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OF

HAFOD FAWR

FOREST

N(W) CONSERVANCY

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HAFOD FAWR FOREST

NORTH (WALES) CONSERVANCY

HISTORY OF HAFOD FAWR FOREST

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HISTORY OF HAFOD FAWR FOREST

CHAIRMAN'S COMMENTS

Hafod Fawr, Inverliever and Isle of Man Plantations were three of the Crown Forests which came under the charge of the Joint Forestry Branch of the Board of Agriculture and Office of Woods, which was formed and placed under my charge in 1912. They were the only areas on mountain land on which we could do any practical forestry work as opposed to collecting data relating to the efforts of others in such places as Coombe Plantation, Keswick (now part of Thornthwaite Forest) and Kerry Woods (now, in part, Kerry Forest).

All three Crown Forests were consequently subjected to intensive study and experimentation, which marked the first effort to get away from the stereotyped nurseryman's mixture and systematically to correlate choice of species with observed environmental conditions.

There was also the important question whether any of the newer species would succeed better on the more difficult sites. Contrary to what is stated in the draft history there were (and still are) a few Sitka spruce in either the P.00 or P.01 plantation, but it is doubtful whether we ever detected them in the early stages. It was also thought from evidence collected elsewhere that Sitka spruce would resist exposure to wind better than Norway spruce. I do not know how the contrary view, to which expression was later given in other forests, ever arose.

At Hafod Fawr, therefore, considerable use of Sitka spruce was made, particularly in interplanting experiments in the upper parts, and I was very interested to learn that Sitka spruce has in fact shown itself the most suitable species and is also promising in mixture with mountain pine under difficult conditions. I think that such areas are worth while investigating in greater detail and illustrating with photographs.

I must have inspected Hafod Fawr before 1912 but soon after details were left to Crosfield and after him to L.S. Osmaston (who became Deputy Surveyor, Dean Forest, at the end of 1912).

P.13 (Compartment 12) was planted on my instructions: my original intention was to make it a mixture of Sitka spruce with species (Douglas fir and Abies grandis) associated therewith in Western America. In the

event it was planted with pure Sitka spruce.

Osmaston certainly planted one or two compartments (13 and 14) with a mixture of Norway spruce/beechn/common silver fir in imitation of the Black Forest just as he planted subsequently in the Forest of Dean mixtures of Douglas fir/Thuja in imitation of a successful plantation at Gairletter (Benmore) long since felled. I did not think at the time and still do not consider that his Hafod Fawr mixture would have been a success but it is unfortunate that the experiment was spoiled by sheep.

I did not see much, if anything, of Hafod Fawr during the war years (1914-18), and the next definite note which I have relates to an inspection made in June 1922. A copy is appended (Appendix III) from which it will be seen that it gave rise to Guillebaud's report of July 1922. Incidentally his survey was repeated by J.A.B. Macdonald in 1933 and could with advantage be brought up to date.

As regards thinning there is no doubt that we were tardy in getting to work. I have a clear recollection on that point but the office records are defective. The following minute on an inspection on 17th April, 1931, throws some light on the subject:-

"I was very disappointed at the progress made in thinning the plantations (larch) since my previous visit to Hafod Fawr. It is thoroughly bad practice to let larch plantations get out of hand in this way. When it is a choice between necessary thinning and planting, thinning must have precedence. I should like to see the Hafod Fawr thinning plan at an early date. Progress should be stated in the Divisional Officer's Annual Report."

R

28.5.51.

HISTORY OF HAFOD FAWR FOREST

GENERAL DESCRIPTION OF THE FOREST

Situation

Hafod Fawr forest is situated in northern Merionethshire two miles south east of Llan Ffestiniog at the head of the vale of Ffestiniog which forms part of the southern boundary of Snowdonia. It is twelve miles from Tremadoc Bay.

Name

The forest gets its name from two of the group of small farms which comprise the area and as far as is known the name is of no special significance. Cwm Cynfal the valley in which it lies, however, is the scene of an incident in one of the tales from the White Book of Rhyddareh (better known to English people in the form of the Mabinogion), whilst the forester's house, Llechgoronwy (Gronw's Stone) is presumably named after one of the chief characters in that tale.

Unlike any other of the Commission's forests in Wales (except Tintern in Monmouth) Hafod Fawr was originally a Crown Forest. It is also noteworthy that only two other Crown Forests in the British Isles - Inverliever in West Scotland and the Isle of Man Plantations were acquired by the Crown in the form of bare land for afforestation. Hafod Fawr was purchased by the Crown in 1899 and planting began the same year and went on without a break for ten years.

