JOURNAL OF THE FORESTRY COMMISSION

No. 30 : 1961

PRINTED FOR DEPARTMENTAL USE

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JOURNAL OF THE FORESTRY COMMISSION

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CONTENTS

ACKNOWLEDGMENTS

We are grateful to the Swedish journal *Skogsägaren* (The Forest Owner) for permission to use the article on Extraction Tracks translated by Mr. Gunnar Godwin. Mr. Clough Williams-Ellis kindly gave his consent to the use of the poem: *Pomona loves the orchard*, by Peggy Pollard.

Our thanks are due to the following photographers and others, whose subjects are indicated below: Mr. Haldane Charters for the views of Camp House and 25 Savile Row; Mr. H. J. Hooper for the three pictures of forest houses, and the timber shed in North Wales; Mr. Valdemars Blankenburgs for the Kielder pines; the *Manchester Guardian* for the helicopter; Mr. R. E. A. Lewis for the Field Level; the Swedish journal *Skogsägaren* (The Forest Owner) for the drawing of the extraction tracks; Mr. W. R. Howell for the views of road making at Lyminge Forest; Mr. W. O. Wittering for the pictures of Box Wood; and Mr. A. Anderson for the tallest lime tree in Britain.

All the other illustrations are based on sketches by the authors of the respective articles.

EDITORIAL

The Commissioners

There has been no change in the constitution of the Commission during the past year.

The list of Commissioners is as follows:

The Earl of Radnor, K.G., K.C.V.O., *Chairman*
Major D. C. Bowser, O.B.E., J.P.
Lt. Col. Sir Richard Cotterell, Bt., J.P.
Mr. Lloyd O. Owen, J.P.
Major Sir John Stirling, K.T., M.B.E.
Mr. Edward Bryan Latham, M.M.
Major Sir William Strang Steel, Bt.
Alderman E. Gwynfryn Davies
Captain John Maxwell Macdonald, B.Sc.
Mr. Thomas Taylor
Mr. H. A. Turner, *Secretary*

It is with much regret that we have to record the death of Sir Samuel Strang Steel, Bt., in August of last year. Sir Samuel served forestry actively from 1919 when he became a life member of the Royal Scottish Forestry Society, of which Society he was appointed Honorary Secretary in 1930—a position he held for 25 years.

He was appointed a Forestry Commissioner in 1932 and during the 17 years he served the Commission he took an active interest in the affairs of all the Commission forests and also those of Private Woodlands.

His large part in the progress of forestry in this century is realised and appreciated by all foresters and woodland owners throughout Britain.

Honours

In the 1961 Birthday Honours List, Mr. D. Healey, Information Officer at Headquarters and a member of the Journal Editorial Committee, was awarded the O.B.E. as a tribute to his long active role in the public service. Mr. Healey has made rapid progress in creating a public awareness of forestry.

We also congratulate Mr. R. R. Donald, Divisional Officer in South Scotland, who was awarded the M.B.E. as a tribute to his 37 years service to forestry. He joined the Commission in 1923 as a ganger.

We are happy to record that several of the 1962 New Year Honours were given to members of the Commission.

One of our Commissioners, Mr. Lloyd O. Owen, has been appointed a Commander of the Order of the British Empire in recognition of his public services.

Mrs. Mary Alison has been awarded the M.B.E. as a tribute to her long and efficient service to the department. Mrs. Alison, an H.E.O. at Headquarters, has been for several years private secretary to the Chairman and the Director General.

We also congratulate Mr. James Farquhar who has become an M.B.E. Mr. Farquhar, the Commission's most senior Head Forester, works with the research branch in Scotland.

The B.E.M. has been given to Mr. Ernest Edward Fancy who is a research forester at Wareham.

Promotions, Transfers and Appointments

Mr. W. M. Cormack, Controller of Finance of the Forestry Commission, has been upgraded to Principal Executive Officer.

Mr. J. N. R. Jeffers, who is a member of our Research Branch at Alice Holt, has been promoted to the rank of Principal Scientific Officer.

Retirements and Departures

Mr. H. Charters, M.B.E., Chief Executive Officer in the Finance Branch at Headquarters, retired during the year after more than 40 years service to the Commission. Mr. Charters is well known for his vast knowledge of fire statistics.

Mr. E. J. S. Hinds, O.B.E., M.B.E., has also retired during the year after 45 years service to forestry. Mr. Hinds was Chief Clerk at the officer of Director, England, and became an Executive Officer at Headquarters and Secretary of the Forest Tree Seed Association of England and Wales on his retirement from the post of Chief Clerk. He also has an encyclopaedic knowledge of the laws and customs of the New Forest and the Forest of Dean.

A Senior Executive Officer who retired during the year is Mr. H. G. Hyem, of the Finance Branch at Headquarters. Mr. Hyem had worked for 37 years with the Commission, and was well known as a friendly and helpful colleague.

We also record the retirement of Col. G. W. Preston, Conservancy Engineer in North-East England Conservancy, whose duties had included the creation of great networks of forest roads in the Border Forests and at Allerston.

Head Foresters who retired during the year included A. Graham of Mabie Forest in South Scotland, and A. Jones who was in charge of Beddgelert Forest for some years.

Obituary

We record with regret the death of a former Secretary to the Commission, Mr. F. W. Hamilton, who retired in 1950 after 43 years service to forestry.

We are also sorry to hear of the death of Mr. R. Fraser, who was Head Forester at Dovey before he retired in 1953, after 32 years service. He was the first Forester at Dovey and was buried in Dovey Valley at his own wish.

Mr. J. D. Robbie, another of our former Head Foresters, has also passed on. He retired in 1958 after 37 years service with the Commission.

We record, again with regret, the deaths of Mr. J. F. Macintyre, Head Forester at Newcastleton Forest, who retired in 1956 after 36 years service, and Mr. A. Weir, B.E.M., who retired in 1950 from his post at Kielder after 24 years service.

I.U.F.R.O. Conference, Vienna

A Conference of The International Union of Forest Research Organisations was held at Vienna in September.

Forestry Commission Delegates were Mr. James Macdonald, Deputy Director General, who was President, Mr. T. R. Peace, Chief Research Officer, Mr. J. D. Matthews, Mr. J. R. Aldhous and Mr. D. W. Henman.

Forestry Commission Journal

The Journal was first issued in February 1922 with an Editing Committee of Mr. R. C. Robinson (later Lord Robinson, Chairman of the Commission), Mr. A. W. Borthwick, Mr. H. A. Pritchard and Mr. Fraser Story who was

Publications Officer at that time. The following passages by Lord Lovat, the Commission's first Chairman, are taken from the Introduction to the first number:

> "The Commissioners have for some time felt the need of a means of bringing about a better circulation of information of a character which cannot conveniently be communicated through the ordinary official channels. They have, therefore, decided to issue a Journal from time to time for private circulation among the staff."
>
> " . . . . . All noteworthy observations in forestry matters made in the field should be recorded. It is well to remember that original observations on things which are new, uncommon, or even merely interesting, are always of value and if recorded may one day prove of considerable importance. The scope for communications of this kind would appear to be great and it is hoped that free use will be made of the Journal for this purpose . . . . . "
>
> "The Editing Committee will be dependent on members of the staff for 'copy' and it is hoped that all will contribute to make the Journal a success.
>
> Lovat"

In those days our total professional staff consisted of 48 individuals including the 2 Divisional Officers and 5 District Officers who constituted the Irish Division of the Commission.

What Price Amenity?

Pomona loves the orchard
And Liber loves the vine
And Clough he
Loves an old façade
And an unspoilt skyline;
But the citizen wants gasworks
Electric wires on high,
And light and drains and telephones
God help me, so do I!

This poem by Peggy Pollard refers to Mr. Clough Williams-Ellis, who has for long been associated with our Snowdonia National Forest Park. It is included at the suggestion of Mr. G. B. Ryle and recalls the difficulties that we often encounter in trying to reconcile the production of useful timber with the need to preserve existing scenery.

Former London Offices of the Commission

The article on our Savile Row office which appeared in the 1960 Journal has brought in several comments on other London offices of the Commission.

Headquarters, first established at 22 Grosvenor Gardens in 1920, moved to 9 Savile Row in 1931, and to 25 Savile Row in 1939.

Before 1946, the English forests were administered by the Assistant Commissioner for England and Wales. His first recorded office was in Belgrave Square, London, S.W.1, conveniently close to Grosvenor Gardens. Later, the A.C. and his staff moved to that real hub of Government activity, Whitehall. They were at 1 Whitehall, London, S.W.1, in 1922 and at 55 Whitehall in 1931.

In 1939, the acquisition of the large suite of offices at 25 Savile Row enabled the Assistant Commissioner to join Headquarters for a spell. But later that year he and his staff were evacuated to Camp House, Promenade, Bristol, for the duration of the war. The move was undertaken for reasons of safety but from all accounts Bristol got just as much bombing, in relation to its size, as did London.

The Headquarters staff also shared the Bristol office for a while, but by the close of 1944 a small nucleus had returned to 25 Savile Row.

