

The mean annual rainfall varies from about 1800 mm. in the western forests to under 760 mm. in central Perthshire. The rainfall variation follows the physiography very markedly, and reaches 3,000 mm. on some of the mountains that will be seen, but is rather below 1500 mm. along the western seaboard.

Snow rarely lies for many days near the west coast, but may lie for several months on the interior hills, especially in the corries.

The depressions from the Atlantic bring with them many gales, and severe winds are a feature of the climate. Many blown trees or gaps, the result of the unusually serious gale of January, 1953 in the north-east, or other gales in the west, will be seen during the course of the tour.

Units of Measurement

Throughout the tour notes, measurements have been given in metric units. Sample Plot data is all given per hectare. "Top Height" is the mean height of the 100 trees of largest girth per acre. This is equivalent to the mean height of the 250 largest trees per hectare and is always given in metres. Diameter (at 1.3 m.) is always given in centimetres. Basal area is expressed as square metres per hectare. Volumes have been converted from the British measure of quarter girth cubic feet over bark, to true cubic metres per hectare over bark.

DAILY TOUR NOTES

Sunday, 15th July

Maps $\frac{1}{4}$ " Sheet 3
 1" Sheets 56, 64, 57

On leaving Perth the bus crosses the River Tay and in two miles reaches Old Scone. On the left are the woods of Scone Palace and it was here that David Douglas worked as an apprentice gardener about 1815. Between 1825 and 1834 he was an indefatigable plant collector for the Royal Horticultural Society, and to him we owe the introduction of Pseudotsuga taxifolia (= douglasii), of Picea sitchensis, Abies procera, A. grandis, A. amabilis, Pinus ponderosa, P. monticola, P. radiata and P. lambertiana.

Scone is an historic spot, for it was in the Royal Palace here that the famous Stone of Destiny lay. All the early Scottish Princes were crowned seated on this stone, until it was seized by Edward I of England and carried off to Westminster Abbey in 1296, where it has been used at the coronation of every Sovereign since.

Leaving Scone, on the right can be seen Dunsinane Hill, made famous by Shakespeare's "Macbeth".

MEIKLEOUR BEACH HEDGE

This great hedge of Fagus sylvatica, upwards of 30 m. in height and 530 m. long, is believed to have been planted about 1746. It appears to have been regularly trimmed for the first 50 or 100 years; then it grew wild and finally had to be cut back to allow free passage along the road. The trimming of the hedge, which is done every 5 or 6 years, is a considerable operation and nowadays an extending tower-ladder is used.

MURTHLY ESTATE

Owner: D. Steuart-Fothringham, Esq.,
Factor: Mr. A. Boyd,
Forester: Mr. F. Anderson.

The woodlands are situated in the county of Perth; the main blocks lie between Birnam and Murthly, occupying Birnam Hill with adjoining slopes and the flat Muir of Thorn area, west of Murthly, together with woods between the railway and the River Tay near Murthly Castle and elsewhere.

Elevation varies from 60 m. to well over 300 m. on Birnam Hill. Rainfall averages about 860 mm. per annum. Snowfall causes little damage. Gale damage is caused chiefly by south-westerly winds, though it has also been experienced from the east. The Highland boundary fault runs across the Tay in a north-east to south-west direction just below Birnam, so that the main underlying rocks are metamorphic schists and slates in the Birnam Hill area, and Lower Old Red Sandstone in the Murthly area. However, over much of the land the rocks are overlain by drift, providing soils varying from light sandy loam to heavy clay loam with peat.

The estate has been the property of the Stewarts of Grantully for a considerable time. In the first half of the 19th century, Sir John Drummond Stewart commenced the grass drives and the building of a new castle (recently demolished). His son, Sir William Stewart, added to the drives and did a good deal of planting, which was carried on considerably by his successor, Sir Douglas Stewart. The late Colonel Steuart-Fothringham succeeded in 1893 and did much commercial planting as well as the planting of amenity and specimen trees. He died in 1936 and is commemorated by a memorial plaque at Drummond Hill.