Area

At the end of P.50 the position was as follows:-

Total area	1367 acres
Acquired plantations	114 "
F.C. plantations	438 "
Total afforested	552 "
Available for planting	82 "
Other land	733 "

Topography

The plantations lie on the north slope of Uwch Afon the highest point of which, Craig Wen, rises to 1823 ft. above sea level. The lowest Compartments 1, 2 and 12 have an elevation of 700 ft. and the highest, Compartments 8 and 9 rise to just below 1600 ft. so there is a range of elevation of nearly 900 ft.

The prevailing aspect is north to north west, but the forest is almost equally divided by a broad ridge running north and south which is composed of three parallel spurs which give rise to easterly aspects.

This ridge is formed by the branching of the Bryn Celynog fault which is also responsible for the precipitous escarpment which forms the eastern boundary of the plantations and shelters them from the north-east wind.

East of this spur which bears along its western edge for its full length the oldest plantation is a sheltered but steeply sloping basin in which are situated the younger plantations. To the west of it the slopes are more gentle, though turning steadily into the prevailing wind. The exposure is mitigated to a certain extent by the series of shallow slacks leading north and north-west.

The detached Sychnant block stands at the western end of the Uwch Afon feature at just below 1000 ft. Exposure to the sea winds is as a result, severe, and it is remarkable how the Sitka spruce which form the bulk of these plantations, withstand it.

Climate

Hafod Fawr has an average rainfall of 75 ins. per annum, about the fifth highest for the forests in North Wales. The following figures are for the three years ending 1922 (average of the three) and for F.Y.48, 49, 50. The very high figures for F.Y.50 would bring the average figure for the three years considerably above normal, hence the figure for these three years being shown individually.

<u>Month</u>	<u>1922</u> <u>(3 yr. av)</u>	<u>F.Y.48</u>	<u>F.Y.49</u>	<u>F.Y.50</u>
October	5.86	0.96	7.80	16.56
November	7.75	8.60	8.27	11.44
December	11.89	6.29	10.00	16.08
January	9.76	15.60	7.10	6.40
February	9.12	5.32	4.68	11.56
March	6.21	4.60	5.93	5.80
April	4.92	2.52	8.47	7.56
May	4.50	2.47	7.27	1.12
June	3.73	9.90	1.59	9.04
July	5.83	5.05	4.52	8.08
August	5.73	9.60	6.12	15.24
September	<u>4.80</u>	<u>10.35</u>	<u>2.88</u>	<u>17.68</u>
TOTAL	<u>80.10</u>	<u>81.26</u>	<u>74.63</u>	<u>126.56</u>

Being near the sea it is fairly free from frost, but severe snowstorms occur from time to time. Sitka spruce in particular has suffered from broken leaders, but there have been no cases of extensive snowbreak.

Geology and Soil

The forest lies on the Ffestiniog flags the most recent bed of the Cambrian system. There are also within the forest area limited outcrops of igneous rock but their influence on the soil and topography is not very great.

The Ffestiniog Flags are in fact dark grey shales which weather fairly readily to a light brown clay loam containing a large proportion of very light coloured shale fragments up to two or three inches in length. The strata dips at 30° to the North, roughly parallel to the general slope of the ground. As a result the soil tends to be shallow and drainage, though of limited depth is fairly free. Though leaching does occur there is no marked pan formation.

Mr. Guillebaud records (Report on Hafod Fawr - 1922) that in places the soil is definitely gritty due to the presence of quartzitic fragments.

Considering the high elevation and heavy rainfall one would expect to find a very sour soil. It is remarkable, however, how comparatively infrequent for such an area is the occurrence of unfavourable indicator species such as Erica tetralix, Myrica gale, bog asphodel and Scripus.

The northern side of Cwm Cynfal opposite the forest, where the slope of the land is normal to the dip of the strata and where as a result the rock weathers the more readily is a noticeably fertile area compared with the surrounding country. This area has a reputation for fertility with the farming community.

On the whole, therefore, the soils of this forest must be considered comparatively favourable to tree growth.

In his report, Mr. Guillebaud defined three types of peat occurring in the forest; a light brown fibrous peat, a dark brown to black non-fibrous peat and a peaty loam.

He remarked upon the very rapid breakdown of the fibrous peat under the canopy of the larches and to a lesser extent under Norway spruce, remarking how this change in rate of breakdown corresponded closely with the change of species in a stand. This effect has not been studied in detail on this occasion but it is remarkable how the P.37 Japanese larch has established itself on deep Calluna/Vaccinium/moss ground and how even before the canopy has closed the turf under this vegetation is already almost completely decomposed.

He also mentions the general shallowness of the peat, the average being 8 in. The maximum depth of 2 ft. occurs in the valley bogs on which some of the best stands occur. Deep peat of the raised bog type is absent.

Vegetation

Though the observations in the 1922 Report and 1933 Survey hold good there is still scope for detailed ecological study at Hafod Fawr. Plantations from the earliest stages to almost final crop spacing occur on a variety of sites within a small area and there are considerable areas of recently felled and replanted land which must provide interesting examples of vegetation changes.

