

HISTORY OF INVERLIEVER FOREST

Introduction and Index

Summary

1. Supervision Details of Conservators, Divisional and District Officers and Foresters with their periods of service are given. See Para. 2 of History.
2. Description of Forest Area The topography, geology and climate of the area are briefly described. See Para. 3 of History.
3. Preparation of Ground and Drainage The methods adopted to prepare the ground for planting and the intensity of the drainage are dealt with briefly. In view of the fact that large scale planting ceased in F.Y. 28 none of the modern methods of draining and soil cultivation by means of tractor drawn ploughs were carried out at this Forest. There is little doubt that had the hinterland peats been plough drained much of the areas at present in check would have been thriving pole stage plantations (if not carrying larger timber) at the present time. See Para. 5 of History and Para. 1(ii) of Appendix II.
4. Selection of Species It was at this Forest that the first attempt to correlate the choice of species with existing vegetation types was made in this country. See Paras. 3, 8 and 9 of History. Inverliever Forest was, from the beginning, a large scale experiment in afforestation on ground considered to be typical of vast areas in the West of Scotland. The Reference "A" of Appendix I and Para. 1(ii) of Appendix II. existing plantations at this Forest and elsewhere in the locality did not at the time provide any useful guide as to which species might be expected to thrive on the more exposed and poorer soil types since they had been formed on the richer slopes and valley bottoms. As might be expected certain initial mistakes were made, particularly with Scots Pine on exposed sites, with Norway Spruce on the hinterland and with *Abies peetinata* and Douglas Fir. These mistakes were quickly recognised and as a result of

a careful survey of existing plantations and of the vegetation types on areas scheduled for future planting which was made between 1913 and 1918, the original assessment of planting sites was thoroughly revised. The selection of species in force from 1919 until planting was completed in 1928 is materially that adopted for similar sites at the present day. Certain sites originally planted would be classed to-day as doubtfully plantable even with modern intensive methods of draining but otherwise the choice of species subsequent to 1918 was basically sound.

5. Rate of Planting The areas planted by P. years are as follows:-

Acquired Pltns.	76.	P.27	120.5
P.09	112.5	P.28	74.2
P.10	122.75	P.29	36.75
P.11	110.	P.30	9.
P.12	158.5	P.31	15.
P.13	94.75	P.32	9.5
P.14	201.5		
P.15	179.25		
P.16	101.		
P.17	72.		
P.18	45.5		
P.19	42.5		
P.20	84.		
P.21	132.		
P.22	123.		
P.23	189.		
P.24	140.		
P.25	75.		
P.26	56.		

Apart from some small areas of replanting, no planting has been done since 1932.

Only/

Only 480 acres of the original acquisition are scheduled for future planting and this will not be carried out until after the death of the present tenant of Torran Farm, Arichamish and Barnaddy. The recent acquisition of Moalochy and the probable acquisition of Barnaline, both of which march with the original area, will provide land for planting - mainly oak, hazel, birch scrub - in the near future at the rate of 200 acres per annum.

6. Rate of Growth and Volumes from Thinnings Details are given which indicate the extremely rapid growth of most conifers - particularly of Sitka Spruce - on the rich slopes in this area of high rainfall. Much of the Sitka Spruce have averaged almost 3 ft. in height growth per annum since planting and even in the older stands, now some 42 years old, this rate of growth is being maintained. The heavy and frequently repeated thinnings also evidence that volume increment has not yet reached its peak. By normal standards many stands of Sitka Spruce would appear to have been drastically overthinned and yet when viewed on the ground there is not one area of thinned Sitka Spruce which could not have had more trees removed with advantage or which appears to have suffered in any way from over-thinning. This is borne out by the data from Sample Plot S.116 and general experience over a number of stands of the same species. See Para. 4 of Appendix II. See Para. 1(i) of Appendix II.
7. Research From the point of view of research this is a most interesting Forest. In the days of the Office of Woods, Research was in the hands of the Forest Staff. Of the early experiments Boyd's Plots are of especial interest. When Inverliever Forest was transferred to the Forestry Commission, the Research Branch took over control of the existing experiments and the responsibility of future experimental work. See Para. 10 of the History and Appendix III.

