½"—6"																
	6½"—9"																
	Over 9"																
	Total																
	2½"—6"																
	6½"—9"																
	Over 9"																
	Total																
	2½"—6"																
	6½"—9"																
	Over 9"																

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Forestry Commission

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

Working Plan Area Inchnacardoch

Volumes 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		Species and Species Groups													
				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)
56	Total	57,659	120.4	12,962	41.8	23,789	41.6	-	-	19,308	34.7	1,600	2.3	-	-	-	-
	2½"—6"	38,424		12,962		15,405				8,457		1,600					
	6½"—9"	19,235		-		8,384				10,851		-					
	Over 9"	-		-		-				-		-					
57	Total	27,425	6.1	21,577	3.5	5,603	2.6	245	-	-	-	-	-	-	-	-	-
	2½"—6"	27,180		21,577		5,603		-		-							
	6½"—9"	245		-		-		245									
	Over 9"	-		-		-		-									
58	Total	53,042	61.05	8,504	14.0	7,390	5.7	16,275	30.6	19,773	9.5	1,100	1.25	-	-	-	-
	2½"—6"	42,509		8,504		5,923		11,136		15,846		1,100					
	6½"—9"	8,644		-		1,000		5,039		2,605		-					
	Over 9"	1,889		-		467		100		1,322		-					
59	Total	27,553	72.25	6,886	22.4	6,038	22.3	9,200	20.35	1,352	4.2	4,077	3.0	-	-	-	-
	2½"—6"	22,571		6,676		6,038		7,246		842		1,769					
	6½"—9"	4,982		210		-		1,954		510		2,308					
	Over 9"	-		-		-		-		-		-					
60	Total	35,893	113.95	19,065	74.35	8,724	25.6	5,552	10.0	-	-	2,552	4.0	-	-	-	-
	2½"—6"	31,598		18,411		7,997		3,172				2,018					
	6½"—9"	4,220		654		727		2,305				534					
	Over 9"	75		-		-		75				-					

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Forestry Commission

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

Working Plan Area Inchnacardoch

Volumes in 000's h. ft. over bark

Areas in acres

* Complete as necessary

* Section ..... * Working Circle ..... * Felling Series .....

Year	B.H.Q.G. Classes	Total		Species and Species Groups													
				Pines		Spruces		Larches		D.F.		Other Conifers		Oaks		Beech	
		Volume	Area	Volume	Area	Volume	Area	Volume	Area	Volume	Area	Volume	Area	Volume	Area	Volume	Area
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
56	Total	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	2½"—6"																
	6¼"—9"																
	Over 9"																
57	Total	10,593	1.5	5,864	1.5	2,669	-	650	-	1,410	-	-	-	-	-	-	-
	2½"—6"	10,293		5,864		2,669		650		1,110							
	6¼"—9"	300		-		-		-		300							
	Over 9"	-		-		-		-		-							
58	Total	9,088	2.25	3,026	-	1,565	1.0	956	1.0	3,344	1.25	197	-	-	-	-	-
	2½"—6"	6,788		3,026		1,565		956		1,044		197					
	6¼"—9"	2,300		-		-		-		2,300		-					
	Over 9"	-		-		-		-		-		-					
59	Total	11,411	-	-	-	6,677	-	1,407	-	3,327	-	-	-	-	-	-	-
	2½"—6"	5,410		-		4,661		603		146							
	6¼"—9"	3,971		-		1,773		804		1,394							
	Over 9"	2,030		-		243		-		1,787							
60	Total	11,269	-	202	-	2,952	-	-	-	8,115	-	-	-	-	-	-	-
	2½"—6"	5,320		157		1,280				3,883							
	6¼"—9"	4,616		-		1,554				3,062							
	Over 9"	1,333		45		118				1,170							

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Forestry Commission

Record of Past Yields from Thinning/Felling

Fo

Working Plan Area Inchnacardoch

Volumes in ~~000's~~ h. ft. over bark

Areas in acres

* Complete as necessary

* Section ..... * Working Circle ..... * Felling Series .....

Year	B.H.Q.G. Classes	Total		Species and Species Groups														O
				Pines		Spruces		Larches		D.F.		Other Conifers		Oaks		Beech		
		Volume	Area	Volume	Area	Volume	Area	Volume	Area	Volume	Area	Volume	Area	Volume	Area	Volume	Area	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	
56	Total	57,659	120.4	12,962	41.8	23,789	41.6	-	-	19,308	34.7	1,600	2.3	-	-	-	-	
	2½"—6"	38,424		12,962		15,405				8,457		1,600						
	6½"—9"	19,235		-		8,384				10,851		-						
	Over 9"	-		-		-				-		-						
57	Total	38,018	7.6	27,441	5.0	8,272	2.6	895	-	1,410	-	-	-	-	-	-	-	
	2½"—6"	37,473		27,441		8,272		650		1,110								
	6½"—9"	545		-		-		245		300								
	Over 9"	-		-		-		-		-								
58	Total	62,130	63.30	11,530	14.00	8,955	6.7	17,231	30.60	23,117	10.75	1,297	1.25	-	-	-	-	
	2½"—6"	49,297		11,530		7,488		12,092		16,890		1,297						
	6½"—9"	10,944		-		1,000		5,039		4,905		-						
	Over 9"	1,889		-		467		100		1,322		-						
59	Total	38,964	72.5	6,886	22.4	12,715	22.3	10,607	20.35	4,679		4,077	3.0	-	-	-	-	
	2½"—6"	27,981		6,676		10,699		7,849		988		1,769						
	6½"—9"	8,953		210		1,773		2,758		1,904		2,308						
	Over 9"	2,030		-		243		-		1,787		-						
60	Total	47,162	113.95	19,267	74.35	11,676	25.6	5,552	10.0	8,115	-	2,552	4.0	-	-	-	-	
	2½"—6"	36,918		18,568		9,277		3,172		3,883		2,018						
	6½"—9"	8,836		654		2,281		2,305		3,062		534						
	Over 9"	1,408		45		118		75		1,170		-						