Two plant associations typical of the Welsh mountain country are well represented here. The Calluna/Molinia/Scirpus association predominates at the bleak and less well-drained western end of the forest, whilst Calluna/Molinia Vaccinium/bracken vegetation occurs at the more sheltered eastern end. On the lower ground and on the central old woodland sites the typical woodland species are well represented.

Roads

An important development in the history of the forest has been the construction of some $1\frac{1}{2}$ miles of all-weather road between 1947 and 1949 by the Roads Branch. Previously, in 1938, a road had been constructed through Coch gwan to Hafod Fawr Uchaf by forest labour and further road building by forest labour has taken place from time to time to facilitate extraction of produce or access to buildings.

SILVICULTURE

(a) Pre-Commission Operations

Pit planting of large transplants was the practice adopted until 1906, the compartments concerned being situated for the most part on fairly favourable sites at 700 ft. to 1200 ft. above sea level. The average cost per acre (including fencing and draining etc.) was just under £20. In 1906 when more exposed and poorer sites were tackled the cheaper method of notch planting was adopted and continued in general use until turf planting was introduced in 1927.

The species used at first were Norway spruce, Japanese and European larch, Corsican pine, Scots pine, alder, occasional oak and possibly other hardwoods.

These were frequently planted, after the practice of the earlier English foresters, in very complex mixtures, particularly on the better ground, pine almost certainly forming the matrix of the crop. Many pure blocks of the major species were also planted, however, great care being taken to confine individual species to the type of ground considered most suited to them. The resulting plantations were a bewildering mixture of species. The selection of species corresponded fairly closely with that of the present day which experience has shown to be sound, though the pure pine and the pine/alder mixture which were planted on peaty and exposed

sites failed badly and were replaced as a result of beating up over the course of years by Sitka spruce.

A few Sitka spruce were introduced into the P.01 stands but it was not until 1911 that this species was used on any scale for beating up so the stands of Sitka spruce on the high exposed plateau in Compartments 8 and 9 must have replaced the Scots pine, Norway spruce and alder which had failed under the rigorous conditions.

When planting was resumed in F.Y.13, 14 and 15 Sitka spruce was fairly widely used though there are only limited established pure stands of this species. In P.15 it was planted extensively in row by row mixture with Norway spruce, but whether the areas which now appear to be predominantly Sitka were originally a mixture and owe their present composition to beating up is hard to say.

A few stunted silver fir and beech in Compartments 13 and 14 suggest that, something akin to the Black Forest mixture of Scots pine, Norway spruce silver fir and beech were originally planted. These relics are only evident on the more severely checked areas where they stand among checked Sitka spruce 2 ft. to 10 ft. in height. The pockets that have not been checked are of pure Sitka spruce which have suppressed any other species that might have been present, so it is not evident whether this mixture was planted only on the more difficult sites. This seems rather unlikely, and in any case this plantation suffered so severely from sheep grazing during the 1914-18 war that it was very heavily beaten up with Sitka spruce which more or less replaced the original crop over much of the area.

The results of these early plantings were comparatively successful, a crop being achieved on about four-fifths of the area. The two spruces and Japanese larch contributed chiefly to this, Scots pine to a limited extent, whilst alder succumbed completely to the unfavourable conditions and Corsican pine and European larch suffered so severely from Brunchorstia destruens and canker respectively that the part they played was small. Silver fir, as has already been mentioned, suffered severely from sheep grazing and check, but judging by the few odd trees on the edge of Compartment 7 which were presumably planted about the same time this species, given the chance, is capable of growing to timber size.

The greater part of this early work was directly supervised by Mr. W. H. More, the Crown Receiver for Wales, acting under instructions from the Office of Woods. A resident woodman was appointed in 1902 and apart from a short break in the 1914-18 war, during which years there was no planting, there was continuous local supervision by trained men up to the time when the Forestry Commission took charge.

(b) Forestry Commission operations

In 1924 the Forestry Commission resumed planting which went on at the rate of 30 to 40 acres per year so that by the end of F.Y.28 all the non-agricultural land west of the old plantations had been planted.

It was not realized till after P.28 that Sitka spruce could stand exposure and poor conditions better than Norway spruce, so in this block of plantations the former is found mostly on the flushes and deeper basin peat whilst Norway spruce occupies most of the remaining ground though repeated beating up with Sitka spruce has considerably modified the original composition of the crop, particularly on the more difficult ground.

Turf planting of wet ground started in P.28 and was extended later to other peat land.

Two interesting variations of the crop occur in this block. In the south-west and most exposed corner a fair proportion of Tsuga is mixed with the Norway spruce but by its irregular distribution it appears to have been introduced in beating up. Though generally smaller than the Norway spruce and tending to be dominated by it it is making quite good growth.