(Sgd.) H.V.S. DIER
S.F.C.

(Sgd.) J.E. JAMES

1. Name

The name is derived from Inverliever Estate, the Lodge being located on the North bank of the River Liever.

2. Supervision

Planting started in 1909 on the N.E. part of Arichamish Farm. The officers in control of the area since its opening to date have been as follows:

While under Office of Woods management:

Executive Officer R.L. Robinson (now Lord Robinson)

Forester J. Boyd 1909 - 1920

Under Forestry Commission management:

Conservators

1946 - 1948 A. Watt

1948 to date J.E. James

Divisional Officers

1920 - 1922 A.D. Hopkinson

1922 - 1934 J.M. Murray

1934 - 1938 O.J. Sangar

1938 - 1939 A.H. Gosling

1939 - 1945 J.A.B. MacDonald

1945 - 1946 A. Watt

1947 - 1948 J.E. James

1949 to date H.V.S. Dier

District Officers

1920 - 1922 A. Graham

1922 - 1925 Vacant

1925 - 1938 W.H. Whellens

1938 - 1939 R.J. Waterman

1940 - 1944 H.V.S. Dier

1944 - 1947 T.E. Edwardson

1947 to date J. Chrystall

Foresters

1921 - 1929 H. Cameron

1930 - 1936 J.D. McDonald

1936 - 1948 J. Kennedy

1948 to date R. Crozier

3. Brief Description of Forest Area

The area extending to 12,608 acres was acquired from Poltalloch Estate in 1907 as an experiment in large scale afforestation. This ground was considered to be typical of large areas of land in the West of Scotland.

The area under plantations extends 6 miles along the West shore of Loch Awe from Arichamish Farm in the South, to Dalavich in the North and varies in width from 1 - 1½ miles. In addition to the above main area there are 3 small blocks at the South end amounting to 110 acres.

Topographically/

Topographically the area is divided into 3 main divisions.

- (i) A steep rise from Loch Awe which gives way to
- (ii) a series of ridges and valleys running in a N.E. to S.W. direction which in turn give place to
- (iii) a high exposed flattish area.

The elevation of the ground rises from both ends S.W. and N.E. to the centre of the area where it culminates in Dun Corrach 951' above sea level and 834' above Loch Awe. The ridges separating the valleys and the high plateau area are fully exposed to the strong S.W. prevailing wind. Dun Corrach affords some shelter to the more undulating N.E. area.

Rainfall is between 80 - 85 inches per annum, and weather conditions may be said to be mild and cloudy. Heavy snowfalls and severe frosts are unusual, but late Spring frosts are harmful.

Geologically two main types occur.

- (i) Epidiorite sill which occupies most of the area, and
- (ii) Loch Awe grits which are confined to the N.E. part of the area.

The soil on the lower slopes where derived from the epidiorite is a stiffish sticky light brown loam. That derived from the grits is coarser and of a less stiff texture. By far the largest proportion of the area is covered with peat of varying depths and textures. Underlying soil is of greyish podsol type. The mineral soils apart from the low lying flats are generally shallow.

4. Acquired Plantations

Acquired plantations extended to 76 acres comprised of 4 blocks of mixed conifers situated along the lochside. The species in each of these blocks was a mixture of Scots Pine, European Larch, Douglas Fir, Norway Spruce and Silver Fir and *Abies pectinata*. A few hardwoods were intermixed and these were chiefly Oak and Birch. Apart from a few scattered Silver Firs near Jruadhan and the mixed Conifer plantation on Inverliever Island, most of these acquired plantations have been felled and replanted, only 7 acres remaining out of a total of 76 acquired.

5. Preparation of Ground

Preparation of ground consisted of scrub clearing, bracken cutting and draining.

In scrub clearing a thin overcrop was retained for shelter purposes. This was later removed by ringing when it had served its purpose.