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Forestry Commission

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

Fo

Working Plan Area Inchnacardoch

Volumes in ~~000's~~ h. ft. over bark

Areas in acres

* Complete as necessary

* Section ..... * Working Circle ..... * Felling Series .....

Year	B.H.Q.G. Classes	Total		Species and Species Groups														C
				Pines		Spruces		Larches		D.F.		Other Conifers		Oaks		Beech		
		Volume	Area	Volume	Area	Volume	Area	Volume	Area	Volume	Area	Volume	Area	Volume	Area	Volume	Area	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	
51	Total																	
	2½"—6"																	
	6½"—9"																	
	Over 9"																	
52	Total																	
	2½"—6"																	
	6½"—9"																	
	Over 9"																	
53	Total	53,005	114.4	8,297	15.75	5,782	19.25	17,755	32.50	21,171	46.9	-	-	-	-	-	-	
	2½"—6"	50,914		8,282		5,699		17,755		19,178								
	6½"—9"	2,091		15		83		-		1,993								
	Over 9"	-		-		-		-		-								
54	Total	38,020	98.45	18,624	41.70	8,801	18.75	2,734	10.6	7,861	27.4	-	-	-	-	-	-	
	2½"—6"	36,803		18,621		8,801		1,799		7,582								
	6½"—9"	1,217		3		-		935		279								
	Over 9"	-		-		-		-		-								
55	Total	60,233	143.35	16,197	62.3	12,070	25.45	5,583	14.6	26,383	41.0	-	-	-	-	-	-	
	2½"—6"	48,912		16,197		10,876		5,583		16,256								
	6½"—9"	11,321		-		1,194		-		10,127								
	Over 9"	-		-		-		-		-								

RECORDS INCOMPLETE

RECORDS INCOMPLETE

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Forestry Commission

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

Working Plan Area Inchnacardoch

Volumes 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 Volume (3)	Total Area (4)	Species and Species Groups: Pines Volume (5)	Pines Area (6)	Spruces Volume (7)	Spruces Area (8)	Larches Volume (9)	Larches Area (10)	D.F. Volume (11)	D.F. Area (12)	Other Conifers Volume (13)	Other Conifers Area (14)	Oaks Volume (15)	Oaks Area (16)	Beech Volume (17)	Beech Area (18)
51	Total																
	2½"—6"																
	6½"—9"																
	Over 9"																
52	Total																
	2½"—6"																
	6½"—9"																
	Over 9"																
53	Total	896	-	-	-	-	-	-	-	896	-	-	-	-	-	-	-
	2½"—6"	598								598							
	6½"—9"	298								298							
	Over 9"	-								-							
54	Total	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	2½"—6"																
	6½"—9"																
	Over 9"																
55	Total	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	2½"—6"																
	6½"—9"																
	Over 9"																

RECORDS INCOMPLETE

RECORDS INCOMPLETE

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Forestry Commission

Record of Past Yields from Thinning/Felling

Fo

Working Plan Area Inchnacardoch

Volumes in 000's h. ft. over bark

Areas in acres

* Complete as necessary

* Section ..... * Working Circle ..... * Felling Series .....

Year	B.H.Q.G. Classes	Total		Species and Species Groups														
				Pines		Spruces		Larches		D.F.		Other Conifers		Oaks		Beech		C
		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)	
(1)	(2)																	
51	Total																	
	2½"—6"																	
	6½"—9"																	
	Over 9"																	
52	Total																	
	2½"—6"																	
	6½"—9"																	
	Over 9"																	
53	Total	53,901	114.4	8,297	15.75	5,782	19.25	17,755	32.50	22,067	46.9	-	-	-	-	-	-	
	2½"—6"	51,512		8,282		5,699		17,755		19,776								
	6½"—9"	2,389		15		83		-		2,291								
	Over 9"	-		-		-		-		-								
54	Total	38,020	143.35	18,624	41.70	8,801	18.75	2,734	10.6	7,861	27.4	-	-	-	-	-	-	
	2½"—6"	36,803		18,621		8,801		1,799		7,582								
	6½"—9"	1,217		3		-		935		279								
	Over 9"	-		-		-		-		-								
55	Total	60,233	143.35	16,197	62.3	12,070	25.45	5,583	14.6	26,383	41.0	-	-	-	-	-	-	
	2½"—6"	48,912		16,197		10,876		5,583		16,256								
	6½"—9"	11,321		-		1,194		-		10,127								
	Over 9"	-		-		-		-		-								

RECORDS INCOMPLETE

RECORDS INCOMPLETE

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Forestry Commission **Annual Control Summary** Form WP 20