A Japanese larch/Sitka spruce line by line mixture was planted on the well drained and comparatively sheltered slopes which occupy about 20 acres of the south-east portion of this block. The Sitka spruce have produced greater volume and are of better form than the Japanese larch which, however, have made slightly better height growth. In the course of thinning the dominant Japanese larch are being gradually removed to favour the Sitka spruce and the final crop will be mainly Sitka spruce.

On the rocky and exposed shoulder at the south-west corner of the pre-Commission plantations there were planted during this period about eight acres of mountain pine. The majority of these are of the dwarf type but they form a thicket-like stand in the shelter of parts of which Sitka spruce has subsequently been introduced with fair promise of success.

From 1930 to 1936 the planting of the more sheltered ground east of the old plantations and the outlying block of Sychnant went steadily forward. The species used were Japanese larch on the better and lower ground and Sitka spruce on the poorer and more exposed ground. It had just been completed when in February 1936 a fire coming from the mountain into the south-east corner of the forest destroyed 106 acres - almost the whole of the most recent plantations and 34 acres of the pre-Commission plantations.

The danger of weevil damage was recognized but apparently the results of trial trapping were reassuring for planting went on on a large scale and by the end of F.Y.39 the whole of the burnt area had been replanted together with some of the lower ground round Bron-y-foel and Tyddyn bach. Japanese larch was used where it had been used formerly, but Norway spruce replaced Sitka spruce on some of the more favourable sites. The new planting was chiefly Japanese larch with Thuja, Norway spruce and Pinus contorta on the steep scrub covered slopes and rock outcrops along the northern boundary.

Proposals and some advance preparations were made to plant the Libert at the western end of the forest in F.Y.40 and 41, but the 1939-1945 war prevented this being carried out.

It is interesting to note that emergency felling which had been planned some months beforehand started within a week of the outbreak of war, on the 6th September in fact. This went on till June 1940, 33 acres, comprised of the whole of the P.04, 08, and 09 stands which had escaped the fire, being felled together with about a quarter of the P.05 plantation.

The whole of this area was replanted with Norway spruce in F.Y.41. This time, however, the weevil damage was severe and nearly 1000 plants per acre were used in beating up in 1943 and 1944. Sitka spruce was the species used, and as turf planting was not possible on the old woodland site flat planting had to be adopted and gave satisfactory results.

No further planting was carried out during the war, but at the end of 1945 a further 28 acres of old plantation - Compartment 4 (P.02) Compartment 5 (P.06) and all except 5 acres replanted till F.Y.48 and 49, nevertheless there was considerable weevil damage and trapping was still necessary in F.Y.50.

It was with some difficulty that Compartments 2A and 3A were saved from being felled also. Though the latter is not a particularly good stand it appears to be still putting on reasonable growth and, standing as it does on the windward edge of the spur which divides the forest in two, it gives good shelter to the younger plantations from the prevailing westerly winds.

In F.Y.50 110 acres of Libert between 1150 ft. and 1550 ft. above sea level which were partially prepared for planting in 1940 and 41 were enclosed for planting in the course of the next three seasons, starting with P.50.

This will complete the afforestation of all land at present available at Hafod Fawr. All the post-war planting has been with Sitka spruce except on limited areas of rocky outcrop where Pinus contorta has been used.

Description of the Plantations

Rather than describe the plantations according to the various sites it is more convenient to do so by species.

Japanese larch

As in the case of the plantations described by Mr. Guillebaud the young Japanese larch plantations have made an encouraging start. Even on the P.26 Calluna/Molinia ground, a type that is not nowadays selected for this species it has got away nearly twice as fast on check areas as the Sitka spruce planted in mixture with it.

The youngest Japanese larch plantations are P.39 and are due for brashing in F.Y.51 and a considerable proportion of them will be thinned in the next two years.

The middle age classes are not very well represented, the next oldest stand being P.29 (Compartment 16) which is only 2 acres in extent. This is situated at just over 900 ft. on the exposed western boundary of the forest on Agrostis/Holcus mollis grassland. As a result the trees have tended to corkscrew. It was first thinned in 1946, the most crooked stems being removed, but 700 stems per acre being left in order to give protection against the wind and discourage irregular growth. The stand will be given its second thinning in F.Y.52, again with the object of removing the most crooked stems. At present it is carrying 2,800 cu.ft. per acre and has a mean height of 42 ft. which puts it almost in Quality Class I.