All bracken was cut on the areas to be planted in the Summer preceding planting.

Little drainage was done on the steep slopes and this was confined mainly to the small flats and flushes. On the high exposed wet peat areas drainage was more intensive but seldom exceeded 20 chains per acre. For example, drainage on the P.13 planting area amounted to 1792 chains of ordinary drains and 802 chains were cut utilising the upturned turfs for planting. The area planted in P.13 was 14.4 acres.

Turf planting was in the experimental stage in the early years and the turfs were utilised only on selected sites. It was not until the early twenties that turf planting became common practice.

6. Methods of Planting

The tool most commonly used was the semi-circular spade although mattocks were used on the harder heather knolls. With the exception of the small turfed areas all planting was direct. Soreefing was done either prior to, or at the time of planting.

Planting distances varied from 5' - 6' for the Larches and Douglas, $4\frac{1}{2}$ ' - 5' for the Spruces and Silver Fir and 4' for Scots Pine.

Mountain Pine when planted pure were at 4' spacing and when used as a nurse species, at 8' - 10' apart.

Beech was the only hardwood planted and this at from $4\frac{1}{2}$ ' - 5'.

7. Early Years. P.09 - P.14

The first plantations were laid down in 1909 on the N.E. section of Arishamish Farm and on the South side of Cruachan Burn. The area resumed from Arishamish extended to just over 1000 acres. On this area the P.09 to P.14 plantations were formed.

From P.15 to P.23 plantations were established on the East and South East/

Forester
Annual Reports
for F.Y.13,
F.Y.18 and
F.Y.19

East section of Barnadby Farm and parts of Torran and Arichamish Farms were utilised for the P. years 24 to 28 inclusive.

8. Choice of Species

For purposes of the selection of species, the forest fell into two categories both as regards soil and exposure.

(A) From the Loch up to approximately the 500' contour soils were mainly mineral but overlaid with a thin layer of peat in places. Vegetation consisted of scrub growth of Oak, Birch, Ash, Alder and Hazel. Open spaces between the scrub areas were covered with a mixture of bracken and various pasture grasses. Near the 500' contour, heath, *Aira caespitosa*, patches of fine bent grasses and *molinia* were present.

(B) From the 500' to 950' contours the soil consisted mainly of peat of various depths and textures, and with a high moisture content. Vegetation deteriorated from *molinia*/heath/bog myrtle associations to *scirpus*/ling/bog asphodel with sphagnum and cotton grass.

Exposure on the high ridges and plateau area was severe but with some shelter in the valleys.

The lower slopes were comparatively sheltered.

Area A.

Species selected to stock the lower slopes comprised Scots Pine, European Larch, Japanese Larch, Douglas Fir, Norway Spruce, Sitka Spruce, Silver Fir and Beech and were planted on following sites:-

Scots Pine Not extensively used on the lower slopes and planted on sites where heather predominated.

European Larch

European Larch was selected for the lower bracken covered slopes on well drained mineral soils.

Japanese Larch

Grown on a wide variety of sites on pure mineral soil and where mineral soil was under a thin peat layer. Vegetation varied from pure bracken to a mixture of heath, ling, some bracken and fine pasture grasses. Sites were often fairly exposed.

Douglas Fir

Douglas Fir

Chosen for the deeper moist soil sites previously under scrub, and on sites carrying bracken and various pasture grasses. Sometimes fairly exposed.

Norway Spruce

This species was used on a wide variety of sites on both mineral and peat soil, in both sheltered and exposed situations.

Sitka Spruce

Similar to Norway Spruce but usually on more sheltered situations, and on deeper soils.

Silver Fir

Selected for better class soils in sheltered situations.

Beech

Planted on exposed sites in mixture with Silver Fir and pure to form protective belts along roadside.

Area B

There were no plantations growing locally in conditions similar to the area to be afforested and from which a guide to selection of species might have been obtained.

The species chosen were Scots Pine, Norway Spruce, Sitka Spruce and Mountain Pine, and these were allocated to the following sites.