In 1947, soon after the post of Director of Forestry for England was created, the English staff returned to London and occupied No. 80 Cadogan Square, in the delectable residential district of Chelsea. In 1952 they moved on to 1 Princes Gate, London, S.W.7, facing the south side of Hyde Park, close to Knightsbridge, and here they have stayed ever since.

The South-East England Conservancy was established, as Division 4, at No. 1 Whitehall in 1927. After a spell in Woking, from 1928 to 1931, they moved to 55 Whitehall in 1932, and to Grand Buildings, Trafalgar Square, in 1937. The wartime evacuation of 1939 took them back to Woking, where they still remain.

To complete the tale of London offices, the Education Branch, along with Publications, once spent a few weeks in the most expensive suite of offices in all London—a first-floor group at the front of Berkeley Square House, Mayfair. As soon as the Treasury discovered what this little lark was costing, the staff concerned were promptly banished to the top floor "maids' attics" of a dilapidated mansion in Bryanston Square, Marylebone.

But even this was a better address than that of the District Officer (Entomology) in 1922. He was outstationed in the Forestry Museum, Royal Botanic Gardens, Kew.

It seems remarkable that, in the fairly short space of forty-one years, the Commission should have had no less than twelve addresses, especially as none of them was within sight, or even within miles, of any forest. By contrast, the other National Headquarters have "stayed put" remarkably well. Director, Scotland, has been at 25 Drumsheugh Gardens, Edinburgh, 3, ever since 1920, and Director, Wales, has stayed at Victoria House, Victoria Terrace, on the seafront at Aberystwyth, ever since 1947.

Of course, for really stopping in one place, it would be hard to beat the Deputy Surveyor of the New Forest. Although the upstairs offices in the Queen's House, Lyndhurst, are modern, the room beneath—the famous Verderer's Hall, is believed to date from the reign of Queen Elizabeth I—say 400 years ago!

We reproduce, in our centre pages, pictures of two well-known Commission offices, provided by Mr. Haldane Charters.

As we go to press we hear, with some relief, that we are to remain at 25 Savile Row for the next twenty-one years, and that the staff of Director, England, are coming to join us.

Sir Arthur Gosling Retires

Before this number of the Journal appears, Sir Arthur Gosling, K.B.E., C.B., F.R.S.E., will have retired from the post of Director General, which he had held for 14 years, after a career unique in British forestry.

Sir Arthur had been with us ever since the Commission was set up, 43 years ago, in 1919. He held every post from Foreman to Director General, and served in all 3 countries—England, Scotland and Wales, as well as in forestry education.

Born at Newland, a village famous for its mighty oak, in the heart of the Forest of Dean, in 1901, Sir Arthur was educated at Bell's Grammar School, Coleford. In 1919 he enrolled as a student in the Dean Forester Training School, and at the close of 1920 he moved to the School of Forestry at Brockenhurst in the New Forest, as an Instructor, with the rank of Foreman.

In 1921 he was transferred to Llanover, now part of Ebbw Forest, in South Wales, where he was promoted to the Forester grade in 1922.

In 1925, he proceeded on unpaid leave to Edinburgh University, where he had a brilliant academic career, gaining his degree of Bachelor of Science in Forestry in 1928, and winning the Younger Medal as top of his class.

Appointed as District Officer in South-West Scotland in 1928, he was promoted Divisional Officer for West Scotland, based on Glasgow, in 1938. During the war years, from 1940 to 1946, he served as Assistant Commissioner for Scotland, based on Edinburgh, and he was appointed Director of Forestry for Scotland in 1946.

In 1947, Sir Arthur was appointed Deputy Director General and moved to London. Promotion to Director General followed in 1948.

Besides these Commission appointments, Sir Arthur has been President of the Society of Foresters of Great Britain, and is currently the Vice-Chairman of the Empire Forestry Association. He led the United Kingdom delegation to the Seventh Commonwealth Forestry Conference in Australia and New Zealand in 1957, and has attended many other international forestry meetings.

In addition to those qualities as an administrator which took him to the top of our forest service, Sir Arthur has always shown a knowledge of the practical and scientific aspects of every branch of forestry, which won the esteem of his staff. Our good wishes go with him and with Lady Gosling, in their retirement to the house they have built in a beautiful rural village in Dorset.

Contributions to the Journal

We welcome articles on any subject having a bearing on the Commission's work, from any member of the staff. The usual channel of submission is through the Conservancy (or similar) office, and senior officers will gladly give intending authors whatever encouragement and help is needed.

If possible, articles should be typewritten, in double spacing, on one side only of foolscap sheets, but articles in manuscript are not ruled out. A note of the author's rank, official station, and postal address, should be added. Sketches, from which finished drawings can be made, are welcome when they help to bring out points made in the article, and we can also accept a limited number of photos.

If for any reason your contribution does not "fit" the Journal, then the Editor will readily suggest some alternative channel for its publication, where such exists.

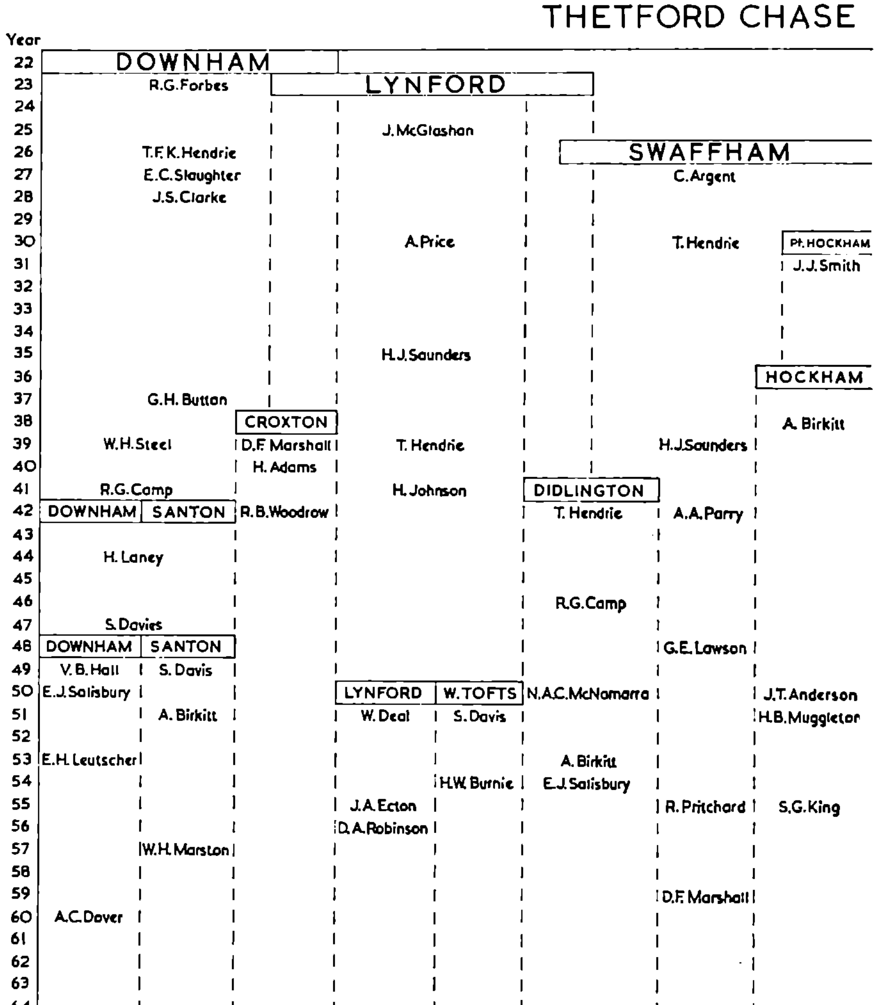
A feature of our earlier issues was a wealth of short notes by Foresters and Assistant Foresters, which taken together added a great deal to the sum of facts on British forestry. We hope to see more of these.

If in doubt, send it in!