The P.26 Japanese larch occurs in Compartment 15 mainly in row by row mixture with Sitka spruce. The first thinning in F.Y.43 was more by way of being a cleaning to benefit the Sitka spruce which were being whipped by the Japanese larch. Only the Japanese larch was removed. Since 1947 the thinning in this stand has gradually been extended and the proportion of Japanese larch reduced until at present, of an average of 820 stems per acre, only 210 are Japanese larch as against 610 Sitka spruce. The object of these thinnings was to free the Sitka spruce from being whipped by the larch, and in the course of the thinnings it has evidently been the dominant Japanese larch which have been removed. As a result, the Japanese larch with its average volume of 1.75 cu.ft. and height of 36 ft. compares unfavourably with the Sitka spruce which averages 5.25 cu.ft. and 42 ft. respectively. Some of the remaining Japanese larch are, however, well above the average and overtop the Sitka spruce.

Whether there is any silvicultural advantage in retaining a proportion of Japanese larch is open to question but the Sitka spruce is certainly the thriftier tree over most of the area.

In the older plantations there are stands of Japanese larch adjacent to Sitka spruce at the altitudes ranging from 700 ft. to 1500 ft. In all cases the Sitka spruce is standing considerably more to the acre than the Japanese larch and usually the average volume per stem is greater. Nevertheless the stands of Japanese larch in Compartment 8 at 1300 ft. to 1500 ft. altitude indicate that it is capable of producing sizeable timber even under severe conditions. According to the Permanent Sample Plot of each species, situated at approximately 700 ft. elevation, the Japanese larch is Quality Class I whilst the Sitka spruce is only Quality Class IV.

Nevertheless the larch may have an important part to play as a nurse to the spruce on exposed places and as a colonizer of the dense heather ground, and in any case its timber producing capabilities on the higher ground should not be under-rated.

Sitka spruce

As the 1922 Report forecast Sitka spruce has proved one of the two most successful species at Hafod Fawr. Admittedly there are still considerable areas of P.14, P.15, P.26 and P.28 plantations that are only now coming out of check, but in these same plantations there are also stands carrying 4,400, 5,200, 3,500 and 2,700 cu. ft. per acre respectively.

Norway spruce

Though this species is not up to Sitka spruce in volume production on comparable sites and on exposed sites is definitely inferior, its productivity is not inconsiderable and its distribution at Hafod Fawr is so extensive that the part it plays is important.

It is the main species in the plantations over 40 years old except at over 1,300 ft. In the 30-40 years age class Sitka spruce predominates.

P.41 replanting of the felled areas was entirely with Norway spruce but following severe weevil attacks it was heavily beaten up with Sitka spruce with the result that the crop is now only about one third Norway spruce. The Sitka spruce already shows signs of completely outgrowing Norway spruce on much of the area.

In the later plantings Norway spruce was avoided except on the lowest ground, though in Compartment 42 P.38 the use of Norway spruce was sanctioned in a sheltered hollow at about 1,400 ft but on the typically difficult Calluna/Molinia ground because of the shortage of Sitka spruce. As might be expected this area presents the familiar appearance of yellow-green trees barely 2 ft. in height standing in dense heather.

In the P.01 plantations in Compartment 3A much of the Norway spruce is heavily branched and with a marked taper. This is in all probability worst where there were formerly checked patches which were slow in closing up, with the result that the trees did not have their branches suppressed and they have persisted and grown throughout the life of the trees.

European larch

The Commission has not planted any European larch at Hafod Fawr and there are few of the old stands of any importance remaining. The best stems occur in Compartment 7 where a P.05 stand was heavily thinned some time about 1928 and underplanted with Sitka spruce in F.Y.31. The Sitka spruce is now catching up with the European larch and will receive its first thinning in F.Y.51, the object being to retain the best European larch to form a proportion of the final crop.

Throughout the P.00 and P.01 plantations there are groups of European larch mixed with Japanese larch, but it is difficult to say which is which until they are felled. About an acre of P.08 European larch occurs at about 1,400 ft. in Compartment 9 and though it has formed a crop is

fairly free from canker it obviously is not at home under such conditions.

Scots pine

A few Scots pine remain in mixture with Japanese larch and Norway spruce in the oldest plantations, but they are either so rough or so feeble that they cannot be considered of any value. On the more exposed sites for which they were specially chosen, the Scots pine managed to survive but could do little more than crawl along the ground. Some Corsican pine on the border of Compartment 2A are fairly satisfactory trees.

During the visit of the Advisory Committee in July 1938 it was noted that - European larch and Sitka spruce are quite unsuitable to so wet a climate". It had in fact been laid down by the Divisional Officer following the Commissioner's tour in April 1931 that - "The planting of pines, with the possible exception of contorta, was to be discontinued in this district".

Mountain pine

In P.26 and P.27 just under 8 acres of mountain pine were planted on rocky ground with a Calluna/Vaccinium vegetation in Compartment 27 between 1350 and 1500 ft. above sea level. For the most part the pine are of dwarf form, but there occur, scattered through the crop and in small groups in the P.26 area, some erect trees.