The commercial forest areas are as follows:-

1. Broadleaved woods and plantations	164 ha.
2. Conifer woods and plantations	848 "
3. Land scheduled for planting	540 "
	1,552 "

The policy now is to replant all the felled and vacant ground and to thin the standing plantations as required. During the war years, 364 ha. were felled and it is intended to replant these areas within 10 years. There are 300 ha. of plantations thinned or in process of being thinned, most of them having been neglected in the war years owing to shortage of staff, and 70,000 trees have been or are being removed, with a cubic content of 9,360 cu. m. since the end of the war. From 15 to 20 men and boys are employed in the woodlands and on other estate work. The nursery extends to approximately 1.2 ha. All seed and cones are collected from selected trees and the seed extracted in the estate kiln. Recently, an area of 200 ha. on Birnam Hill was fenced against rabbits and deer. Approximately 100 ha. have now been planted and it is intended to plant the remainder in the next two years or so.

This estate has on it some of the tallest specimens in Britain of the following species: Picea omorika, Picea sitchensis, Picea glehnii, Tsuga mertensiana, and perhaps the finest Tsuga heterophylla (Roman Bridge).

The bus will enter the estate by the East Lodge and drive along an avenue of specimen trees. These include Pinus cembra, Abies grandis, 40 m. tall by 1.63 m. diameter, Tsuga heterophylla 36 m. tall on the left and another 35 m. tall on the right. Following a fine avenue of Tilia and Taxus up to the Castle, the party will alight from the bus.

(1) Murthly Castle. The large Pseudotsuga taxifolia adjoining the castle were planted by Sir William Stewart in 1849 and the tallest tree is now 49 m. high. Both the thick-barked and heavily branched type and the lightly branched and thinner-barked type are present. As a source of seed only the latter has been drawn on for the production of estate requirements.

A selective felling was made in these Pseudotsuga taxifolia during World War II. The average volume per tree was 9.72 cu.m. Measurements of two trees (taken in 1954) on the terrace below the chapel are given:-

(i) Height, 44 m., Diameter, 80 cm., Volume, 8.6 cu.m.

(ii) Height, 49 m., Diameter, 97 cm., Volume, 12.1 cu.m.

The timber of trees felled was excellent and the amount of heart rot negligible. In this group leading down to Jubilee Terrace are five Pseudotsuga taxifolia Plus trees (selected by the Forestry Commission Geneticist).

(2) Jubilee Terrace. Here are some young spruces planted in 1934. The seed from which they are grown was taken from trees of Picea omorika, but the trees produced are considered to be hybrids. There were Picea glehnii and sitchensis in the neighbourhood of the Picea omorika, by which the P. omorika might have been pollinated. Note the avenue of Abies procera. On returning via the Chapel a Libocedrus decurrens 28.7 m. tall will be seen.

(3) Garden Hill. At this point in the avenue a stop will be made to examine two large specimens of Picea sitchensis planted in 1846. They measure as follows:-

(i) Height, 47 m., Diameter, 160 cm., Volume, 34.2 cu.m.

(ii) Height, 49 m., Diameter, 147 cm., Volume, 28.1 cu.m.

The latter is the tallest P. sitchensis in Britain.

Continuing past a large A. pinsapo 25 m. x 61 cm. diameter on the left, the party approaches Roman Bridge.

(4) Roman Bridge. At Roman Bridge, the oldest Tsuga heterophylla on the estate will be seen. This tree is 96 years old, 40 m. in height and 102 cm. diameter. Some good specimens of Pseudotsuga taxifolia about 90 years old will also be seen, one 42 m. high and 107 cm. diameter.