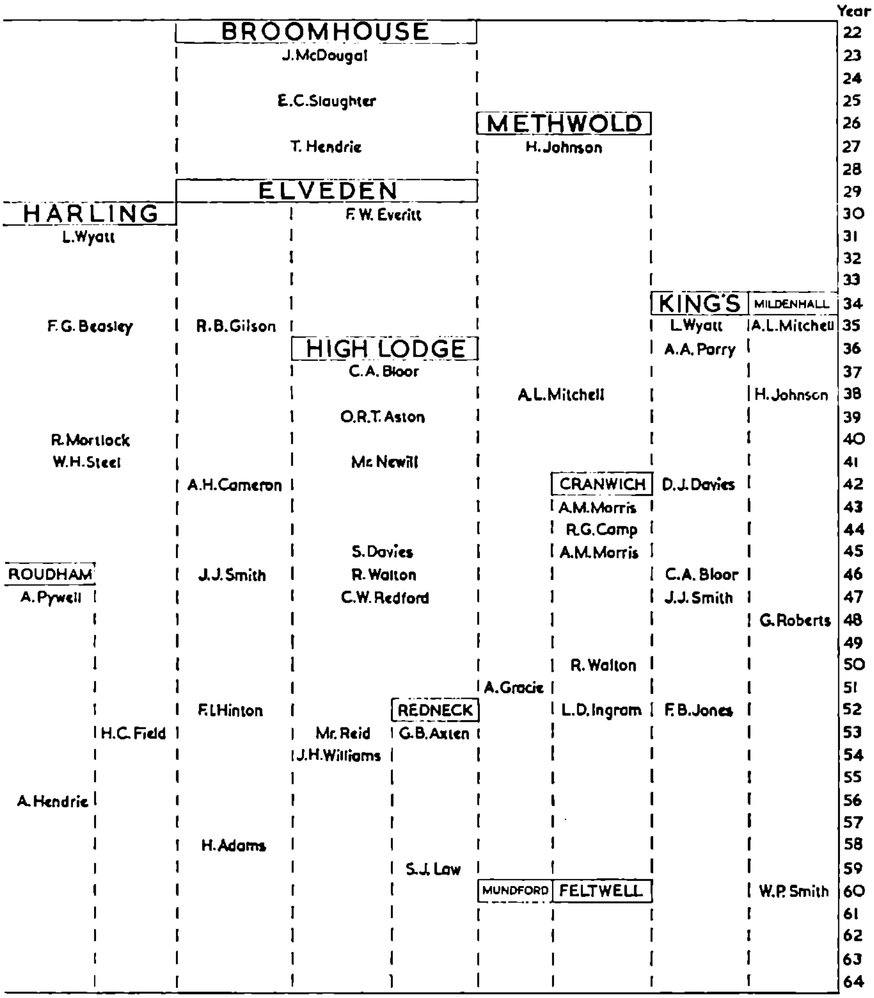
Thetford Chase Beat History

In any large forest, it is often difficult to trace back the story of management over the years, especially when the extent of the various beats has been changed from time to time. One very practical solution is a chart, setting out the calendar years and the areas involved, on which the names of the men in charge can be entered. This method is suggested by Donn Small, District Officer in East England Conservancy, whose chart for Thetford Chase appears on the following pages. It includes the names of many well-known characters.

THETFORD CHASE



BEAT HISTORY



A FAREWELL NOTE FROM SIR ARTHUR GOSLING

The Editor has invited me to contribute a note to the 1961 issue since, as he says (I hope ambiguously), "You will not be with us when the 1962 number goes to press." This I am very glad to do, as it gives me an opportunity to thank all the staff for the great help and inspiration I have always received from them and to wish them the best of good fortune in the future.

The last time I was asked to write, or perhaps it would be more accurate to say the last time I wrote, something for the Journal was, I think, in 1932—not a good record I fear. At that time I was in Argyllshire and the forests in Cowal were suffering appalling damage by voles. I vividly remember the catastrophic appearance which the whole countryside, particularly the forests, presented; but in due course the voles disappeared and when I went through these forests recently I found them thriving, producing pitprops, pulpwood and a fair proportion of logs for the Ari sawmill. It struck me that it was difficult for anyone who had not visited these forests about thirty years ago to believe that such an incident had occurred.

The same might almost be said now of the great windblow of 1953 in the north-east of Scotland. It can be comforting to reflect that when distance enables one to see this sort of incident in its proper perspective it is seldom so devastating or hopeless as may at first appear.

At a time like this one's thoughts almost inevitably turn backwards. Nearly thirty years ago a colleague who remains one of the senior officers of the Commission wrote with some impatience but not intended to be taken literally: "Paper records have superseded good plantations in importance." I am afraid there is much more paper about today than there was then, and probably from time to time the same sort of impatience is expressed. Certainly it is unfortunately true that life is much more complicated than it used to be.

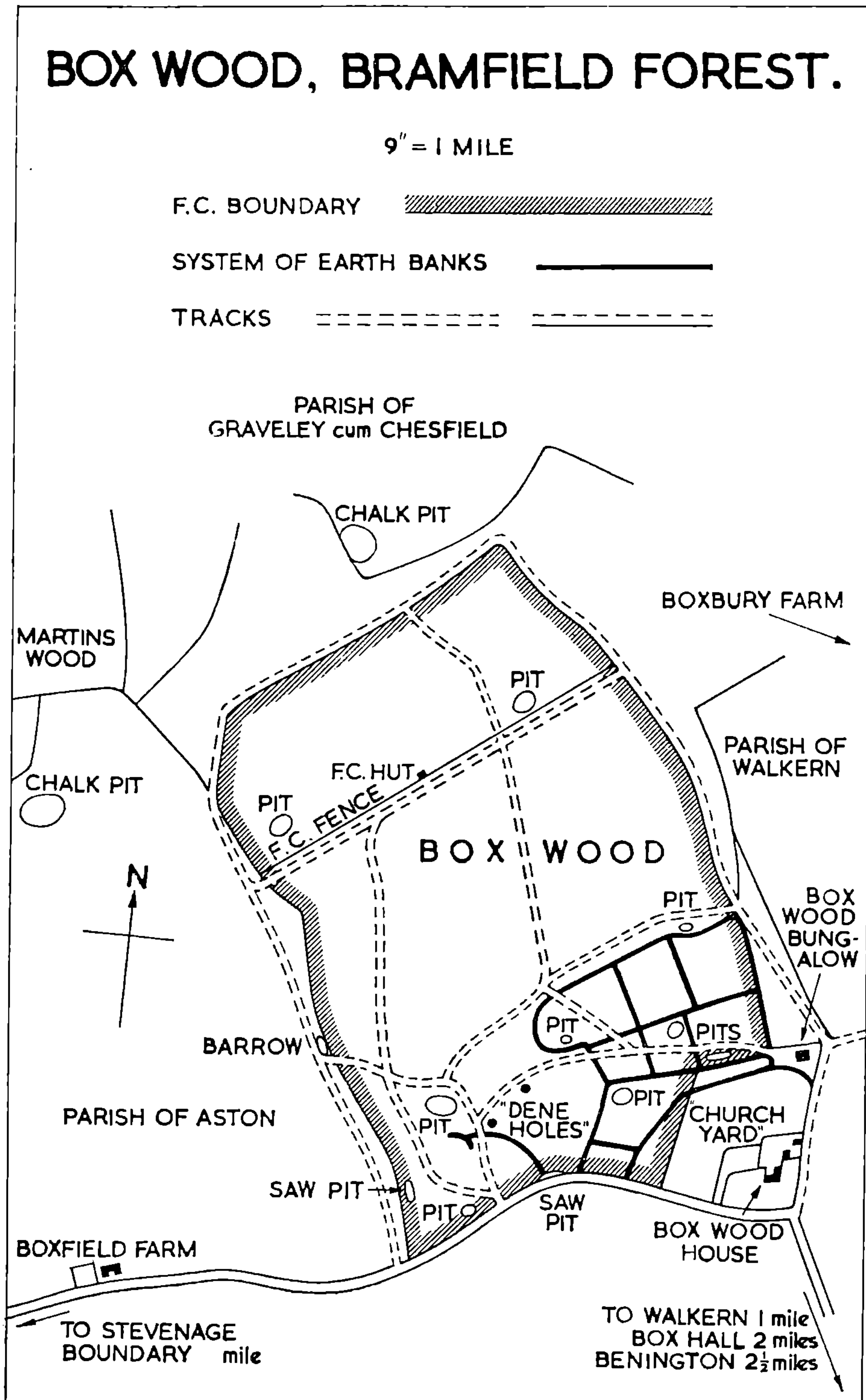
I recall in the very early 1920's when I was a Forester, having an unannounced visit from the then Assistant Commissioner, during which he inspected among other things an old farmhouse and buildings near the top of one of the mountains in South Wales. At that time he was enthusiastic in establishing new Forest Workers' Holdings, but there was little money available to do it. We walked through and around the buildings and he concluded "We can turn this into three holdings. Get out some plans, order the material, and I will send a handyman to do the job." I measured the buildings; having earlier had a little experience in a drawing office I was able to draw some rough plans, using my imagination as best I could; thereafter I visited a Builder's Merchant in Newport and ordered all sorts of things which he told me would be wanted. The District Officer didn't seem to be involved in this at all; all I can remember about him is that it was at about this time he left the Commission and in due course became an architect with a lucrative practice of his own. I gather that the Divisional Officer also knew nothing until unexpected bills began to come in.

The handyman in due course arrived; and, astonishingly enough, eventually three houses emerged at a total cost (without overheads, of which we had never heard in those days) of about £250 each. True, the occupants had to go outside for their water tap, and the cooking arrangements were by modern standards a bit primitive, but no-one seemed to expect too much in those days. In fact the first man to occupy one of the houses was my successor.

Clearly everything was done in the most informal way. Very little paper work was involved, no professional people were employed, no permissions were required from the Local Authority. We had a very free hand.

Those who long for the so-called "good old days" and deplore modern restrictions and protocol might reflect on the sequel. I lost touch with what happened to the houses for a long time, but I returned to the scene a month or two ago. None of these houses has survived. The site has been levelled, the land planted up. As if to temper my disappointment I was told the houses had served a very useful purpose in supplying bottoming for one of our new forest roads!