From time to time Sitka spruce have been planted in gaps in the pine and particularly in the sheltered eastern side of the P.26 area where they form about 25% of the crop they are getting away from the nurse species and putting on leading shoots which average 15 in.

A small area of mountain pine/spruce mixture was believed to have been planted in P.14 but the spruce have killed out the pine.

Pinus contorta

Pinus contorta was not used in early planting but has been used to beat up the mountain pine referred to above and the trees have grown well and are now well above the mountain pine and growing vigorously and healthily.

Pinus contorta was planted in P.39 on rocky outcrops where it is growing well.

Douglas fir and Tsuga

These species have been used for underplanting heavily thinned larch

crops. The oldest example of this practice is in Compartment 7 where they were used for underplanting European larch, which was, however, removed during the 1939-45 war. The Tsuga tends to be of rough form and there is the possibility that it is a bad type. Part of the stands of both species are now ready for brashing. Considering its age it can be seen that the Douglas fir does not do particularly well at Hafod Fawr.

In Compartment 9 about an acre of the burnt area at 1500 ft. was replanted with Tsuga in P.38. The site is fairly well sheltered by remaining patches of the old crop but the vegetation is Calluna/Molinia. Nevertheless some of the trees are already 10 ft. in height and are growing strongly.

The most recent example of underplanting is in Compartment 1 where, on the Chairman's instructions the P.08 and P.14 Japanese larch were heavily thinned to 220 trees per acre, the canopy being completely opened, and underplanted in P.41 with Tsuga and Douglas fir. The plot was again thinned heavily in F.Y.50, leaving 80 trees to the acre. Whereas the Tsuga look healthy and average 6 ft. in height the Douglas fir have an unthrifty appearance and are only 3ft. tall.

The remains of a pure crop of blue Douglas fir occurs at the eastern end of Compartment 12. The site is a well drained steep slope formerly carrying an oak crop of some sort. The area now presents a derelict appearance and the few Douglas fir which have survived in the coppice oak are very poor.

Alder

Although it is recorded that this species was planted extensively in mixture with Scots pine, it was obvious by 1922 that it was unsuited to the high and exposed sites for which it was chosen. In 1951 it is only with difficulty that any trace of it can be found.

Ploughing

No ploughing was been carried out at the forest as the small areas and broken nature of the ground did not justify the use of the ploughing tackle.

Research

Though at Hafod Fawr research plots were not laid out or their development followed up in a systematic manner as at some forests, the experimental nature of the earlier plantations and their value as an indication of the possible development of the Commission's plantations under the conditions existing over much of North Wales was recognized from the start.

In 1922 Mr. Guillebaud carried out an ecological and silvicultural survey of the newly acquired plantations and in July 1922 produced his "Report on Hafod Fawr". A further report was produced by him in 1927.

In April 1933 Mr. J. A. B. MacDonald with the assistance of Mr. R. E. Fossey and of Professor Robinson of Bangor, carried out a very detailed survey and produced a report "Hafod Fawr Forest, North Wales, A Regional Survey" in February 1934. The object of the survey was to describe the ecological conditions existing on a full range of sites throughout the older plantations at Hafod Fawr and on comparable unplanted and unenclosed or recently enclosed sites adjoining them, tracing the soil and vegetation succession and therefrom arriving at recommendations for the selection of species for the various unplanted sites described.

Since this survey was made about half the plantations surveyed have either been burnt or felled and replanted and the permanent sample sites are no longer marked.

The forest is unique among Commission areas in Wales in showing the results of fifty years of afforestation of mountain land. The forest shows the gradual change in choice of species from the usual mixtures of European trees, Norway spruce, Scots pine, and European larch with occasional silver fir, Corsican pine, beech, alder and oak, to Sitka spruce and Japanese larch which through beating-up have often replaced the originally planted trees except Norway spruce in some of the early plantations. Sitka spruce, Japanese larch and Norway spruce form the bulk of the plantations in recent years with small areas of Tsuga, Douglas fir, Pinus contorta and Thuja.

It is remarkable how on the highest and poorest ground Sitka spruce planted years later amongst stunted pines came through and formed a crop. Unfortunately the best examples were burnt. These areas were among the earliest and most convincing examples of successful pine/spruce mixtures and the more recent introduction of Sitka spruce into mountain pine bears out these earlier results.

Although Sitka spruce has proved the best tree on poor sites in severe exposure and has so far produced cleaner timber than Norway spruce and shows signs of being the only tree to regenerate naturally to any extent, Norway spruce still remains an important tree on suitable sites when it can be expected to be freer of spring frost and insect trouble than Sitka spruce.

Japanese larch has proved its value as a pioneer on some difficult types of ground, but Sitka spruce has usually proved its ultimate superiority on all types of ground found at Hafod Fawr. The experimental introduction of more exacting and higher yielding species to the older Japanese larch crops should provide useful data.