Working Plan area: Inchnacardoch

Operation (1)	Unit of Measurement (2)	F.Y. 63 Programme (3)	F.Y. 63 Actual (4)	F.Y. 64 Programme (5)	F.Y. 64 Actual (6)	F.Y. Programme (7)	F.Y. Actual (8)	F.Y. Programme (9)	F.Y. Actual (10)	F.Y. Programme (11)	F.Y. Actual (12)
Prep. Ground(Ploughing)	Acres	300	274	300							
Prep. Ground (Other)	"	300	-	23							
Planting	"	250	255	300							
Drains (New)	Chains	1,200	2,413	2,100							
Fences (New)	"	200	187	10							
Beating Up	000's Plants	10	-	20							
Weeding	Acres	90	-	35							
Cleaning (Brashing)	"	30	32	12							
Cleaning (Other)	"	20	6	-							
Drains (Maintenance)	Chains	200	185	500							
Fences (Maintenance)	"	1,000	150	150							
Roads New (Formation)	Miles	1	1.0	-							
Roads New (Metal)	"	1	1.0	-							
Roads (Maintenance)	"	19.5	19.5	17							
Nurseries	Acres	33.5	33.5	23							

Forestry Commission **Annual Control Summary** Form WP 20

Working Plan area: Inchnacardoch

Operation (1)	Unit of Measurement (2)	F.Y. 63 Programme (3)	F.Y. 63 Actual (4)	F.Y. 64 Programme (5)	F.Y. 64 Actual (6)	F.Y. Programme (7)	F.Y. Actual (8)	F.Y. Programme (9)	F.Y. Actual (10)	F.Y. Programme (11)	F.Y. Actual (12)
Felling	Acres/000's h.ft.	-	.3	-							
Thinning	Acres/000's h.ft.	-/20	1/.5	30/10							
Extraction	Acres/000's h.ft.	20	1.5	10							
Other Produce		-	-	-							

PART II

Chapter 24 - Summary of Facts on which to base Proposals

(a) Forest Conditions and Potential

Inchnacardoch is a forest situated in the Great Glen and lies to the north and west of the village of Fort Augustus. It has a total area of 9,545 acres of which 3,036 acres had been planted at the 30th September, 1962.

With the exception of an extensive flat moor lying north and west of the River Oich, the ground rises in a series of moderate slopes and basin-like flats towards the watershed between the Great Glen and Glen Moriston. Nowhere is the topography so severe as to make for really difficult road making conditions.

Climatically the forest is midway between the dry east and the wet west. The rainfall averages 48 inches per annum with occasional heavy winter snowfalls. Frosts are common and have caused damage in the nurseries. Although sheltered from coastal gales, strong winds occasionally sweep through the glen.

The underlying rock formation is of two main types: Moine schists and foliated granite or granite gneiss. The former occupies 80% of the area and the granite is confined to the south western part of the forest between the Allt na Craidhe and the Inverrigan burn.

The soils are of three main types viz. creep soils, morainic soils and deep peats. Creep soils cover some 400 acres of the lower slopes and are associated with areas which originally carried deciduous crops of oak and birch. The upper slopes are characterised by morainic soils interspersed with deep basin peats. The latter are the most difficult subjects to afforest especially at the higher elevations. It is on such peats that the early experiments on planting deep peat on the Lon Mor were carried out.

The creep soils are capable of growing productive crops of Sitka spruce or Douglas fir depending on the moisture holding capacity of the site; the morainic ground if ploughed can support Scots pine, Pinus contorta and some larch and there is limited scope for growing some Sitka spruce in mixture with any of these species. For the most part, the peats can only be successfully afforested with Pinus contorta although where flushing occurs - and this is seldom - some Sitka spruce can be introduced.

(b) Existing Crops and Increments

The principal species planted at Inchnacardoch has been Scots pine which occupies some 1,299 acres or 42% of the 3,036 acres planted. The other main species are Sitka spruce - 522 acres, Norway spruce - 387 acres, Pinus contorta - 359 acres, Douglas fir - 227 acres, Japanese larch - 170 acres and European larch - 62 acres. There are 75 acres of other coniferous species and 7 acres of alder; the latter has been planted mainly for amenity purposes. Area, Quality Class, volume and increment details by species are given in Tables I, II and III which accompany this chapter.

Scots pine - 1,229.5 acres.

The average Quality Class of Scots pine is III but there are some good stands - 7 acres of Quality Class I - 362 acres of Quality Class II - which were mainly planted in the P26-P35 period when Scots pine was planted on the poorer creep soils and on the deeper and more fertile moraines. Quality Class III and IV stands are to be found on the poorest of the gravelly soils and on the deeper peat covered moraines. The 350 acres not classified is solely on account of age, while the 21 acres below Quality Class V are mainly on infertile ridge and mound tops and where planting has strayed on to deep peat.

Stem form is moderately good throughout but with some fairly heavy branching in the faster growing stands.

Lodgepole pine - 359 acres

Pinus contorta has been planted on a wide variety of sites ranging from the gravelly soils at low elevation to peats in exposed situations. Best results have been obtained on the gravel flats but growth on the high elevation peats has also been satisfactory. Stem form on the lower flats is good, trees as a rule being straight and light branched. A Research Branch sample plot of Mount Ida provenance shows the rate of growth to be equivalent to that of Quality Class II Scots pine. Later plantings on the Lon Mor indicate that even better results may be obtained by using coastal provenances from the Queen Charlotte Islands and Washington coast areas.