Interesting and instructive though it may be to look backwards it is far more exciting to look ahead, and foresters with some justice claim that in the nature of things, planning as they are a long-term venture, they are more accustomed to do this than are most people. Henceforth I shall look on from the side lines, but that cannot stop me from sharing the vision of the great developments which will come. The Commission has reached a point where I think it will be said that the period of rapid territorial expansion, started after the last war, is practically over. Since 1947 we have planted nearly 850,000 acres and—although I hesitate to say it—spent something like £150 millions. A phase of consolidation and adjustment, in preparation for great exploitation and marketing developments already beginning in a small way, must now take place. It is easy now to foresee the time when the Commission won't be asking the Treasury for money, but handing over the results of well-gotten gains. I look forward with *every* confidence in the future. Good luck to you all in your efforts!


BOX WOOD, BRAMFIELD FOREST.
9" = 1 MILE
F.C. BOUNDARY
SYSTEM OF EARTH BANKS
TRACKS
PARISH OF
GRAVELEY cum CHESFIELD
CHALK PIT
BOXBURY FARM
MARTINS
WOOD
PIT
PARISH OF
WALKERN
F.C. HUT
CHALK PIT
PIT
F.C. FENCE
BOX WOOD
N
PIT
BOX
WOOD
BUNG-
ALOW
PIT
PITS
BARROW
"DENE
HOLES"
PIT
"CHURCH
YARD"
PARISH OF ASTON
PIT
SAW PIT
PIT
SAW
PIT
BOX WOOD
HOUSE
BOXFIELD FARM
TO STEVENAGE
BOUNDARY mile
TO WALKERN 1 mile
BOX HALL 2 miles
BENINGTON 2½ miles

JOURNAL OF THE FORESTRY COMMISSION
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THE HISTORY OF BOX IN THE COUNTY OF HERTFORDSHIRE

By

W. O. WITTERING

Executive Officer, Headquarters

Box Wood is part of Bramfield Forest. Within its bounds are the remains of an extinct village.

Box Wood is an oblong-shaped block of woodland bordering the Stevenage/Buntingford road about a mile to the west of the village of Walkern. The "designated area" of Stevenage New Town lies about the same distance from the western fence of the wood. The land at Box slopes gently from north-west to south-east losing about 50 feet of its maximum height of 430 feet above sea level. These details and other information required by a Forestry Commission Acquisition Report induced the Forestry Commissioners at their meeting in February 1954, to approve the acquisition by 999 year lease of 60 acres of woodland in the category "felled, devastated and scrub" comprising "scattered hornbeam, oak, ash and miscellaneous coppice suitable for under-planting."

The purpose of an acquisition report is to provide a sufficient description of the land under report to enable the Commissioners to decide whether or not the land is suitable for acquisition; seldom does it give superfluous detail, rarely does it delve far into the past.

The Saxons and Danes

More than a thousand years ago before the Normans invaded our shores, Box was a vastly different place from the quiet compact replanted area of woodland of today; it was a thriving village which has now almost completely disappeared. Even a superficial glance inside the wood brings to light various peculiarities not normally found in similar areas.

The earliest visible sign of mankind is what appears to be a round barrow about 250 yards from the road, six feet high with a circumference of about 45 feet; situated on the western boundary of the wood, it is rather difficult to find being completely covered with brambles. Several attempts have been made in the past to excavate this site but no finds of any importance have been recorded. The barrow may date back to the Danish era and is most likely a burial mound. It is smaller in size than the better known Six Hills which stand beside the Great North Road south of Stevenage just over three miles away and are thought by some historians to be Danish in origin (though some local opinion holds them to be the work of the Devil!). Certainly, a large house called "Daneshill" stood only a short distance away until demolished in 1959. Oddly, less than a mile to the north of Box Wood there is a farm called Dane End. The Danes invaded North Hertfordshire, and in 850 A.D., Bertwulfe, Saxon king of Mercia, called together a band of nobles and prelates in an Assembly at Benington (2½ miles south-east of Box) to discuss the plight of one Askill, a monk who, coming in the name of his abbot Siward, and other monks at the monastery of Croyland (now Crowland near Peterborough where there is a ruined abbey) made grievous complaints of the many losses and injuries which had been brought about by "the neighbouring Danes and other deceitful enemies".

The system of dividing the country into hundreds is attributed to the Saxons in the time of King Alfred about 886 A.D. and Box falls within the Hundred of Broadwater. In Edward the Confessor's reign (1042–1066) the ownership of the estate of Box seems to have been shared by three men. Aethelmar, Lord of Benington, held 1 hide and 3 virgates and land for 2 ploughs; Domesday Book (1086) added that there was one bordar and that Box "lies and is rated in Belintone (Benington) and is tilled with its own ploughs". (These old measures are a little complicated, a hide—about 120 acres—being originally sufficient land to support one free family and their servants, though by the time Domesday was compiled it had become merely a unit of taxation. A virgate consisted of separate strips of land worked by a virgator, or village aristocrat, totalling about 30 acres. The amount of arable land (termed a carucate) cultivated by a full plough team of eight oxen is thought by one historian to be 120 acres and by another to be 160. A bordar held his own house and performed the base service of his lord for it; he could not dispose of his property without permission.)

Alward, a vassal or tenant of Alestan of Boscombe Down in Wiltshire held 2 hides, 3 virgates and land for 5 ploughs. In the demesne (the manor grounds) there was land for 2 ploughs "and a third may be made. There are 3 cottars and 3 bondmen". (A cottar was similar to a bodar but lived in a meaner house or cottage; a bondman was virtually a slave.)

The remaining smallest portion of the village was held by Samar a vassal of the thane (lord of a village) Alnod. This piece contained half a hide and land for one plough. There was one bordar.

So from Domesday, we can estimate the extent of the village at the time of the Battle of Hastings as about 1500 acres, somewhat larger than the whole of Bramfield Forest.

The Normans

After the Conquest, King William took control of all the land and redistributed it amongst his followers. One William of Ow succeeded to the possessions of Alestan and subsequently leased them to Peter de Valoignes. Robert of Bayeux, bishop and brother of King William, acquired Samar's half hide which he leased to a certain Osbern, otherwise unknown, who held eight other manors belonging to the bishop of Hertfordshire. The remaining portion (Aethelmar's) went with the barony of Benington to Peter de Valoignes who became sheriff of Essex and Hertfordshire. Hence, except for a small piece, Peter de Valoignes controlled the whole of Box.

Peter de Valoignes had become immensely powerful and held 57 lordships (including 17 in Hertfordshire) and was first governor of Hertford Castle. He began the construction of Benington Castle by building the mound in about 1100 A.D. His son Roger who succeeded him added the masonry in 1136–1141. By now, barons were becoming all-powerful in England and built and fortified castles and raised private armies with little or no opposition from King Stephen. It is said in the Saxon Chronicle that "they put the country-folk to sore toil with their castle-building; and when the castles were made they filled them with devils and evil men. By day and night men and women who were suspected of hiding their wealth were carried off to the castles and tortured till they confessed where their money lay. Many thousands they starved with hunger. They spared neither church nor churchyard, but took all the goods that had been placed for safety there and then burned the church itself." Henry II soon put a stop to this iniquity and destroyed Benington Castle in 1177, the cost of the 100 picks used being charged to the Exchequer. A stump of the castle keep remains to this day adjacent to the southern wall of Benington Churchyard, but the rest of the flint-walling and the gatehouse are imitations erected in 1820 by the eccentric owner of the time, George Proctor.

The Village and the Villagers

But what of the village itself in these troubled times? Box is said to have had a church which it shared with the neighbouring hamlet of Chells and which was known to be in decay at the time of the Dissolution of the Monasteries in 1530. The land on which Box Wood House now stands is described on a Walkern Tithe map as "Churchyard"; it would seem that the house stands on the very site of the church. Sir Henry Chauncy writing in 1700 says: "There was a vill or parish which was situated between the parishes of Stevenage, Chivesfield (Chesfield) and Walkerne; there was anciently a church to the same in a field on the hill near the woods now called the churchyard where the foundations may be seen." Only 28 years later, Salmon wrote: "The church is entirely demolished. It stood in a small field that lies between the wood and the highway leading to Walkern. In that field is no visible rubbish."

Box Wood House was built as a shooting lodge in 1890 but there is no record of any rubble having been found when the foundations were being excavated and no record of any investigations having been carried out between Salmon's time and the building of the house. The present owner of Box Wood House has never found anything in the grounds to confirm the old histories. The area abounds with flint stones and the lack of "visible rubbish" suggests that the church may have been built of wood. Was it one of those burnt by the barons?

Salmon also states that "St. Foyne grows very kindly in that consecrated ground". Sainfoin *(Onobrychis viciifolia)* was grown in the past for fodder and, as a result of past cultivation, it still flourishes there.

An interesting old tale which survives to this day holds the Devil responsible for the fate of Box Church. Legend states that the church was never completed; each night after the workmen had finished their day's stint and gone home, Satan would transport the masonry to the site of the existing Parish Church of Walkern (a mile to the north-east). After a while the villagers gave up their task.

Behind the "Churchyard" in the south-east corner of the wood and within the Commission boundary, there is a system of man-made earth banks. The accompany plan gives some idea of their extent; see also Plates 14 and 15.