The party will then re-enter the bus and drive along an avenue of Cedrus libani and Cedrus atlantica. On the bank on the left are large individuals of P. sitchensis, Abies procera and P. taxifolia. On the right is a Pinus jeffreyi, 26 m. tall, one of the largest in Britain, and on the left a Chamaecyparis lawsoniana 28 m. tall. In the "hedge" of Thuja plicata on the left, the tallest tree is 33 m. high.

As the bus moves along to the W. Lodge, Quercus and Betula standards underplanted 40 years ago with Thuja plicata will be seen on the left. The Thuja have recently been thinned. On the right Quercus standards have been thinned out for underplanting.

The bus leaves the W. Lodge and drives along the main Perth road to Rohallion.

(5) Rohallion. See plots of Larix eurolepis, Tsuga and Thuja.

(i) L. eurolepis. Grown from seed of the 1st generation from Atholl. Planted 1908 with 300 twice transplanted plants. Stocking in 1954 was:-

Number of trees per hectare	:	590
Volume per hectare	:	293.4 cu.m.

Crowns are small because of delayed thinning, but are now recovering. This is one of the first two plantations of L. eurolepis whose planting date is exactly known, though older individuals are in existence.

(ii) Tsuga heterophylla. This plantation includes two Forestry Commission Sample plots. Previous to planting the vegetation on the area was grass with Pteridium. In the season before planting it was ploughed and a crop of oats (Avena sp.) taken off. It was planted in 1905 and now falls in Quality Class II. The plants were grown in the estate nursery from seed taken from the largest Tsuga on the property (Roman Bridge).

Age years	Main Crop						Total thinning Yield		Total Crop Yield
	No. of trees	Top Ht.	Form factor	Diam.	Basal area	Volume	No. of trees	Volume	Volume
47	Sample Plot 92 <u>Tsuga heterophylla</u> "B" grade.						Light low thinning.		
	1327	25.9	.463	23.8	59.5	671.6	2041	167.6	839.2
47	Sample Plot 93 <u>Tsuga heterophylla</u> L/C grade.						Light crown thinning.		
	736	25.9	.453	26.7	40.6	454.4	2775	457.0	911.4

(iii) Thuja plicata. This plantation is of the same age and was planted under the same conditions: It suffered severely from gale damage. A plot measured where the stand was complete gave:-

Number of trees per hectare	:	1310
Volume per hectare	:	325.8 cu.m.

There was delay in carrying out thinning which accounts for the small crowns, which should now be able to expand.

These plantations form part of Great Birnam Wood and on the hill above is the site of Duncan's Camp, the Scottish king slain by Macbeth.

If time permits a visit will be made to the Estate nursery.

(6) Estate Nursery. This is fairly typical of the better private estate nurseries, the larger estates preferring to grow their own plants from seed collected from their own good stands. An unusual feature is the seedbeds of the Dunemann system with which Continental foresters will be familiar. Where the area of seedbed is small and adequate water is available this system can be used to produce large plants comparable with those grown in Heathland nurseries. Picea abies litter has been used for these beds which are 30-38 cm. deep.

The party then drives into Birnam and over the River Tay into Dunkeld.

The Gaelic name for Dunkeld is Dún Chailleann, Fort of the Caledonians. It was here that the Pictish Church, established originally on Iona by St. Columba, was established in the 9th century A.D. and the Abbot of Dunkeld was placed at its head. The original building was burnt but the abbey was rebuilt and converted into a cathedral by David I in 1127. It contains the tomb of one of the legendary figures of Scottish history, - Alasdair Mòr Mac an Rìgh, better known as the Wolf of Badenoch, buried here in 1394.

THE DUNKELD LARCHES

The introduction of Larix decidua in the eighteenth century had a profound effect on forestry in Scotland. There is some uncertainty as to when the first individual larch trees were actually planted, but there is no doubt when larch was first used as a forest tree. Between 1740 and 1826 three successive Dukes of Atholl on their estates at Blair Atholl and Dunkeld transformed Scottish forestry by their work with the L. decidua. Their earlier attempts were hampered by the scarcity of plants, and it was not until the time of the 4th Duke, who succeeded to the properties in 1774, that the greatest development took place. The "Planting Duke", as he was called, added more than 4,050 ha. of pure L. decidua to make a total of some 6,200 ha. of woodland.