European larch - 62 acres

The average Quality Class of European larch is II. It has been mainly planted on deep creep soils of the lower and middle slopes. Results, despite the high average Quality Class, have been disappointing, the stem form being poor due to wind sweep and canker attack.

Japanese larch - 170.5 acres

Like European larch this species was initially planted on the creep soils of the lower and middle slopes. Later it was used on a small scale on the better morainic ridges. The average Quality Class is III and stem form, although superior to European larch, is not outstanding.

Post war planting has been almost entirely restricted to the formation of fire protection belts.

Douglas fir - 227 acres

The average Quality Class of Douglas fir is III and of the 227 acres planted, all but 13 acres have reached classifiable standard. Sites chosen were those which previously carried a hardwood crop, and steep rocky slopes. Best stands are to be found on the rock strewn slopes where stem form is excellent. On the deeper and more moist sites, such as found in flats and hollows, the stem form is less satisfactory being marred by butt sweep and a tendency to coarser branching. Sitka spruce on similar sites has produced top quality stems.

Norway spruce - 387.5 acres

The average Quality Class of Norway spruce is III. Where planted on ideal sites - deep, moist creep soils - results have been good, there being 33 acres of Quality Class I and 43 acres of Quality Class II. Much of the earlier plantings on calluna covered morainic soils and peats were a failure, some 300 acres being written off in 1938.

Stem form generally is straight and light branched but the quality of the timber is often reduced by the incidence of heart rot and frequently by heavy fluting of the lower stem.

Sitka spruce - 522 acres

The average Quality Class of Sitka spruce is V and this disappointingly low standard is mainly due to the sites chosen for the species in the early years. Apart from a few small stands on the better/

better morainic and creep soils, it was planted on inadequately drained calluna covered moraines and peats and in these conditions results have been poor.

The classifiable stands are to be found on the mineral soils and on the better drained peat flushes and flats.

Stem form in the measurable stands is good and to date this species has not suffered from Fomes attack to the same extent as Norway spruce.

The broad picture then is of a forest with a comparatively large acreage of most of the common conifers which have been planted in pure groups according to the ideas on choice of species prevailing at the time of planting. On the lower slopes, with its rich creep soil, all species have responded well with some excellent stands of Douglas fir, Norway spruce, and Sitka spruce and with passable stands of Scots pine. Larches, although of reasonably high quality class, are of poor stem form and the same can be said of Douglas fir where it has been planted on over moist sites.

As the plantations ascend the hill there is a gradual falling off in the performance of larch and spruce until near the top pines become increasingly dominant. The new plantations which are now being established on these high elevation areas and on the area previously written off as failed will consist mainly of Pinus contorta, Scots pine with a little Sitka spruce on the more fertile flushes.

Loss by windblow has so far been slight and the forest is as yet practically unmarked by this form of damage.

(c) Choice of Species and Techniques

The selection of species in the early years of planting was naturally influenced by the small stands of European larch, Japanese larch, Douglas fir, Norway spruce and Sitka spruce, which were growing on the area at the time of acquisition. What was perhaps not fully appreciated was the fact that these successful plantations were growing on the fertile creep soils. When these species and Norway spruce were used for planting the poorer moraines and peats without adequate ground preparation, the results were disappointing. When, in 1926, this was realised Scots pine came to be the principal species planted and the results were better. But the pendulum had swung too far towards Scots pine with the result that today we have considerable areas of pine growing on sites which could support a more demanding species.

Today Douglas fir and Sitka spruce would be planted on the creep soils. Current planting at Inchnacardoch is, however, largely concerned with the planting of deep peats and peat covered moraine and it is nearly all at a high elevation. The practice is to plant the Scots pine on the sheltered and drier ridges: Pinus contorta is used on the more exposed ridges and deep peats. Sitka spruce is only planted pure on the molinia peats but is used in mixture with pine on other sites where there are indications of flushing. All ground of this type is now ploughed at 5 feet to 6 feet spacing and the plants given an application of 1½ ounces per plant of ground mineral phosphate at time of planting. Results to date are encouraging.

Japanese and hybrid larch are grown to provide protection belts in and around the forest and to a lesser extent to meet the needs of amenity. The use of hybrid larch as a pioneer species on the morainic soils is not ruled out.

(d) Reserves of Plantable Land

The/

The reserve of plantable land at the end of F.Y. 63 was 645 acres and this will be planted up at the rate of approximately 250 acres per annum. The need for additional land is obvious but the possibility of further acquisitions is not encouraging because Inchnacardoch is in close proximity to Port Clair Forest to the north and Glengarry Forest to the south. Nearby estates are well managed and firmly held.

Reclassification of land from unplantable to plantable is, however, a course which is at present being investigated. Reclassification depends largely on the outcome of flag exposure tests which are now being carried out. The area from this source could be as large as 600 acres.

(e) Produce and Markets

Thinnings began in 1934 and were entirely carried out by Forestry Commission labour until 1952 when the first sale of standing thinnings was made. The practice was to sell the thinnings in the long length at roadside.

Like so many forests in the North Conservancy, Inchnacardoch suffered from variable market conditions though because of its favourable position it was possible to maintain some measure of systematic thinning at this forest.