These banks are possibly the remains of the hedges and ditches around the villans' and cottars' dwellings and the manor house itself, though one school of thought puts this a short distance away at the site of the existing Boxbury Farm. Once again no serious investigations have been carried out and no foundations have come to light. Another interesting "indicator" comes to our aid in the form of a colony of the rare Green hellebore (*Helleborus viridis*) in the south-western corner of the wood. Some botanists comment that such colonies may exist as relics of cultivation from abandoned gardens. It was also grown by housewives as a cure for boils, spots and worms!

The Manor of Box descended through the Valoignes family until by marriage it came to Alexander de Baliol. By now it was 1277 and Edward I was on the throne. Though it is recorded that the lords of Box claimed full manorial rights and privileges including the right to hold courts, Box was small compared with the neighbouring Walkern and many of the rights appear to have been surrendered to this much larger village. In spite of much inquiry, I have been unable to trace any of the old manorial records of Box.

The converse applies to Walkern and some of the inhabitants of Box have much of their life history recorded for posterity because of the survival of fourteenth and early fifteenth century Walkern Manor Court Rolls. In 1324, one of the villagers, a serf, was named Randolph (or Ranulf) de Boxe; he died in 1331 leaving a wife Isabel and a son John who lived to the ripe old age of 86! Isabel died in 1349 a victim of the Black Death which seems to have hit the village badly, in fact it may have been responsible for its final abandonment.

As far back as 1166, a William de Boxe was subtenant of Boxbury. One of his heirs, also named William, seems to have seen signs of the beginning of the end of Box, for he moved out, and in 1307 is recorded as living in a house he built and called Box Hall at Benington. At this time, the tenant of Boxbury was paying (more often *not* paying!) his rent to the Manor of Walkern.

Box villagers spent quite a lot of their time in Walkern Court paying for their misdoings. The commonest crime was that of trespassing on the lord's property and entries such as follow are quite common:

"Ranulf de Boxe for damage done in the corn in the lord's park, fined 6d."
"Richard Boxen for damage in the lord's herbage with two horses, fined 3d."

In July 1328, Richard de Boxen was appointed reeve in place of one Geoffrey Tranail who failed to balance his books to the extent of 108s. 9$\frac{3}{4}$d. The penalty paid by the ex-reeve is not stated! Two years later Richard was in court himself charged with receiving 10d. which had been stolen by John Popeler Junior from Walkern Manor. He was fined 3d. In 1334, Richard was back in court again; he and a William Gardner had removed boards from the sluice of the lord's watermill, the wheel and the doors had also mysteriously disappeared and it was later discovered that the miller himself had stolen them! Nevertheless, Richard must have been a reasonably good citizen for in 1335 the Court Roll records that "the ale-taster on account of debility through sickness was deposed from his office". Richard was elected in his place and duly sworn in. However, through failing to carry out his duties properly he was fined 8d. at the next court (May 1336)! In October of the same year, he was appointed Serjeant of the Manor and became such a busy man that eventually he had to resign from the posts of ale-taster and reeve and confine his activities to his duties of serjeant and looking after his cattle and horses.

An early mention of timber at Box occurs in October 1335 when Agnes Starlingges took Henry Passemer to court because he had not paid her 16/- for timber she had sold him from "a certain grove at Box". Agnes agreed to accept payment by instalments, 10/- at Christmas and the rest at the feast of St. John the Baptist. Elsewhere, an oak is valued at 8d. and half a load of "stubbes and stokkes" (stumps and rootstocks?) worth, to the lord, 8$\frac{1}{4}$d.

Even in those days, youths spent some of their time beating up old ladies for it is recorded that at Whitsuntide 1351, "Richard the boy of Nicholas ate Monc made an assault on Alice Boxe". His father was fined 6d. However, he seems to have been provoked for at the same court Alice was also fined 6d.

It is coincidental to note that at this time the surname "Bramfield" was quite common in Walkern. Hence by linking Box Wood with Bramfield Forest, the Commission has to some extent merely re-united the old names.

It was customary when a tenant had "ended his last day" (as the court rolls put it) for a close relative to claim the dead man's holding from the lord of the manor. The relatives had to appear in court, establish their rights, do homage and fealty to the lord and pay a fee before the property became theirs but when there were no heirs the holding reverted to the lord. In 1351, just after the Black Death, 14 properties were surrended to the manor court at Walkern because there was no-one to take them. In October of that year it is recorded that a house of Ralph de Boxen was valued by the lord's serf at 9s. and was sold by the reeve because it was ruinous. Another small house was appraised at 6d. In 1361 the Black Death struck again and many more properties were surrendered. This must have been a mortal blow to a village as small as Box and clearly it could not have survived much longer.

In 1360 part of Box was held by the Manor of Knebworth (4 miles to the south-west) and, in a Deed of Sale of that year, Robert and Thomas Dellerton of Knebworth and Sir Hugh de Wretele, Rector of Walkern, sold crops and stock from their lands in the Manors of Knebworth and "Boxeby" and from their tenements at Langton and Chells to Lucas the Vintner of Hitchin. The property came to Lucas on "the Monday next after the feast of St. James the Apostle". He bought 10 acres of grazing, 6 acres of peas, 5 acres of barley and 369½ acres of corn, the latter being valued at 3/- per acre. Among the animals purchased were 10 horses at 8s. 4d. each, 10 oxen at 13/- each, 1 bull and 20 cows at 10/-, 318 sheep at 2/-, 158 young sheep at 14d., and 79 lambs at 8d. He also had to pay 1 mark of silver for the hay at Boxeby and 20/- for repairs to the manor houses including Chells. This latter payment confirms that Box was combined with Chells at this time. This early mention of a Lucas at Hitchin is very interesting; the Lucases were a very influential family in Hitchin in the 17th–19th centuries and, though devout Quakers, owned a brewery there.

Later on

Though Box was to cease to exist as a village the land was not abandoned. Throughout Box Wood there are pits of varying shapes and sizes probably dug to provide gravel for the roads, chalk for fields and flints for building. (Flint was the traditional building material in North Hertfordshire.)

Abandonment of the village probably caused the area now leased by the Commission to revert to woodland being situated as it is on the borders of four different parishes. The remaining villagers probably foresook the high land at Box for the valley of the Beane at Walkern. Box Wood seems to have become a subject of timber production a considerable while ago for, when the 1939–45 war came, 1340 oaks of about 250 years of age were extracted as well as 80 elms and about 1000 spruce. An old saw pit survived until recently beside the road just east of the entrance gate. It has now been filled in but it is significant that a contractor working for the Commission in 1961 set up his portable saw mill there. The remains of another saw pit can be seen on the western boundary about 30 yards from the road.

Seventy yards from the entrance gate there is a bottle-shaped chalk pit usually referred to by local antiquarians as a "dene-hole". There is another some 60 yards further on. This method of obtaining chalk goes back hundreds of years for Pliny, writing in his Natural History in the first century A.D., says that "fine white chalk was taken from a considerable depth in the ground, pits being sunk in most instances as much as 100 feet. These pits are narrow at the mouth but the shafts enlarge very considerably in the interior as is the case in mines. It is in Britain more particularly that this chalk is employed." The British had discovered that chalk from a depth formed a more efficaceous dressing to the soil than that from the surface. The same field was not chalked twice and Pliny adds "the good effect is found to last full 80 years".

The practice had reached the stage of being normal treatment for fields in this part of the county by the end of the eighteenth century, and practically every field had its chalkpit. A pit about four feet in diameter was sunk and the sides were shorn up with brushwood basketwork. The chalk was raised with a counter-balanced bucket on a rope which ran over an overhead wheel. After a while, much larger open pits were worked for chalk and a retired farm foreman who was born at Boxfield told me that when his father and some other workmen were working a large pit at the back of Boxfield Farm, they broke through into a "dene-hole" which had niches in the wall still containing tallow, the remains of the lighting system employed by the men who laboured down there. It is difficult to see the purpose of the two "dene-holes" in Box Wood unless the chalk was applied to the ground in the wood itself or was transported elsewhere. However, they caused quite a flurry when the Commission took over, being suspected of containing unexploded bombs! The mistake is understandable for in 1941, a German bomber jettisoned five bombs, one of which blew a hole in the road, isolating Walkern from Stevenage; the others, the craters of which can still be seen, fell in the wood, narrowly missing Box Wood House.

The Flora and Fauna

Between the wars, several notable birds were seen in the wood; a hobby (a small falcon) was shot there in February 1932 and a merlin was trapped there the following month. Hobbies are said to have bred there until 1880. Both the common buzzard and the rough-legged buzzard were seen at Box in the early thirties.

An interesting peculiarity of the flora of Box Wood is the unusually high proportion of white bluebells among the more common blue variety (*Endymion nonscriptus*) in fact it is possible to pick a bunch of white ones almost as easily as the blue, especially around the barrow.

An intruder in the wood is the Roman snail (*Helix pomatia*) the edible snail of France and the largest land snail in Britain. It is said to have been introduced by the Romans and is fairly common in the woods around this district.

The north-east corner has been appropriated by a colony of badgers, one of whom a few years ago was knocked down by the 6.15 a.m. Walkern/Stevenage bus. His pelt now decorates a settee in Box Wood House!

The Name

"The Place Names of Hertfordshire" (1938) suggests that the name of Box Wood is derived from the Box tree. I suppose this is rather obvious but it might well have come from the Anglo-Saxon word "boc" meaning "Beech".