Scots Pine In the first 5 years P.09 to P.11 Scots Pine was extensively used on much of the exposed sites, particularly where heather was dominant.

Norway Spruce

Selected for sites generally where heather was in mixture with grasses.

Sitka Spruce

Planted on the more sheltered sites and along valley bottoms and on better soils than the above two species. This species was not extensively used and in early years formed only 10% of the spruces used.

Foresters

Annual Report
F.Y.13.

Actual numbers
used in P.13:

N.S. 292,000
S.S. 30,000.

Mountain Pine Used in the poorest and most exposed sites.

Planted pure and also in mixture with spruces.

9. Results of Early Planting

Area A Results on mineral soil sites were generally satisfactory. All species grew well, but much damage was done to the larches by blackgame. Douglas appears to have been the most difficult species to establish. In later years much of this species suffered from windblow on exposed sites.

After a successful start Silver Fir was almost completely destroyed as a result of Chermes attack.

Little change was made in selection of species in later years on this type of land. The planting of Silver Fir was abandoned and Douglas Fir was allocated to more sheltered sites.

Chairman's
memo 16.5.23

Area B It was evident by the Summer of 1912 that all species used on the higher ground were going to be difficult to establish. Scots Pine in particular suffered severely both from exposure and the unsuitable soil conditions. In addition it had been badly cut back by blackgame.

Norway Spruce had also checked badly and on the poorest sites many plants had failed to grow.

Sitka Spruce on the better sites also checked, but death rate was not so high as in the other two species.

Following the poor results obtained with Pine it was decided to abandon the use of this species. Blanks in the Pine crop were replanted with spruces.

In view of the unsatisfactory growth on these upland areas it was decided in 1913 to survey the whole of the area scheduled for planting using the vegetation as an indicator as to type and condition of soil. Other factors such as exposure were taken into account when classifying land as suitable for planting.

Vegetation
Chart result-
ing from
survey
attached.

Chief points arising from the survey which was completed in 1918 was the classification of plantable and unplantable land, the recommendation of choice of species based on experience gained from the early plantations and a prescription as to intensity of drainage required.

During the survey period planting was confined to the "good" land on the East section of Barmad Farm, on which P.15, 16, 17, 18,

19 plantations were formed. Land forming part of this farm was also used for P.20, 21, 22 and 23 plantations.

Choice of species from 1918 onwards followed the recommendations resulting from the survey.

From 1918 onward a much higher proportion of Sitka Spruce was used to stock spruce areas. These were allocated to more exposed sites and in later years P.24 - 28 accounted for almost 90% of the spruces used.

Forester's
Annual Report
F.Y.18. Actual
numbers used
in P.18.
N.S. 28,000
S.S. 64,000

10 Research

Inverliever, having been acquired as an experiment in large scale afforestation, is the site of many experiments. The first of these may be said to be the vegetation survey carried out between 1914 and 1918, which was instituted by Mr. R.L. Robinson (now Lord Ribinson), in the course of which Forester Boyd staked a large number of plots on the various vegetation associations as tabulated in the survey report. These sites were stocked with a variety of conifers and are now known as Boyd experiments.

Much research work was done on peat areas. These involved drainage; use of chemicals and artificial manures as a means to improving peat soils; and turf planting.

F.C.
Bulletin
No. 15.

Earliest Forestry Commission experiment was laid down in 1921 and concerned the spacing of Sitka Spruce.

Five permanent thinning sample plots were laid down in 1938 in Sitka Spruce planted in 1924 and one in Japanese Larch planted in the same year.

Pruning experiments incorporating Douglas Fir, Norway Spruce and Sitka Spruce also occur. A plot of Sitka Spruce was selected for research into natural regeneration in 1949.