The change from early light thinnings to recent heavy thinnings is perhaps partly a result of the difficulty in marketing produce in the early years, and the present ease of disposal and partly the result of a general change towards heavier thinning practice.

Brief mention should be made of the four exceptional climatic conditions effecting forests in North Wales in recent years :-

- | | |
|-------------------------------------|--|
| (1) The May frosts of 1935 | (2) The snowstorms of February, 1938. |
| (3) The ice storm of January, 1940. | (4) The severe winter of January-March 1947. |

Although other forests in the vicinity were effected by some or all of these severe conditions, Hafod Fawr suffered very slightly.

W. A. Cadman
State Forest Officer

F. C. Best
Conservator

APPENDIX I

NOTES FROM INSPECTION REPORTS 1922-1949.

<u>Date</u>	<u>Inspecting Officers</u>
June 1922	Technical Commissioner
October 1927	Assistant Commissioner
April 1931	The Commissioners
October 1931	Assistant Commissioner
May 1933	The Chairman & Divisional Officers
March 1935	Assistant Commissioner and Divisional Officers.
July 1937	Assistant Commissioner Mr. W. L. Taylor.
October 1937	The Chairman
July 1938	The Chairman with Advisory Committee
November 1941	The Chairman with Divisional Officers
April 1944	The Chairman
April 1946	The Chairman
February 1948	Director Wales - Mr. A. P. Long
April 1948	The Chairman, Director Wales and Directorate Engineer.
August 1948	Mr. W. L. Taylor Commissioner
May 1949	Sir William Taylor

Hafod Fawr being the only Commission forest in North Wales containing any considerable area of acquired conifer plantation the most important contents of the notes are concerned with thinning and underplanting and the preparation and disposal of produce.

(a) Thinning

The 1922 report does not mention what thinning was necessary or suggest a thinning policy, but from the sizes of some trees mentioned, the oldest plantations must have been about ready for thinning, though the wide adoption of mixture and the poor growth of some of the component species must have tended to defer thinning. Difficulty of access and lack of established markets must also have been important factors.

The earliest details of thinning policy at Hafod Fawr are provided by the Thinning Plan prepared by the District Officer Mr. R. H. Smith in 1934, and revised in 1936. In addition to prescribing the areas to be thinned from 1934 to 1939 it also states in which years the various plantations had been thinned previously.

According to it Compartment 2 (P00) and Compartment 3A (P01) were first thinned in 1925, Compartment 3 (P01) in F.Y.27, and Compartments 1 (P.08) and 7 (P05) in 1928.

First thinnings were carried out in 1931 in P.08 Norway spruce and Japanese larch in Compartment 10. In 1932 first thinnings were continued in Japanese larch in Compartment 6, (P.04), Compartment 8 (P.06), Compartment 11 (P.09) and also in the Norway spruce/European larch/Scots pine mixture in Compartment 6 (P.04). In 1933 first thinnings took place in Compartments 4 (P.02), 5 (P.03) except for Scots pine, 7 (P.05) Norway spruce only, 12 (P.13) Sitka spruce, and in Compartment 13 (P.14) Japanese larch.

The plan in the majority of cases allows, as Mr. Smith specifically states, for the annual thinning of Japanese larch to begin with. What would appear to be the outcome of the 1936 revision is the omitting of the 1936 thinning of the Japanese larch and the extension of the period between thinnings to two years. For the species and the mixtures either a one or a two year interval was allowed between thinnings.

Because of the early "condition of the unthinned plantations" the Chairman instructed during the Commissioner's Tour of April 1931 that planting should be suspended to allow arrears of maintenance to be made up.

Some idea of the degree of thinning of Japanese larch that was adopted at this date can be got from a count made in Compartment 13 P.14 in 1932 following a criticism of too heavy thinning. This stand had originally been planted at 4ft. or 4½ft. spacing.

<u>Degree of Thinning</u>	<u>Stems Standing</u>	<u>Stems Removed</u>
Heavy	855 per acre	885 per acre
Light	1360 " "	660 " "

A further indication, but this time in the case of Sitka spruce, is given by the Chairman's instructions at the Divisional Officers' meeting in November 1941. Four to six acres of P.15 Sitka spruce in Compartment 14 which were considered due for thinning were inspected and a demonstration thinning marked. 250 stems per acre were to be removed and the stand thinned again in two years, 600-1000 cu.ft. per acre being removed.

Tour notes tend to criticise the thinning of later years as being too heavy rather than too light. It will be seen in the section headed "Description of plantations" that the figures given for stems standing per acre are, for the most part, well below those given in the official

bulletin on thinning but the stocking recommended in the booklet is now generally considered to be on the high side.

Some figures provided in the case of P.13 Sitka spruce in Compartment 12 at the Chairman's request after his visit in April 1946 do not suggest over-thinning.