Our Box Wood is one of three of the same name in the county; there is another at Great Amwell near Ware, and a third, which was the home of the "ate Boxe" family, is not far from Hoddesdon. To the north of Box Hall at Benington, there is a small wood known as Boxfield wood.

Box Today

We have now reached the present day. The only human habitation is at Box Wood House and the adjoining bungalow, which are the home of a local solicitor and the orphan children who share this house and its beautiful surroundings under the care of his wife. To the west, in the parish of Aston, lie the two cottages known as Boxfield Farm, and to the east in the Parish of Walkern is Boxbury Farm, the home of one of our lessors. A narrow by-road leads southwards to Chells Manor once so closely linked with Box and its church, and, a little to the west of this is Narrowbox lane, so overgrown that it has become impassable. It is no longer needed to provide access from the extinct Manor of Langthornes to the vanished church at Box. Two miles to the south-east, partially surrounded by the moat doubtlessly constructed by William of Box, stands the beautiful fifteenth century Box Hall, now a farm house and still owned by the lord of the Manor of Benington who resides in Benington Lordship, cleverly linked by sham nineteenth century masonry with the keep of the castle built nearly 800 years ago by Roger de Valoignes.

Though the village of Box is now no more than a few aged remains in a piece of woodland, there is certainly a wealth of material well worth serious study in *our* Box Wood.

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MY FOUR CHESTNUTS

By

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Clerical Officer, Headquarters

Looking at the title of this article, the reader might be led to believe that a very funny thing happened to me whilst on my way to the office the other day, four times. But it did not. What I am about to relate, began in 1956.

After a long term of preparation which included working overtime as and when the occasion presented, plus the financial return from my small store (I was not known in H.Q. as "Old Cadbury" for nothing), together with a definite miserly attitude toward spending money at all, I was about to reap the reward of those years of austerity. My ambition to have my own bungalow was going to be realised. My wife and I had only to decide where we wanted to live and the world was ours—we thought.

"We don't want to move too far away from mother" my wife warned whilst we were searching for "Shangri La". "Of course not dear, we could never do that" I replied absently and my wife had looked at me sharply. Eventually, we found a site in the pleasant Essex market town of Waltham Abbey and only about four miles away from Chingford where we were living at that time. The estate was ringed with tall Horse Chestnut trees and looked wholly delightful in its unbuilt state. The builder assured us that the dwellings would be no more than six to the acre and we congratulated ourselves at being fortunate to find a spot so close to "home", plus the fact that we would be getting a bungalow, the type of home we particularly wanted. Finally, although it was far from easy, (a credit squeeze was on at the time) we obtained our mortgage and the builder proceeded to build.

I watched the progress of my new home with pride. The footings were dug, the foundations laid, the shell erected, the roof put on—each stage bringing me one day nearer to the fulfilment of my dreams. At last, approximately six weeks after the date given by the builder, we moved in.

It was then I realised the meaning of nature in the raw. I had been rather starry eyed up till then and had paid little attention to the proximity of the trees. Now that the boundary fences had been erected, there were four giants standing at the bottom of my garden, and it was with rather a shock that I realised that I had got to live with them. My neighbours had trees of course. Some had one, some had two or even three, but I had hit the jackpot. I had got four! "Never mind," said my wife brightly, "at least the children will have plenty of conkers in the autumn." I gazed at the trees thoughtfully. Sturdy Horse Chestnut trees every inch of 100 feet tall. Splendid specimens, trees to look upon with pleasure in any forest only these trees were not in a forest. They were in my back garden and I was not thinking of conkers so much as thinking that the clearance between my bungalow and the trees was perhaps 80 feet and if the trees *should* every come crashing . . . . .

Almost immediately in front of my Chestnuts were three substantial stumps, relics no doubt of the days when the former owner of the land had decided to "thin out". At least these presented no problem, I would soon have them out—so I thought. I set to work with a will on the largest of the three. I bought a fork, borrowed a mattock and begged a pick. It was not easy and after three months toil I had an aching back, a broken fork and one large hole in my garden and three tree stumps—still. I tried boring holes in the thing and filling them with paraffin but I only succeeded in burning paraffin without burning any stump. I tried sawing it, then I hacked at it, cursed at it and could have wept over it, but to no avail. At last, I hit upon the idea of building a fire at the base of the stump and keeping it alight day, and as far as possible, night. I managed to burn it out eventually but it had taken me almost six months to do it and I felt no sense of triumph. My next door neighbour, who also had a tree stump, quite simply piled earth on his and turned that part of the garden into a rockery. I looked at my two remaining stumps despondently then went and acquired a load of rockery stone. This was defeatism, but by now I had admitted defeat. At least I had a rockery even though it was the biggest on the estate.

It was late autumn when I moved in (why is it always wet, cold and utterly cheerless whenever I move?) and within three months I was forced to spend a fortnight in bed suffering from bronchitis. Winter turned to Spring and the trees came into their full glory. That first Summer was one of those rigorous seasons peculiar to this country. The trees would sway alarmingly in the gusty weather and if the sun shone we hardly saw it—our trees blotted it out very effectively for most of the day. I was beginning to hate my neighbours. They all seemed very young and virile, able to shin up *their* trees and lop them to a reasonable size. Sometimes I borrowed a ladder, armed myself with a saw, looked up at the crown of my trees, then deemed it prudent to put off the climbing until another day. Eventually I had to face it. I have no stomach for heights.

Summer changed to Autumn and down came the conkers and the leaves. Oh those leaves! I burned them, buried them, composted them and pretended they were not there but it was no use. The more I got rid of them, it seemed the faster they fell, so I let them stay where they were, then had a good clear up at Christmas. Then there were the "conkers". It was a bumper year that year and my two young daughters gathered a record harvest of the little shiny brown nuts. We had conkers in the kitchen, in the lounge, and in the bedrooms. Necklaces of conkers, trays of conkers, dishes of conkers. I gave them away until even the local children begged me not to give them any more. But eventually, the last nut fell from its tree and the conkers slowly disappeared. Even that wonderful process known as natural regeneration was "conquered". As far as I could tell, I had dug up all the sinister looking shoots coming from those chestnuts which had buried themselves in my garden.

During the Winter, my trees—leafless—did not seem to sway quite so alarmingly but I knew that, for my own peace of mind, something would have to be done about them. So early the next Spring, I contacted a firm of tree lopping specialists and bargained with them until they agreed to my price, then one Sunday morning the men came with their ropes, tackle, power saw and axes and in a few hours my proud trees had been cut down to a reasonable size and my garden was in a mess. My rockery was shattered and my lawn was full of great holes, but these things were at ground level; I could restore them at my leisure.

The operation seemed to have a salutary effect on my neighbours, willing hands helped me to shift the branches and we soon had them stacked neatly at the bottom of my garden—out of sight behind the trees. I was now able, quite literally, to see the "wood for the trees" and I felt pleased to know that I could help to offset my fuel bills by burning logs. However I did not have logs but huge branches so next I had to buy myself a small logging saw, and set to work. My enthusiasm died quickly! The branches were extremely tough and sappy, sawing them proved to be a slow, laborious process. Furthermore, finding somewhere to stack the logs began to become a problem. My wife suggested humorously that I hire a horse and cart and go round the district on Saturday mornings, but I decided that there might not be a good market for logs in July—even in Britain.

Meanwhile, my trees had burst forth again, only now they no longer seemed quite so omnipresent; cut to a manageable size they formed a pleasing background to my lawn, rockery and flower beds. They reminded me somewhat of guardsmen with boughs and leaves forming a delightful "busby" on each one.

By now, I have restored my lawn, reshaped my rockery and made the back garden presentable once more. I still have enough sawing up to do, to keep me busy for a long time to come, but whenever I place a log on the fire it gives me great satisfaction to know that once, this same timber which caused me to sleep uneasily o'nights, now warms and comforts me.

Of course, it may well mean that lopping the trees will cause the roots to grow more vigorously towards my bungalow!

LAND USE FOR FORESTRY AND AGRICULTURE

By

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1. Formation of Policy

Forest is probably the naturally dominant type of vegetation throughout the world wherever there is sufficient soil fertility and moisture to permit tree growth. Grassland is likely to be dominant only where fire or other agencies persistently destroy the trees.

The demand for land for agriculture has to a varying degree led to the clearance of the natural forest. With an increasing degree of civilisation, non-agro-forestal users of land for buildings, roads, recreation, reservoirs, airfields, defence and the exploitation of minerals have taken the place of forestry and agriculture on an increasing but still relatively small scale. These are all high-value uses and in an uncontrolled economy receive priority over both forestry and agriculture for existing land. Even in the United Kingdom, however, where by many standards the efficiency of agriculture is high, the rate of increase of productivity from the remaining farm land is more than outstripping the loss of food production owing to the transfer of land to industrial and other uses.

In a classical laissez-faire society land use would be determined solely by the market value of the land. In most societies however land use has been modified by government measures. These may be by legislation, as in the United Kingdom where planning permission is required for a change in land use (which does not however include a change from agriculture to forestry or vice versa), and in Switzerland where the area of land under forest may not be decreased, or by financial manipulations such as subsidies and tax relief.