From 1952 to 1962 most of the thinnings have been sold standing to merchants and Commission working has been confined to the felling of roadlines and the clearance of windblow. The volume felled annually in that period has been of the order of 50-60,000 hoppus feet with merchants working about 40-45,000 hoppus feet and the Commission handling the balance.

The position is now changing. The current annual increment of the forest at the end of F.Y. 61 was calculated to be 207,000 hoppus feet. Of this some 100,000 hoppus feet will be removed annually in thinnings, about half of this will be worked by merchants and half by the Forestry Commission.

From 1966 the forest will have a pulp wood commitment of 75,000 hoppus feet per annum. This will be mainly obtained from thinnings and the balance from the removal of unthrifty stands - principally larch.

Marketing which has proved so difficult in the past, will in the future present no problem. There is always a ready demand from local merchants for the sawlogs: the pulp wood will go to meet the Forestry Commission commitment to the new Pulp and Paper Mill at Fort William and the balance of the small round wood which does not meet the pulp wood specification will be available for sale to the Chipboard Factory (Bonnwood) at Inverness.

Until the pulp mill comes into production, the resident merchant, Messrs. Peter McGinsh Ltd. of Crieff, will be sold some 70,000 hoppus feet of standing thinnings per annum and the balance of 30,000 hoppus feet will be used to train the local staff in pulp wood production. Of the produce resulting from this training the sawlogs will be sold after advertisement to local merchants and the small round wood to Bonnwood Ltd. in Inverness.

(f) Staff and Employment

(a) Staff

There is one Head Forester, one Forester and one young Assistant Forester under training. This is the correct staffing for the present work load made up of a 250 acre planting programme/

programme, a 30 acre nursery and a production programme of 100,000 hoppus feet per annum.

When the nursery is finally closed and the planting finished a staff of 1 Forester and 1 Assistant Forester will be adequate.

(b) Labour

The number of workers employed is 34. Of these 9 are 60 years of age and over, 11 are established and wastage, except that due to retirals due to age, is not high.

Replacements when required are not difficult to obtain owing to the availability of houses and holdings and due also to the close proximity of Fort Augustus.

At present 13 workers are tenants of Forestry Commission houses or holdings, 7 are housed in the hostel, and 14 live in non Forestry Commission property in or around Fort Augustus.

The quality of the labour is only moderate.

As with the supervisory staff, the labour position will require to be kept under review as the nursery and planting requirement of labour decreases.

Other Factors

1. Houses and Holdings

(a) Houses

There are twenty-four houses situated on the forest. One is the old Auchterawe Farmhouse now occupied by a District Officer and the others are as under:-

2 detached brick built houses.
16 semi-detached brick built houses.
1 stone built two storey house.
1 stone built three storey house.
2 detached timber built corrugated iron clad houses.
2 semi-detached timber built corrugated iron clad houses.
1 Hostel - timber built and corrugated iron clad capable of housing up to 20 men.

The housing position is satisfactory, the only requirement being a new house for a Forester which will be built within the period of the plan.

The hostel will be required to accommodate workers over the next few years but it is not the intention to retain it for longer than is necessary.

(b) Forest Workers' Holdings

There are eight Forest Workers' Holdings all of which were built in the middle twenties. The Holdings extend in area from 2½ acres to 22 acres and are largely arable. All Forest Workers' Holdings are occupied by Forestry Commission workers.

It is the intention to reorganise the Forest Workers' Holdings in the future and present proposals are that four of the eight will become house tenancies, three will remain as Forest Workers' Holdings and one will become a small agricultural unit./

unit. This will have the effect of increasing the land holding of the three Forest Workers' Holdings to be retained.

2. Roads

The total mileage of forest roads required to serve the forest of 4,000 acres will be 41 miles. Of this 16 miles have already been fully constructed and a further 4 miles have been prepared to category II standard. During the period of the plan a further 6.5 miles will be made. 5 miles of public roads serve the area. Road making on the whole has not been too difficult, the terrain being fairly smooth with solid rock occurring in patches only.

INCHNACARDOCH FOREST

TABLE I

Area and Age Class Distribution
at 30/9/62

Classification	Area (Acres)	1951-1962 1-10 years	1941-1950 11-20 years	1931-1940 21-30 years	1921-1930 31-40 years	1901-1920 Over 41 years
High Forest						
Conifers	3,026	1,040	496	458	925	117
Mixed	10	-	-	-	-	-
Broadleaved	-	-	-	-	-	-
Total	3,036	1,040	496	458	925	117
Plantable Reserve	902	-	-	-	-	-
Other	5,607	-	-	-	-	-
Total	9,545	-	-	-	-	-

INCHNACARDOCH FOREST

TABLE II

Existing Crops - Volumes and Measurements - Main Species

at 30/9/62

Species	Total Area	Area Classification			Average Q.C.	000's hoppus feet		000's hoppus feet	
		Quality Class Area I-V	Below Q.C.V	Not Classifiable		Measurable Volume	C.A.I.	Classification of Volume	
								B.H.Q.G.	% of Volume
Scots pine	1,299.5	858.5	21	350	III	773.9	74.3	2½"-6" 6¼"-9"	86 14
Pinus contorta	359.	No Tables			No Tables	36.4	5.3	2½"-6" 6¼"-9"	30 70
European larch	62.	26.	-	36	II	52.9	2.3	2½"-6" 6¼"-9" 9½"-12"	29 21 50
Japanese larch	170.5	95.5	6	69	III	167.5	10.5	2½"-6" 6¼"-9" 9½"-12" 12½"-15"	25 57 12 6
Douglas fir	227.	214.	4	9	III	682.7	47.4	2½"-6" 6¼"-9" 9½"-12" 12½"-15"	24 46 25 5
Norway spruce	387.5	292.5	78	17	III	624.7	40.8	2½"-6" 6¼"-9" 9½"-12"	65 28 7
Sitka spruce	522.	134.5	185	202.5	V	208.2	23.8	2½"-6" 6¼"-9" 9½"-12"	40 56 4