Taken out:

1942	166	stems	per	acre;	400	cu.ft.	per	acre;	Av.	2.4	cu.	ft.
1944	80	"	"	"	433	"	"	"	"	5.0	"	"
1946	30	"	"	"	210	"	"	"	"	7.0	"	"

Timber standing in 1946:

340 stems per acre 2,720 cu.ft. per acre.

Average volume of stems 8 cu.ft.

Hafod Fawr being a small and compact forest with good access and a predominantly spruce crop it is possible to adopt a policy of light and often, and in view of the unevenness of many of the stands this policy is desirable. Compared with some forests the thinning is decidedly of the conservative and orthodox type. The Conservator stated in his comments on Mr. Hummel's inspection in 1948, however, that "I have been of the opinion that we tended to over thin our older plantations at Hafod Fawr".

(b) Underplanting

It was on the Commissioners' tour in April 1931 that instructions were first given for underplanting larch, in this case European larch in Compartment 7 (P.05), but it was noted that it had already been heavily thinned apparently with the underplanting in view.

In May 1933 it was laid down that the worst European larch in this plot were to be removed gradually, "leaving only a few to come to maturity". Another thinning of the European larch over the Sitka spruce was ordered by the Divisional Officer in February 1936.

In September 1941, Mr. R. H. Smith ordered the removal of the European larch overcrop and this was done except in the case of the Sitka spruce, but no reason for this is given.

The more recent underplanted plot is in Compartment 1 where P.08 and P.14 Japanese larch were thinned heavily in 1941 and Tsuga planted on the lower ground and Douglas fir on the upper ground the same season.

In 1946, following the Chairman's Tour in April, the Japanese larch were reduced to 220 stems per acre "crowns just touching" being the guide. Mr. Hummel of the Research Branch inspected the area in 1948 and recommended that the stocking be reduced to 80-100 stems per acre in the next three years. This was done in F.Y.50.

(c) Produce

It is apparent from inspection notes that the disposal of produce was no easy matter in the early days. In May 1933 the Chairman suggested that the unemployed should be allowed to take timber which the Department could not sell, the Forester marking the trees and they felling and carrying away the timber. There is no record whether this scheme was put into effect.

In March 1935 the Assistant Commissioner said he would investigate the possibility of disposing of pitwood. At the same time the production of stakes from Grade I poles and the sale of Grade II poles was approved. It would seem therefore that these latter were the only class of produce for which there was a market at that time.

In April 1937 the Utilization Officer visited the forest and instructions were given for the preparing of rustic poles and peeled pitwood.

Improvement of facilities for extraction and the employment of six men to carry out the preparation of produce were recommended.

At the later inspections in 1937 the preparation of pit props is mentioned in a way that suggests that production had already started, but instructions were given by the Chairman in October that "thinnings are not to be put on stock or trimmed out unless there is a reasonable prospect of selling them".

No further mention of produce occurs in inspection reports for a long time, but records show that pitwood was being despatched regularly in the latter half of 1937 and in 1938. In March 1939 the emergency war fellings were planned and as already mentioned these were put into effect within a week of the start of the war. From then on the preparation of produce either by merchants or by the Department became an established part of the forest operations at Hafod Fawr.

(d) Miscellaneous

The following items are of general interest. The Chairman said at the

Divisional Officers' meeting in November 1941 that the Japanese larch in Compartments 8 and 9 was probably the highest in the country and was on no account to be felled. He also considered handing over about 30 acres on this highest ground to the Research Branch.

In April 1944 the Sitka spruce regeneration under the P.14 Japanese larch in Compartment B was recorded from the first time and instructions were given by the Chairman that the area should be enclosed.

INSPECTION OF HAFOD FAWR - 14th JUNE, 1922.

(With Messrs. Murray and Young)

(1) Existing Plantations

The plantations have now reached a most interesting stage and are especially instructive as regards the planting of high lying and wet ground.

Among the most interesting points are the following:-

- (a) the excellent growth of Japanese larch at high elevations and on poor and wet soils - conditions under which the European larch had failed almost completely;
- (b) the failure of Scots pine under conditions similar to (a);
- (c) the recovery in the growth of common spruce on wet peat soils at various elevations after hanging fire for ten to twelve years;
- (d) the promise shown by Sitka spruce at high elevations and poor conditions generally.

These and similar questions are worth detailed investigation and I have instructed Mr. Guillebaud to make a detailed report on the area from the experimental point of view.

(2) Future Policy

It is high time that a decision was reached as to what is to be done with this property. The small area already planted is not by any means an economic unit, and if the work is to go forward the whole of the remaining land that is suitable should be planted up in the course of a few years. There is a great deal of waste land in the neighbourhood and there appears to be no reason why Hafod Fawr should not become the nucleus of a large forest.

(Intd) R.L.R.

6/7/22

Hafod Fawr