APPENDIX I

Notes from Inspection Reports and other Documents

Inspection Reports

11.9.26	Chairman's Inspection
11.6.34	Chairman's Inspection
2.9.40	Chairman's Inspection
30.10.46	Director's Inspection
26.8.47	Chairman's Inspection
8.3.48	Director's Inspection
7.3.49	Director's Inspection
26.5.49	Director's Inspection
8.6.50	Director's Inspection

Other Documents

1912 - 1913	Forester's Annual Report
1918 - 1919	Forester's Annual Report
28.2.20	Chairman's memo No. 116 covering summarised statement of Mr. John Boyd's 10 years' experience.

(Ref. "A") 16.5.23

Chairman's minute

17.9.27

Note of visit by Chairman and the Rt. Hon. Lord Clinton

3.1.28

Chairman's memo 394/27

12.6.35

Report of Forestry Commissioner's Tour

The earlier documents deal with the early history, the choice of species, preparatory work and the lessons learned from these with recommendations for the future.

Instructions and recommendations made in the Inspection Reports deal mainly with beating up, thinning, wind damage and access.

Beating up is referred to in the earlier reports which condemn the practice of replacing sickly looking plants. Experience has shown that these eventually come away and beating up only resulted in overstocking.

Instructions were also issued that work on the more productive lower slopes was to be done before dealing with the upland area.

Attention/

Attention is drawn to the need for timely thinnings, particularly of the faster growing European Larch, Douglas Fir and Sitka Spruce.

In later reports the thinning of Sitka Spruce is constantly referred to as being too light. A heavier grade was essential if a 3 year thinning cycle was envisaged.

Plantations on the less accessible areas were to receive timely thinning even if difficulty arose in extracting the produce.

The need for following up thinnings with drain repairs is also emphasised.

In order to safeguard against damage by wind, attention is drawn to the necessity for timely thinning, maintenance of drains and the risk arising from planting too close to drain sides.

Species recommended for replanting blown areas are Sitka Spruce, *Abies grandis* and Tauga.

More recent reports deal with the necessity of improving the county road through the forest in view of the increasing amount of produce resulting from thinning operations.

(Sgd.) J. CHRYSTALL

APPENDIX II

District Officer's Notes

1950

1. Growth of the Species Planted

Sylviculturally, the most striking feature of Inverliever Forest is the quick growth of all species and particularly Sitka Spruce on the lower mineral soil slopes and the contrasting slow progress made by species on the high moorland areas.

(1) The Lower Slopes

European Larch has been most successful on soils derived from the grits and located in P.15 and P.16. On the more shallow soil and exposed sites in P.11, 12 and 13 rate of growth has been slower and results of blast are evident in the sparseness of the crown on the exposed side.

After recovering from blackgame damage suffered in the early years it grew fairly rapidly but suffered in the dense pole stage from canker. A very heavy thinning was made in 1937 of the quicker growing plots in P.15 and 16. Later light thinnings followed in 1940, 1941, 1942 and 1943. The crop now stands at from 100 to 170 stems per acre with a volume of from 1,200 to 1,900 cu. ft. per acre. Most of the cankers have now healed over and there is a big improvement in crown development. Much of the Larch has been underplanted with Beech, Norway Spruce and Tuga. Larch is heavier where underplanted with Beech.

Japanese Larch also suffered severely from blackgame in the early years. It has suffered less on exposed sites than European Larch but on such sites stems are often coarse. On sheltered sites growth is rapid and stems cleaner. Best stands of this species occur in P.23, P.24 and P.27.

Douglas Fir On exposed sites Douglas suffered severely from windblow and twisted stem formation. On the deeper soils where planted in succession to scrub the crop has grown rapidly. Best formed stems are found near the lochside in P.16 on what appears to be raised beach. This species also suffered from delayed thinning but is now improving steadily.

Norway Spruce The rate of growth of Norway Spruce on the sheltered and mineral soil sites has been very satisfactory. Where planted on shallow and exposed sites growth is appreciably slower.