INCHNACARDOCH FOREST

TABLE III

Volumes and Increments of Main Species
at 30/9/62

Species	Total Area	Area of Measurable Timber	Total Volume 000's h.ft.	Av. vol. per measurable acre hoppus feet	Total C.A.I. 000's h.ft.	C.A.I. per measurable acre hoppus feet
Scots pine	1,229.5	858.5	773.9	900	74.3	86
European larch	62.	26.	52.9	1,037	2.3	45
Japanese larch	170.5	95.5	167.5	1,775	10.5	110
Douglas fir	227.	214.	682.7	3,190	47.4	221
Norway spruce	387.5	292.5	624.7	2,140	40.8	140
Sitka spruce	522.3	134.5	208.	1,550	23.8	177

A. Objects of Management

Inchnacardoch is one of the oldest of the Commission's forests and much of the early work must be considered to have been of an experimental nature. Experience has shown that in these early years mistakes were made in choice of species, and that by present day standards ground was inadequately prepared. These factors have in turn been largely responsible for the site potential not being fully realised. It is, however, largely on the evidence obtained from these early plantings that the recommendations proposed to achieve greater productivity are based.

There is ample evidence to show that the productivity of the fertile creep soils would be more fully and profitably utilised by replacing the existing stands of Scots pine, European larch, Japanese larch and Norway spruce with Douglas fir on the well drained slopes with a high boulder content, and with Sitka spruce on the deeper moister sites.

The volume production of Douglas fir on the deep moist sites has been satisfactory but stem value has been considerably reduced as a result of butt sweep. It is, however, on these sites that the Quality Class II and III stands of Sitka spruce of excellent stem form are to be found and it is on these grounds that the recommendation to restrict future planting of Douglas fir to the drier steeper slopes and Sitka spruce on the more moist sites is based.

Norway spruce too has grown well on the creep soil sites there being Quality Class I, II and III stands on the more fertile sites, but it is now quite evident that had these sites been stocked with Sitka spruce both the volume production and profitability of the forest would have been considerably increased. Present day valuation of spruce logs is based on size rather than on whether the species is Norway or Sitka spruce and since Sitka has the capacity to produce a greater volume of larger sized timber in a shorter time there is no sound reason why it should not be used to replace Norway in second rotation planting.

On the morainic soils and deep peats presently stocked with Scots pine, Pinus contorta, Japanese larch, Norway spruce and Sitka spruce there is ample evidence at Inchnacardoch and at other forests in the Great Glen to show that production would have been considerably increased had these sites been planted with Sitka spruce on molinia dominated sites, with Pinus contorta on the tougher shallow peat covered moraines and calluna covered deep peats, and with Scots pine on the more sheltered knolls and ridges. Pinus contorta has already produced a rate of growth equivalent to that of Quality Class II Scots pine. Success with any species on these more difficult sites is however dependent on the employment of up to date standards of ground preparation and manuring; the results of inadequate ground preparation and lack of manuring have already been well demonstrated at Inchnacardoch.

The planting of Japanese larch would be more or less restricted to the formation of protective belts around the perimeter of the forest, while hybrid larch would be suitable as a pioneer species on some of the less exposed morainic soil sites.

As regards the rotation to which the present crops are to be grown profitability assessments made in respect of these species at similar type forests indicate that the optimum rotation is of the order of 55-65 years for Douglas fir and Sitka spruce and 75-85 years for Scots pine and Norway spruce.

In view, however, of the considerable areas of Scots pine and Norway/

Norway spruce which adjoin stands of Douglas fir and Sitka spruce pre-rotation cutting of these stands might well be considered if market conditions were favourable at the time.

As regards the larches it is proposed to remove about 80 acres of these by stages in order to supply that part of the Commission's pulpwood commitment which cannot be met from thinnings. At the same time the opportunity will be taken to restock the ground with a more productive species.

The forest has a pulpwood commitment of about 75,000 hoppus feet annually and to obtain this volume it will be necessary to fell a total of 120,000 hoppus feet. Based on the C.A.I. for the productive part of the forest it is estimated that approximately 100,000 hoppus feet will be found annually from thinnings. The balance of 20,000 hoppus feet will be found firstly by heavy thinning the unthrifty larch plantations to allow restocking to take place and secondly by removing the overwood as this becomes necessary for the free development of the new crop. The area involved extends to some 80 acres with a standing volume of around 200,000 hoppus feet.

At rotation age it is estimated that the average final crop tree of Douglas fir will have a B.H.Q.G. of around 13 inches and an average volume of 35-40 hoppus feet, but because of the poorer sites occupied by Sitka spruce the final crop tree will be slightly less and will have a B.H.Q.G. of 11-12 inches and an average volume of around 30 hoppus feet. At 75/85 years the Scots pine and Norway spruce average final crop trees will have B.H.Q.G. measurements of 9 and 11 inches and volumes of 15 and 30 hoppus feet respectively.