The Dunkeld strain of L. decidua has spread throughout Scotland and has produced some very fine trees and plantations. The introduction of L. leptolepis to Dunkeld in 1883 had as one of its consequences the occurrence of the Dunkeld Hybrid Larch (x Larix eurolepis Henry). Larix eurolepis has reached the second and third generation and has given excellent indications of vigour and disease resistance. Two important problems in British forestry today are the re-instatement of L. decidua and the further development of L. eurolepis and it is to Dunkeld that we must return to learn more about the parents and their early progeny.

(1) The Parent Larch (L. decidua). This tree stands close to Dunkeld Cathedral and, though a rough tree, its history makes it of great interest. It is the survivor of five trees planted in 1738. The history of these five

trees cannot be exactly ascertained as there is no contemporary account and few references were made to them before 1830. Numerous accounts were written after this date and there is disagreement among them on almost all the facts of interest. Many accounts give the original number of trees as two, but that only two were standing after 1809 is probably the reason. Most accounts mention an early start in a glasshouse, but this is suspect for several reasons, one being that this story is also attached to larches at Monzie, Minto, Mertoun, Lee and Monymusk and even to the early Pseudotsuga taxifolia in Britain. By 1738 larches were plentiful in England and several had been planted in Scotland (e.g. 1725 Dawyck and Kailzie, Peebles-shire and 1734 Blair Drummond, Perthshire).

However, it appears most probable that Colonel Menzies of Culdares brought a number of larches from London in 1738. Five were left at Monzie (Crieff), five at Dunkeld, eleven at Blair Atholl and a few were taken home to Meggernie.

The five at Dunkeld grew very rapidly and all were still standing when the first seed was collected from them, it is believed, in 1750. In about 1787 one was felled owing to a misunderstanding or an argument, and though intended for mill axles was converted into garden furniture and a summerhouse. Two were felled for ship-building in 1809. Of the two left, the larger tree was frequently measured until it was struck by lightning in 1906. It was left two years, but failing to survive, it was pulled down in 1908. When last measured, in 1905 by H.J. Elwes, it was 30.5 m. high and 1.52 m. in diameter at 1.3 m. It was made into panelling for walls at Blair Castle.

The remaining tree, now 219 years old from date of planting, still makes vigorous growth, and many grafts from it are at Alice Holt and Hørsholm, Denmark. In 1955 this tree was 31.2 m. high and 1.56 m. in diameter at 1.3 m. It shows in exaggerated form the habit associated with old trees of Dunkeld origin - the heavy branches suddenly up-turned and tendency of the main axis to lean sideways in the upper crown.

(2) The Larix decidua on Kennel Bank. Between 1740 and 1750 Duke James planted 350 L. decidua at Dunkeld and 873 at Blair. All these trees were planted in the ornamental grounds around Dunkeld House and Atholl House as a trial of the new species. It is recorded that trees at Dunkeld were planted at 54 m. above sea level and it is believed that the trees on Kennel Bank date from 1750. When the growth form, and in particular the branching habit, of the fourteen trees on Kennel Bank are compared with that of the existing parent and with photographs of the other tree at the Cathedral we must agree that these trees are probably early progeny of the original introductions. The original trees were then twelve years old and it is reasonable to assume that they had borne some cones. It is hoped that further evidence will be available when the grafts made in 1951 have developed.