The principles which motivate governments in deciding land use, however, appear to be vague or non-existent. In the United Kingdom, for example, there is no Land Use Policy. No permissive planning is exercised over the change between forestry and agriculture. Some control is exercised over the activities of the Forestry Commission which needs the approval of one or other of the Agricultural Ministers before it can buy land for afforestation. In practice, only land having a low market value, normally not more than £10 per acre, can be purchased for this purpose, and further the agreement of the agricultural authorities as represented by the Provincial Land Commissioner is normally required, in practice if not in theory. This is usually based on a rule of thumb measure, such as the number of breeding ewes per hundred acres which the land would support as sheep grazing, which is related more to the land's potentialities for agricultural production than its relative value in the alternate uses of agriculture and forestry or to the national requirements of wool and mutton on the one hand and timber on the other. Fiscal policy may act in contradictory directions. On the one hand, agricultural subsidies serve to maintain artificially high prices for poor quality land, while on the other, tax relief for forestry may tend to encourage the planting of land which might give a higher return for agriculture.

In Switzerland, where, with one-quarter of the surface area covered in forest and an average standing volume of 7,000 H. ft. per acre, there might appear to be less cause for anxiety over timber supplies, felling is strictly controlled and no areas may be reclaimed to agriculture except in special cases and then only if an equivalent area of forest is planted elsewhere. This applies not only to the protective forests which make up 80% of the total, but to the remainging 20% as well. This policy appears to be based more on an innate conservatism than on a reasoned belief that none of the land now bearing forest could be put to more profitable use.

In Holland the planning of land use appears to have more direction than in the other Western European countries visited. The quality and value of most of the land makes some form of intensive agriculture the only reasonable one for the greater part of the country. On the new Polders, however, it is the aim to devote about 5–10% of the land, on the poorer sandy soil, to forestry in order to establish what is regarded as a desirable balance between forestry and agriculture. The reasons which led to deciding on this proportion could not be determined.

Although the need for a rigid National Land Use policy may be disputed it is desirable to have some criterion for judging the best use of land. Land use cannot, however, be considered *in vacuo;* it is only one factor, along with the use of capital, labour and technical resources, to be considered in planning for the maximum total benefits for the community over a given time. In this connection the optimum use of land may not coincide with maximum productivity from the land. It is interesting to note that in the Netherlands, which is virtually the most densely populated country in the world, the policy of maximum agricultural production per acre has been specifically rejected in favour of one of maximum production per worker employed.

The value of land is both economic and indirect. The economic value can be subdivided into:

(a) **Physical**—This will be the net value of the products which can be produced from the soil after taking account of all capital and expenditure involved. This is the "rent" of classical economic theory.

(b) **Non-physical**—The value of the land for purposes such as water catchment, defence, etc.

The indirect values of psycho-social welfare cannot be assessed in economic terms but include amenity, recreation, and the psychological satisfaction of land ownership. This last point is of most importance in peasant communities, while with increasing civilisation and urbanisation the recreational uses of land become more and more important.

The economic value of land for varying uses must then be considered in the light of the non-physical factors. An example from South Wales may be used to illustrate this. Land near a densely populated area has been used for the opencast working of coal. When the coal has been extracted there are three possibilities:

(i) The land may be restored to grazing land at a cost of about £900 per acre. It will then have an economic value of perhaps £10 per acre on an average.

(ii) It may be restored to a lesser degree for afforestation purposes, at a cost of £250 per acre. It may then have an economic value of about—£5 per acre as forest land.

(iii) It may be left as it is at no cost at all.

Clearly from the purely economic point of view there is no justification for spending any money on restoration, and in parts of the United States of America such land is left unrestored. But from the point of view of those people living and working in the neighbourhood such a position would rightly be regarded as insupportable, when for a cost representing no more than one shilling per ton of coal won from the land it could be restored to forest land and the scars of the mining hidden within a few years. Complete restoration to agriculture, however, would have no economic justification and there is little reason for supposing that it would enhance the amenity more than afforestation. A consideration of both economic and indirect benefits would therefore rationally lead to a policy of afforestation but not agricultural restoration of such land.

2. Implementation of Policy

The problems which arise in obtaining the most efficient use of land are both technical and social—political.

The technical problems are those of lack of, or surplus of, water, lack of soil nutrients, presence of deleterious influences such as atmospheric pollution, salinity, etc. It is unnecessary in a report of this nature to go into details of land reclamation, irrigation, etc., which have been developed throughout the world, but it can safely be said that those problems have proved much less intractable than the economic, social and political problems involved.

Of these, problems of land ownership are probably the most general. Land is sometimes owned by too few persons, as in Southern Italy where 1 % of the people own 75 % of the agriculturally usable land. This is frequently dealt with by making illegal the ownership of land above a defined acreage, but it is less common to meet legislation designed to meet the more widespread evil of land being shared amongst too many owners. This is not a serious problem in Britain where inheritance by primo-geniture has for long been customary (though in essence this is still one of the problems in some of the sheep grazing areas in Mid-Wales), but in countries where inheritance is or has been by gavelkind both the small size and scattered nature of the present holdings make economic working impossible.

Attempts to tackle these difficulties were seen both in Switzerland and the Netherlands. In the former it is the scattered nature rather than the size of the holdings which is receiving attention. If 50 % of the landowners owning at least 50 % of the land in a neighbourhood give their consent, a Field Corporation is established which values the individual holdings and reallocates the land so that as far as possible each owner receives land of the same size, quality and similar location as his original holding, but consolidated instead of scattered. In this way, for example, the average owner who may have had his land in about eight separate lots each of half an acre, will after reallocation have on average two lots each of two acres. In the Netherlands the government has gone further, and attempted not only to consolidate the holdings but to increase their average size. To assist in doing this it is able to provide additional land, through the reclamation of the Polders, in which a proportion of the newly reclaimed land is set aside for farmers from a Land Consolidation area who are prepared to give up their old holdings there. The Field Corporation also encourages people to leave agricultural employment by buying farms and paying a termination allowance to those leaving. In both countries these land consolidation schemes are accompanied by technical improvements such as, in the Netherlands, the building of new farm buildings, bridges, dykes, pumping houses, etc.

A problem of land ownership of considerable importance in parts of Wales is the existence of common grazing rights on some unenclosed lands, with the result that it is difficult or impossible to improve the value of such land by ploughing and reseeding, afforestation, etc. Until a system of registration of such rights is evolved it is difficult to envisage any way in which this land can be put to its best use.

Lack of capital to carry out the improvements of land which are technically possible and even commonplace is a problem which is seen at its most intense in the so-called "underdeveloped" countries, but which also applies on an individual if not on a national scale in all countries. In the latter, governments generally have introduced financial assistance in the form of ploughing grants, fertiliser subsidies, etc., as well as less direct assistance such as government-financed research institutes. There are grounds for suggesting, however, that subsidies should be confined to measures necessary to provide *long-term* benefits, and that financial aid for measures producing *short-term* benefits should be confined to loans, since if measures such as, for example, grassland improvement will not yield economic returns within a short period without the use of subsidies it may well be that the land is not being put to its best use.

The application in practice of methods of sound husbandry is a problem which, while most difficult in the underdeveloped countries where educational standards are lower than in the West, is nevertheless by no means solved even in the most advanced countries. Here again it is possible that the over-lavish use of subsidies may help to perpetuate the use of inefficient methods in both agriculture and forestry.

3. Special Application for Forestry in the United Kingdom

In concluding this report it is perhaps worth considering to what extent the general principles of good land use can be applied by the Forestry Commission in Great Britain.

It is desirable that there should be a clear aim based on rational considerations. This has been the case since the formation of the Forestry Commission, when the aims have been originally the accumulation of the maximum growing stock of timber for strategic reasons, and, after this policy became out-dated, the use of land so as to obtain the maximum return from the capital invested in it, together with obtaining the greatest degree of indirect value of the land. Where there is conflict between the economic and the indirect returns there is no easy guide to obtaining the best balance, but it is important that neither should be regarded as the sole consideration. Thus while State Forests must be made as profitable as possible, this should not be regarded as an over-riding consideration and their recreational and amenity aspects must be given due weight even where these may make profitable working more difficult. The degree to which these latter considerations should over-ride the former must be a matter for personal judgment, but in general there should be an attitude of trying to meet the wishes and requests of the public whenever they do not *seriously* interfere with the commercial aspects of the forests. To give an example, to deny access of the public on foot, horseback or even for organised activities such as cycle rallies would seem wrong unless harm to the Commission from such activities is not only possible but probable. On the other hand to grow uneconomic hardwoods on sites where conifers would be profitable would appear to be giving undue weight to the indirect (and debatable) amenity aspects at the expense of the profitable economic use of land.

It should not be forgotten by foresters that even when land has been purchased for the purposes of forestry this need not at all times by regarded as the sole commercial use. There may be cases, for example, where small blocks of land intended, ultimately, to be afforested, may for a period of years be better used for agricultural purposes until the acquisition of adjoining land enables the ground to be fenced more cheaply. Or it may be that under certain conditions a policy of grazing beneath larch may be more profitable than one of underplanting it, and in such cases this would be the better land use unless it is known that such grazing would have adverse long-term effects on the soil. Sporting rights, again, may be of sufficient importance to justify modification of silvicultural practice in some cases.