The prescribed thinning grade has been a C/D grade but in practice this has rarely been accomplished mainly because of fluctuating market demands. Until recent years these demands were much below the potential thinning yield and in order to work through the stands in the thinning stage the operative grade had been something approaching a B/C intensity. With an assured market in the form of the pulp mill it should be possible to work to prescription and future thinnings will be of a crown type and of an intensity to allow more rapid development of the stands to take place. This in turn should have a beneficial effect on the M.D.R.

Although the age class distribution is far from normal, it is acceptable, and there is no good reason for altering it by special fellings other than the phased removal of unthrifty crops. Should natural regeneration be a successful means of restocking, care will be required to ensure that the most profitable species are allowed to develop freely.

B. General Objects of Management

The Commission's policy is as follows:

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

Inchnacardoch is bounded on the north by Port Clair forest and on the west by Glengarry forest. The nearby private estates are well managed and appear to be tightly held but should opportunity occur every effort will be made to extend the area of Inchnacardoch forest.

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

This general object will be pursued by attention to good silviculture. Special attention will be paid to timely thinning/

thinning and most importantly to the removal of unthrifty crops and their replacement with more productive species.

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

The present plan prescribes for the retention of a steady and well trained labour force which will form an important section of the small community of Fort Augustus. In order to ensure this a major part of the production programme will ultimately be worked by men directly employed by the Forestry Commission.

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

During the period of the plan a proportion of the thinnings and fellings will be sold standing to timber merchants. In addition all logs produced will be sold in the open market and the quantity of logs thus made available to merchants will increase.

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

Inchnacardoch is situated in one of the most beautiful parts of the Great Glen. The forest itself adds greatly to the scenic attractions of the locality and no operations such as extensive clear fellings which might detract from this will be permitted.

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

By producing substantial quantities of pulpwood this forest will assist in the development of a major industry at nearby Fort William. The forest community now established at Jenkins Park will be maintained and if possible developed to play an important part in the adjoining village of Fort Augustus.

(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".

There is comparatively little private forestry in the immediate vicinity of Inchnacardoch Forest, but by supplying produce to the new pulp mill at Fort William it will play its part in maintaining an expanding market for small round timber which will be available to forest owners over a much wider area.

Local Objects of Management

(a) Short Term

To produce a minimum quantity of 75,000 hoppus feet per annum of pulp wood from thinnings and clear fellings of unsatisfactory and unprofitable species and to replace them with more productive ones.

(b) Long Term

(1) To produce sawtimber of Douglas fir and Sitka spruce of around 13 inches and 12 inches B.H.Q.G. respectively on a rotation of 55 to 65 years and of 9 inches and 11 inches respectively for Scots pine and Norway spruce at 75 to 85 years.

(2) To retain the present even age system of

management of the forest.

(3) To work towards a sustained yield and thereby create steady employment and a regular flow of timber to the market.

Chapter 26 - Outline of Prescriptions

(a) Amenity

The amenities will be preserved by practising good forest management. Where the forest abuts on the public road no clear felling will take place but the crop will be harvested by means of a form of group selective felling system or where appropriate by interplanting.

When replanting the regulations regarding the proximity of trees to public roadsides will be observed: the planting of hardwood and conifers not recommended on economic grounds will be permitted on a limited scale for amenity purposes.

(b) Organisation

1. Administration

The forest will continue for the present to be staffed by a Head Forester assisted by a Forester and an Assistant Forester but, with the closing down of the nursery, will be reduced to one Forester and one under Forester or Assistant Forester.

2. Management

The forest will form one Working Circle and one Felling Series.

(c) Planting Rate

Planting will proceed at the rate of about 250 acres annually ensuring that all the present land is afforested before the underplanting of larch areas starts in F.Y. 67. Restocking of larch areas will be at the rate of approximately 20 acres per annum. Planting distances will not greatly depart from afforestation spacing but will be decided in the year underplanting is to be done.

(d) Silvicultural Operations

1. Silvicultural Systems

The formation of even aged stands will be maintained but the retention of the existing crop to serve for a short time as a nurse crop will be accepted on those areas where it is considered advisable in the interests of profitability to change species.

2. Preparation of Ground

Preparation of ground will be carried out by the most modern and approved method. No cultivation will be required on the creep soils but elsewhere ploughing will be done where the topography and ground conditions permit. Drainage of the creep soils must be carefully planned in order to avoid erosion: the linking of the road drainage system with the forest drainage system should also be carefully planned with the same object in view.

Larch lop and top which will result from the heavy larch thinnings will be racked or spread over the ground and planted through.

3. Choice of Species

Species selection will be in accordance with the Object of Management which specifies the planting of Douglas fir and Sitka spruce to the limit of their suitability and the planting of Pinus contorta and Scots pine on the calluna covered moraines and peats. Japanese larch will continue to be used for the formation/

formation of fire belts and hybrid larch may be used as a pioneer species on suitable morainic sites.

4. Maintenance of Plantations

Conservancy instructions about beating up will be followed. Weeding will be carried out as is considered necessary. Drain maintenance will at all times require close attention. Leader drains must be kept clear of brushwood particularly where these lead to culverts and bridges.