2.45	53	5	0.45	73	1
0.35	70	28	0.25	06	2
0.45	70	28	0.25	06	2
0.35	73	01	0.45	73	1
2.55	72	11	2.75	87	2
			0.09	01	2

Growth data has been obtained as follows:-

Larix decidua, Kennel Bank, 1955

Tree No.	Diameter at 1.3 m. cms.	Height metres	Form of tree			Notes
			Stem	Crown	Branching	
1	95	35.0	good	good	poor	Irregular branching
2	86	36.5	good	good	poor	Irregular branching
3	95	39.5	good	good	good	
4	105	34.0	good	good	good	
5	95	35.0	good	good	good	
6	99	39.5	V.good	good	good	A magnificent tree
7	67	35.0	good	poor	good	
8	86	37.5	good	good	good	
9	70	35.5	good	good	good	
10	73	43.5	good	V.good	V.good	Good habit; small vol.
11	124	33.5	good	V.broad	large branches	A big tree; rather coarse
12	80	36.0	good	good	good	
13	86	32.7	good	good	good	
14	73	37.0	good	poor	good	Rather coarse tree

It is probable that when hybrids are obtained from the seed of the L. leptolepis on the Avenue the male parents are these L. decidua.

(3) The Japanese Larches. Larix leptolepis (Murray). A tree standing about 270 m. east of Dunkeld House together with eleven other L. leptolepis on the front drive below Kennel Bank or the Avenue, as it is commonly called, about a quarter of a mile to the east of the first tree, were grown from seed brought from Japan by the 7th Duke of Atholl. This was in 1883 or 1884 and the seed was sown in May, 1884. The twice-transplanted three-year-old plants were put out in the spring of 1887.

In 1931 it was recorded that the eleven trees on the Avenue yielded most of the hybrid seed of the Dunkeld Hybrid (L. eurolepis Henry) and this is still true. In 1899 these trees measured 5-7 m. in height and in 1905 were almost 8 m. in height, with luxuriant foliage and some bearing cones. They had reached 15 m. by 1916 and by 1955 had the following dimensions.

Larix leptolepis. The Avenue, 1955

Tree No.	Diam. at 1.3 metres cms.	Ht. metres	Tree No.	Diam. at 1.3 metres cms.	Ht. metres
1	57	24.0	7	57	24.5
2	76	23.5	8	67	28.5
3	60	25.5	9	51	24.0
4	67	24.5	10	57	26.0
5	73	27.5	11	57	22.5
6	70	29.0			

The stem, crown and branch form are all fully described by J.D. Matthews in "Japanese Larches at Dunkeld" Forest Record No. 25, Forestry Commission, 1954.

(4) The Dunkeld Hybrid Larch. The first tree to yield the hybrid was a L. leptolepis standing about 270 m. east of Dunkeld House. Seed from this tree was raised specially at the request of H.J. Elwes, probably in 1900, but in 1907 Elwes himself was uncertain if the plants were hybrid or not. The oldest known hybrid seedlings were planted out at Inver, near Dunkeld. The Inver trees are still in existence and seed is collected from them. One was 21 m. in height with a diameter of 53 cm. at breast height in 1953. Two other samples of the first hybrid trees were planted at Blair Atholl in 1905 and will be seen on Tuesday. However, Brown (Trans. Roy. Eng. Arbor. Soc. 4) recorded in 1899 that he had "sown seed for two years, collected.....from trees which were planted only eleven years ago".

The first seed was therefore collected from the 1896 and 1897 crops and sown in the spring of 1897 and 1898. It is possible that these seedlings attracted attention in the nursery, and so prompted Elwes to suggest the special collection of 1900 and the study of the progeny to see if hybrids really had arisen. Almost directly opposite Kennel Bank there is a large L. eurolepis 28 m. tall by 47 cm. diameter which may well be from this very earliest seed collection but there is nothing on record to substantiate this.

The first plots of L. eurolepis are those at Rohallion, Murthly (seen this morning) and the Lower Warren Wood, Dunkeld both planted in 1908 from the 1904 seed crop from the Avenue trees. Maybe an even earlier stand is at Lagrennich, Blair Atholl, but the exact planting date is uncertain.