Sitka Spruce This species is probably the most successful of all the conifers planted at Inverliever both as regards productivity and adaptability. On high exposed/

exposed difficult sites it succeeds better than any other conifer. Trees in the region of 100' are not uncommon on the sheltered deep soil areas in P.09, 15 and 16. Sample plot No. S.116 shows a periodic mean increment of 387 cu. ft. U.B. for the 17th, 18th and 19th growing seasons and increases to 456 cu. ft. U.B. for the following three growing seasons.

Because of its rapid growth Sitka Spruce requires timely and regular thinnings. Failure to do this particularly on moist sites invites loss from windblow. Planting too close to drainsides also often leads to windblow. Sitka starts its growth early in the mild wet weather conditions and damage from late Spring frosts is suffered on low lying sites. Growth normally continues well into October.

A disturbing factor affecting this species is the occurrence of dieback which has been found in four parts of the forest in C.137 P.16, C.126 P.21, C.139 P.17 and C.193 P.28. Affected areas are as yet of small extent and do not exceed $\frac{1}{2}$ acre in the first three, and a single tree in P.28. First indication of the disease is a yellowing of the needles which is followed by rapid and complete defoliation. Investigation of the root systems of infected trees reveals them to be completely dead. The causes of dieback are being investigated.

Silver Fir Only a few trees of the original crop now remain. After decimation resulting from Chermes attack the area was restocked with Norway and Sitka Spruce in 1926 - 1928.

Abies nobilis Nobilis occurs only in a few small groups throughout the forest and were planted by Forester Boyd in the course of the vegetation survey. They are mainly sited on exposed sites. This species is windfirm and does not suffer unduly from exposure.

Thuja plicata Occurs only in small groups and is the only species so far which shown evidence of heart rot (apart from a small group of Sitka Spruce in P.16 Comp 134).

Beech On exposed sites is short and bushy but under larch is of better form. The types planted have not been good.

(ii) The Exposed Moorland Sites

Growth on these has been irregular and slow.

Norway Spruce which covers the larger part of the area has progressed very slowly and large areas still remain in check. In addition to the effects of exposure, rate of growth has undoubtedly been affected by the lack of adequate drainage and by the direct method of planting employed in forming the plantation. On the best of these poor sites and for reasons not apparent, small groups consisting of a few trees start putting on growth often after having been in check for many years. slowly/

slowly enlarge to the leeward side.

Much of the land similar to that planted with Norway Spruce in the early years was, as a result of the survey of 1914 - 1918, classified unplantable.

Scots Pine which was fairly extensively planted in the first three planting seasons has almost completely failed. The area now under Scots Pine is 12 acres. Growth is slow and except for a plot on the scree slopes of Dun Corrach, appears unhealthy.

Sitka Spruce has been the most successful species under these conditions. It is not uncommon to find Norway Spruce and Sitka Spruce growing side by side 1' and 20' high respectively. In C.183, P.14, where Sitka is growing at an elevation of 850' trees are up to 60' high with Q.G. at B.H. of up to 9". Sitka has suffered less from exposure than Scots Pine and Norway Spruce.

Mountain Pine has in many cases not succeeded in colonising the ground. As a nurse species its very slow rate of growth made it of doubtful value.

2. Natural Regeneration

Restocking by natural regeneration has so far proved unsuccessful. Sitka Spruce regenerates quite freely in the shade of parent trees and on bare soil resulting from extraction operations. In the shade of the parent trees seedlings generally live for a few years and then die off probably as a result of the dense shade. On bare ground the competition from other vegetation is too severe for them to survive.

Investigations into natural regeneration are being carried out by Research Branch and a plot of Sitka Spruce planted in 1916 has been set aside for this purpose.

Natural regeneration of species other than Sitka Spruce is not common.

3. Wind Damage The species suffering most from windblow are Douglas Fir, Sitka Spruce and, to a smaller extent, Norway Spruce. Other species are unaffected.

Douglas Fir has suffered most severely and particularly on exposed sites. On fairly sheltered sites, although not blown, sabre butt is common as a result of wind damage in earlier years.

Norway Spruce has suffered only slightly in this respect.