Brashing will be carried out as required but the necessity for limiting this operation to the minimum intensity required for efficient marking, felling and extraction of thinnings will always be the most important consideration. Pruning will be carried out in accordance with SM.113 and the guidance given in Forestry Commission bulletin No. 35 with the exception that no larch will be pruned.

5. Thinnings

The current C-D grade of thinning will be replaced by a crown type whereby not more than 30% of the C.A.I. will be removed at each thinning.

The exception to this will be the treatment of the 80 acres of unthrifty larch plantations which are scheduled to be cleared to meet the part of the forest's commitment which cannot be met from thinnings. These stands will be heavily thinned leaving an overstorey of approximately 80-100 trees per acre which will be retained until such time as the underplanted crop is established. These heavy thinnings will start in F.Y. 66 and will continue annually until F.Y. 71. The annual rate of production will be 20,000 hoppus feet.

6. Fellings

Clear fellings during the period of the plan will be restricted to the clear felling of that part of the 80 acres of larch overcrop which is no longer required for shelter purposes. This will be carried out systematically, the oldest underplanting being relieved first. The yield per annum will be in the region of 20,000 hoppus feet and the first coupe will not be felled until F.Y. 72 by which time all of the larch stands will have been heavily thinned.

(e) Regulation of Yield

Until F.Y. 66 yield will be from thinnings only. The C.A.I. is at present 207,700 hoppus feet so that the volume removed annually will be in the region of 100,000 hoppus feet.

For regulation of yield purposes the forest will be divided into five equiproductive blocks which will be thinned in rotation.

In F.Y. 66 the heavy thinning of unthrifty larch crops will start in order to meet part of the pulp mill requirement at the rate of around 20,000 hoppus feet per annum. Clear felling of the retained larch overcrop will start in F.Y. 72 also at a rate of 20,000 hoppus feet annually.

The combined thinning and felling yield will, therefore, be approximately 120,000 hoppus feet for the years F.Y. 66 to F.Y. 75.

Clear felling of rotation age crops will start around 1980 and as this will create a sudden rise in the volume some adjustment of the yield will be required in the second decade of the plan. No thinning will be carried out in the five years preceding clear felling.

In/

In the event of a shortfall in pulpwood supplies areas of the less productive species will be brought forward for felling. These are largely stands of Scots pine and Norway spruce which would be replaced with Douglas fir or Sitka spruce according to site conditions.

(f) Roads

Roading intensity will be in accordance with Conservancy instructions and construction in accordance with the instructions laid down in HM2a.

In the period F.Y. 63 to F.Y. 70 the mileage of new roads to be constructed will be approximately 6.5 miles, 1.5 miles in F.Y. 66, 2 miles in F.Y. 68 and 3 miles in F.Y. 69.

Roads to serve the areas now being planted will not be required during the period of this plan.

The maintenance of roads will be the responsibility of the Forest Staff who may call for advice from the Engineering staff when required.

(g) Marketing

Until the end of F.Y. 64 the thinnings will continue to be sold standing under the existing five year contract. From 1965, onwards, Peter MacAinsh Limited, Crieff or other established merchant will be offered around 60,000 hoppus feet annually of which a proportion will be prepared and put to roadside by them for onward movement to the pulp mill at Fort William. These sales will be negotiated annually when prices and exact quantities will be agreed.

The working of the balance of 60,000 hoppus feet will be undertaken by direct labour.

Currently a better stumpage is obtained by selling standing, but on the other hand consideration has to be given to providing steady employment at the forest, and because of this, and the need for a measure of close control of supplies to the Fort William mill, 60,000 hoppus feet will be allocated to direct working. The working of 50% of the volume with Forestry Commission labour also agrees with Directorate policy which stipulates that approximately 50% of all the pulpwood supplies to the mill will be worked by direct labour.

The log element of the Forestry Commission worked timber will be offered for sale on the open market.

(h) Protection

(i) Fences

Existing forest boundary fences and fences around nurseries, houses and Forest Workers' Holdings will be kept in a good state of repair at all times.

Fencing liabilities imposed under the various dispositions and feu charters will continue to receive the necessary attention.

(ii) Animals

Animals, apart from periodic attacks by voles and rubbing and browsing by Roe deer, do little damage to plantations; the latter will be kept in check by selective shooting.

(iii) Insects

Insects which have done damage to the plantations are Pine Weevil, and the Spruce Greenfly - Neomyzaphis abietina. Future plantings and replantings will be treated with Didimac or other approved/

approved insecticide to obviate damage. There is the normal forest population of Pine Shoot Beetle and Chermes cooleyii but unless these considerably increase in number no action is necessary.

(iv) Fungi

In the nursery it will be necessary to continue spraying larch seedlings and transplants with sulphur emulsion sprays to combat attack by Meria laricis.

In the forest the use of an approved fungicide on freshly felled stumps will continue on those stands not subject to Research Branch treatment.

(i) Staff and Labour

(i) Staff

The staffing at the present time is adequate but will require to be reviewed as the nursery and planting programmes decrease in size.

(ii) Labour

The existing labour force of 34 is adequate but retirals, of which 9 are expected on account of age over the next five years, will not need to be replaced as a result of the impending closing down of a large part of the nursery.

(j) Housing

One additional house is required for a Forester. No additional houses are required for workers.

(k) Miscellaneous

Nil.