The Atholl estates made full use of their good fortune, and annual seed collections were made from these trees. The seed yield varied considerably from year to year as did the individual variation in the progeny. The hybrid plants were selected in the nursery chiefly on the basis of vigour and a number of first class stands of the F1 generation are now in existence in the Dunkeld and Blair Atholl districts. Collections of seed have also been made from these and F2 generation stands have been planted.

On the Glamis estate in Angus, similar collections of hybrid seed were regularly made from L. leptolepis parents from 1911 until after 1930, the oldest first generation L. eurolepis plantation there dating from 1915. There are also second generation plantations at Glamis.

In 1931 Lord Dundee, realising the possibilities of getting a ready supply of Hybrid larch seed began establishing the first seed plantations in Britain at Birkhill near Cupar, Fife. Lord Dundee interplanted L. decidua and L. eurolepis from Dunkeld with the object of obtaining the back cross L. decidua x (L. decidua x L. leptolepis).

After inspecting the old trees and the L. eurolepis parents in Dunkeld House grounds the party boards the bus and drives to Lower Warren Plantation.

(5) Lower Warren Plantation. Sample Plot No. 102. 1st Gen. L. eurolepis. Heavy low thinning. This was planted in 1908 on an undulating bank above the Tay. It is quite a fertile site and excellent for the growth of larch. The original plantation of 9 ha. was planted with pure groups of L. eurolepis and groups of L. eurolepis in mixture with Pseudotsuga taxifolia. The P. taxifolia restricted the development of the crowns of the larch and have been gradually removed from the area of the Sample Plot (which was established in 1933) but can still be seen in other parts of the wood. The latest measurements (December 1953) are as follows:-

Age years	Main crop						Total thinning yield		Total crop yield
	No. of trees	Top Ht.	Form factor	Diam.	Basal area	Volume	No. of trees	Volume	Volume
45	245	25.6	.500	31.5	19.1	243.9	1463	294.0	637.9

The height growth of 25.6 m. is equivalent to Quality Class I L. leptolepis. It will be noticed that the thinning of the plot is of a heavier grade than the rest of the wood, where the stocking (in 1954) was 532 per ha. but the standing volume was only a little more than in the sample plot.

Leaving the Sample Plot the party re-enters the bus and drives back towards Dunkeld passing fine young woods mostly of L. eurolepis or L. leptolepis on either side. Taking the Blairgowrie road, a series of lochs will be seen on the right of the road, first Loch Craiglush, then the Loch of Butterstone, next Loch of Clunie and finally Marlee Loch. On the left opposite Loch of Clunie is Forneth, the birthplace of John Jeffrey, one of the leaders of the Oregon Association and a noted collector whose name is perpetuated in Pinus jeffreyi.

Driving through Blairgowrie we follow the River Ericht up to the Bridge of Cally. On the left there is the remains of a wood of Abies spp. which was badly blown in the great gale of 31st January, 1953 which blew down 1,850,000 cu.m. of timber in the N.E. of Scotland. The exact identification of these Silver firs has been a source of disagreement but as some of them appear to be resistant to Adelges nusslini (Börner) it is possible that they may be Abies börmuelleriana Mattfield or A. borisii-regis Mattfield. (Forms of A. alba and A. cephalonica). At the bridge we turn up into Strath Ardle. On the left is the Forestry Commission's Blackcraig Forest which has a planted area of 618 ha. The woodlands up Strath Ardle are not extensive but they suffered severely from the 1953 gale as this blew straight down the valley from the north-west.

We come into Pitlochry by a steep hill, and from the top a fine general view of the wooded valley of the River Tummel can be seen. Note how the flat land alongside the river is used for agriculture, the steep middle slopes of the hill are under forest and high hill land is devoted to sheep grazing or grouse-moors.

Night at Pitlochry.