Sitka Spruce Blown areas involving this species are usually located on deep, moist sites where trees have grown rapidly.

Many of the blown areas have started as a result of trees having been planted too close to drainsides. Late thinning also reduces the trees wind resisting qualities. Neglect to maintain drains in good running order is also detrimental.

the standing crop. Attention to these points should have the effect of reducing losses by windblow.

4. Rate of Growth and Volumes from Thinnings

For management purposes Inverliever is divided into two thinning series - North and South, with the Cruachan burn forming boundary between the two. Thinning plan is based on a three year cycle and the North and South areas are subdivided into three.

T.S. North

Block I consists of P.16, 17, 20 and part 21.

Block II of P.19, 22 and 33.

Block III of P.18, 19, 22, 23 and remainder of P.21.

T.S. South

Block I consists of P.13, 14, 24, 25, 27 and 28.

Block II of P.11 and 12.

Block III of P.09 and 10.

Light thinnings and cleaning commenced in late twenties in the Larch and Douglas areas but it was in the middle thirties before intensive thinning commenced. Up to and including F.Y.39 the volume removed amounted to 61,000 cu. ft. consisting chiefly of European Larch, Douglas Fir and Sitka Spruce. Area thinned during this period was 345 acres.

From 1940 to 1945 rate of thinning was greatly accelerated to supply war demands. Most of the thinnings during these years came off the steep slopes immediately above Loch Awe P.09 to P.18 inclusive. Species consisted of European Larch, Japanese Larch, Douglas Fir, Norway Spruce and Sitka Spruce. In addition to thinnings 66 acres of European Larch and Douglas Fir were clear felled. Of the 680 acres thinned many of the faster growing stands received light annual thinnings in 1940, 1941, 1942 and 1943, and the remainder two thinnings. The volume removed in thinnings during this period totalled 816,000 cu. ft. 75,000 cu. ft. resulted from clear fellings. This latter area included Torran and part of New York Wood.

In post war years F.Y.46 to F.Y.50 inclusive, thinning operations have been confined almost wholly to first thinnings on the higher and more inaccessible sites comprising part of P.17A, P.20, 21, 22 and 23 in T.S.N. and P.24, 25, 27 and 28 in T.S.S. Volume resulting from thinnings during this period amounted to 292,000 cu. ft. of which 64,000 cu. ft. was sold standing. Area thinned 530 acres.

Total/

Total area in thinning stage to end of F.Y.50 is approximately 1,555 acres and total yield to end of F.Y.50 is 1,244,000 cu. ft. which figure includes volume from clear felling.

While much of the leeway arising as a result of the war have been made up, approximately 160 acres in P.22 and in the irregular developed area between the county road and the western boundary including part of P.09 to P.14 require first thinning. Some of the stands in the second and subsequent thinning stage are also in arrears.

Completion of repairs to the county road and the occupation of the 30 new houses being erected at Dalavich will greatly assist in catching up on arrears as a result of the improved access and the increase in labour force.

Of the various species in the thinning stage European Larch (117 acres) has almost reached the final crop stage on the better sites. On exposed sites where growth has been slower further light thinnings will be necessary. The rapid growth of this species in early years makes early thinnings necessary and much of the canker experienced at Inverliever was probably partly caused by the impaired state of health due to delayed thinning. The rapid healing of the cankers and the very improved condition of the crown and the overall appearance of vigour now evident are indicative to the open condition preferred by European Larch. On lower slopes density is from 100 - 170 trees per acre. Trees are up to 60' with a B.H. Q.G. of up to 12". Volume per acre varies from 1,200 to 1,800 cu. ft. per acre.

The area stocked with Japanese Larch extends to 101 acres. During war years this species was fairly heavily thinned and stocking at present varies from 300 - 400 according to rate of growth. Thinnings are desirable at three year intervals.

Douglas Fir Area 87 acres. Because of its susceptibility to windblow requires careful thinning on all sites and particularly on exposed sites. All of this species is now in the subsequent thinning stage with the exception of P.28 which received its first thinning in F.Y.50. Volume removed per acre amounted to 550 cu. ft. Much of this area has suffered from wind damage and affected stems were removed. Standing crop is fairly rough but now appears to be stable. This was a scrub area prior to planting. In C.134 a plot of Douglas planted in 1937, 1940, 1941, 1942 and 1945 now stands at 260 per acre with an average Q.G. B.H. of $8\frac{3}{4}$ " and an average height of 67' and $2\frac{1}{2}$ " top dia. Volume per acre is 4,600 cu. ft. Thinnings are desirable on a three year rotation.

Norway Spruce

Norway Spruce Of the 1154 acres stocked with Norway Spruce approximately 450 acres are in the thinning stage and are located below the county road and on the more sheltered areas above the road in P.14, P.17, 18 and 19. Because of its use as a utility species up to the early twenties the rate of growth is most uneven and varies with the character of the soil and the degree of exposure. The thinning stage is reached in groups. On the deeper soils and where sheltered light thinnings at three year intervals and on the slower growing exposed sites thinning at six year intervals is sufficient.

Yields from first thinnings vary from 200 - 300 cu. ft.

Best stands are to be found in P.14 and P.16 on the lower slopes where stocking is 550 per acre, average timber height to $2\frac{1}{2}$ " top dia. is 50' and average Q.G. B.H. $7\frac{1}{2}$ ". Volume per acre is just over 5,000 cu. ft.

Sitka Spruce area 800 acres. The bulk of this area has reached the thinning stage. Growth is rapid and thinnings are required at three year intervals. Yields are heavy in comparison with other species. First thinnings in the P.27 area C.197, 198, 199 and 200 carried out in F.Y.48 gave a yield of 600 cu. ft. per acre. Second thinnings due in current year (F.Y.51) have been marked and measured in C.199 and 200 and thinnings amount to 640 cu. ft. per acre. Rate of growth in the P.27 area is similar to Research Sample Plot P.24, where annual increment is 410 cu. ft. per acre at 26 years.

Subsequent thinnings in the older stands done in current year average 800 cu. ft. per acre. Stocking on these sites varies from 300 - 370 stems per acre, overall timber height is up to 74' and average Q.G. B.H. $9\frac{1}{4}$ ". Volume per acre is around 7,000 cu. ft.

Many trees are approaching 100' and the following measurements are of one of these in P.15. Height - 102'. Q.G. B.H. - $18\frac{1}{4}$ ". Q.G. Half Height - 12". Volume - 102 cu. ft.

5. Replanting

The area replanted extends to 163 acres. Species used have been mainly Norway Spruce, Sitka Spruce and Tsuga.

Most of the replanting was done in F.Y.28 when 108 acres, the bulk of which was formerly stocked with Silver Fir, was replanted. Other areas required restocking as a result of windblow and clear felling.

In the shelter of surrounding woods all three species have grown well and especially/

especially on areas of small extent. Sitka Spruce growth under these conditions is very rapid as evidenced in C.178 where 36" growths are common. On the larger and more open areas on the lower slopes of P.11 and 12 formerly stocked with European Larch and Douglas Fir growth is slower. Norway Spruce was used largely to replace Silver Fir and has developed evenly. Tsuga was not extensively used but is most promising.

6. Underplanting

79 acres have been underplanted and the overcrop, with the exception of a small plot of Douglas Fir underplanted with Tsuga Heterophylla, is European and Japanese Larch.

The species used for this purpose were Beech, Norway Spruce, Sitka Spruce, Abies grandis and Tsuga. Beech and Norway have been most extensively used. Much of the area underplanted has been damaged by grazing.

The species which have succeeded best are Beech and Tsuga. The former has grown well under open European Larch in P.15 and P.16, and Tsuga has done well under rather open Douglas Fir in P.15. Norway Spruce under Japanese Larch in P.18 has suffered as a result of the rather dense shade and would be more successful if introduced at a later stage and under a reduced canopy.

(Sgd.) J. CHRYSTALL

3.2.51.