Although forest policy should be based on national considerations, its implementation may have to call on methods other than the powers of reason. Until a Forest Service is self-supporting it must depend upon Government for funds before forestry can be carried out at all, and governments are rarely swayed solely by rational considerations. Forestry must be made popular. The Forestry Commission has owed much in the past to support given by individual influential members of governments, and while it would be out of place for a government department to attempt to reproduce in this country the activities of, say, the American oil lobby, no opportunity should be missed of interesting members of the legislature in the work being done by the Forestry Commission. In the long run, however, a popular demand for and love of forests must be stimulated. It is worth noting that in the United States of America a post-war increase in the popular use of forests for recreational purposes has led to an effective pressure for the more liberal provision of funds for forestry purposes. Work such as talks to schools, the provision of forest parks and encouraging public access to the forests is likely to produce results which will be slow in showing but may have incalculable effects over a generation.

In what is probably the most detailed investigation yet made into the economic merits of forestry and sheep production on the hill land of Great Britain, Dr. K. R. Walker has suggested that it is necessary for the government to adopt four measures to enable land to be used to its optimum purpose:

(1) Allow the Forestry Commission to pay higher prices to get better land.

(2) Pay hill farming subsidies only to those farms which have a prospect of becoming economically viable units.

(3) Be less rigid in its attitude to what land is suitable for afforestation.

(4) Raise Forestry Commission wages to enable a better type of labour to be recruited.

I think that the first three are essential if the best allocation of land between forestry and agriculture is to be obtained in Great Britain. If in addition to adopting these measures, the government were to discourage the planting of land for planting's sake and to require, rather, that land should only be planted or replanted if this was likely to show some worthwhile economic or social benefit, this would do much to ensure the best use both of land and other resources in Britain.

ROYAL SCOTTISH FORESTRY SOCIETY
64th ANNUAL EXCURSION: DEESIDE, 1961

By

J. F. EVANS and J. A. MACKAY

Foresters, North Wales and North Scotland

The party assembled at The Huntly Arms Hotel, Aboyne, on Monday evening, May 1st. It was early evident that the members were in good fettle, the various small groups being quickly involved in good going forestry arguments covering a wide field.

The excursion was organised in two parties, A and B. The writer was attached to B Party. On Tuesday in brilliant sunshine we travelled by the excursion coach to Aberdeen; Royal Deeside sparkling in the morning dew looked its best.

Our first call was at Messrs. James Cordiner & Son Ltd., and afterwards at Messrs. William Fiddes & Son; the object of the visit to see something of their box-making factories where we were very kindly and patiently shown round the various departments. Home timber was being used almost exclusively. We were told that Norway spruce is the most suitable and noted a very little imported timber—Maritime pine from Portugal.

In this short account, it is impossible to give a detailed description of the many operations; one was particularly struck by the skill and dexterity of the operators and surprised to hear that they were not on piece rates.

The largest "gallery" watched girls hand-stapling the re-inforcing wire on beer cases, forty staples per minute, and one forester was heard to remark: "Man! She would be grand at droppering." The main operations were:

Conversion Circular sawing and hand sawing of logs into battens, squares and slabs.

Sawmilling Re-sawing of slabs and battens to boarding, cross cutting and ripping of boards to boxboards. Linderman jointing and surface planing operations.

Machining Handholing, dovetailing, printing operations, assembling. Nailing, wiring, stapling and finishing processes prior to despatch.

It would seem that any grade of timber will do for some grades of boxes; black knot, shake, black fungal stain in Scots pine—all are accepted in what appears a most useful market for timber. The really inferior grades are broken into small units, the worst of the black stained stuff is withdrawn, and all waste timber for conversion is used in the furnace for kiln drying.

In both factories about two hundred workers are employed, many of them women. The production per day is difficult to estimate because of the various sizes and specifications but an average output was five thousand kipper boxes, one thousand fish boxes, and probably a similar number of beer and whisky cases. One was greatly impressed by the well finished cases for a well-known make of typewriter.

After a picnic lunch at Hazlehead Park, a visit was paid to the Pinewood Park nurseries of Benjamin Reid & Co. Mr. Shackleton showed the party round.

The nursery covers about 80 acres, and has been used for forestry and horticulture for a little over 60 years. Unfortunately it has many disadvantages such as:

(1) Heavy cold stony soil.

(2) Difficult drainage.

(3) Awkwardly laid out field.

Advantages are:

(1) It is situated conveniently near Aberdeen for recruitment of labour.

(2) The climate does not suffer from great extremes, though it is rather cool and the soil takes long to warm.

Water is available everywhere, by means of portable alkathene piping.

Protection against frost

First year seedlings of Sitka spruce, *Abies* species, *Tsuga*, *Thuja* and *cypress* are covered all winter. The seed beds are edged with rough boards. Lengthways is laid light-gauge 2-inch wire netting which will support the final covering of hessian or polythene sheet. To prevent frost damage in the spring after growth has started, Norway spruce and European larch are also shaded until the end of May.

Lining-Out

The Ledmore lining-out plough is used. This has a three-point linkage for the hydraulic lift of a Ferguson tractor and could be employed in any nursery where a Ferguson tractor can be worked. The plough opens a trench. Seedlings in lining out boards are placed in the normal way. The plough closes the trench against the trees and at the same time opens a new trench. The normal squad consists of 6 women (2 in each 3 shelters), 3 men or boys to carry lining-out boards to the trench and back, 1 man with a spade for tidying ends, a tractor driver and a ganger in charge. We were told that under good conditions the squad will line out 100,000 seedlings per day, or over 8,000 each.

Sowing

Conifers and hardwoods are all sown broadcast in 3 ft. 6 in. wide beds. Hardwoods are covered with about 1 in. of soil and conifers $\frac{1}{4}$ in. coarse sand. Tractors are used to a maximum in all sowing operations.

Seed Orchard

This is a general purpose polycross Scots pine seed orchard. There are 66 clones occurring mostly six times in a randomised layout; all were grafted on established 1+1+2 Scots pine, four stocks being grafted in each position to reduce the possibility of failures. The grafting was carried out in April 1958. The parent trees are elite specimens from the following forests:

Darnaway	Grant	Rannoch and Keltney
Altyre	Crathes	Meggernie
Logie	Tanar	Charter Hall
	Drumlanrig	

Seed Plantations

This consists of a first cross hybrid larch trees interplanted with European larch in order to produce a back cross. Parentage in both cases is from certified seed stands. Every second east-west row will eventually be removed to leave individuals 18 ft. apart.

Seed Store

This consists of a Prestcold refrigerated room with a capacity of about 250 cubic feet. The room could store between 2,000 and 3,000 lbs. of conifer seed, depending on species. The seeds are stored in airtight metal containers or in airtight polythene bags inside cardboard drums. Temperature is maintained by thermostat 33°–34°F. Keeping seed in good condition over a period of years ensures continuity of sowing despite the occurrence of crop failures.

Tea was kindly provided by Mr. and Mrs. Shackleton who were thanked on behalf of the visitors by Mr. J. Farquhar Stewart.

During the day, the activities of the party was recorded by television camera and later in the week, members were horrified to see the result during the television news service. Here, surely, was the answer to Rabbie's prayer!

On Tuesday evening, back in our hotel, a capacity audience listened to Professor Steven of Aberdeen University who took as his subject: SCOTS PINE, ITS PLACE IN SCOTTISH FORESTRY.

I have no doubt this excellent lecture will be reported in full elsewhere and I shall only touch briefly on some of the points:

Site: Traditional heath type.

Strain: Importance of correct strain, emphasis on *horizontalis* type.

Treatment: Good planting at 4 ft. 6 in. spacing.

Early and careful beating up to avoid gaps producing "wolves", and attention to damage by capercailzie, squirrel and insects. The thinning should after 30–50 years be fairly heavy, and selected stems should be pruned so that the timber can compete ultimately with imported redwoods.

In the discussion which followed several questions were dealt with which have been well covered by other writers. The question of ploughing is a big one: should we change our methods to complete ploughing? Is the tine serving its purpose?

Wednesday, May 3rd was "Open Day". A very large number, estimated at over 200, were welcomed by Lord Glentanar to his estate. A well prepared booklet was distributed which gave the history and described the plantations on the property. One was very happy to meet again Mr. Duncan Ross, Head Forester, who dealt very ably with all the questions asked.

To give a full account of all the stands seen and to detail the discussion and agreement would require a considerable volume in itself. I can only touch briefly on them.

The indigenous pinewoods of Scotland, which collectively have come to be known as the Great Caledonian Forest, once stretched across Scotland from west to east, and from Glen Falloch on the south to Strath Oykell in the north. In time it stretched back into the dim pre-historic past. Only small remnants exist today; one of the most important of these is Glen Tanar.

Fraser Darling has called its destruction "the biggest effect man has exerted on the history of the Highlands". This destruction happened within historic time, partly between A.D. 800 and 1100, and then from the 15th century till the end of the 18th.

The indigenous trees were Birch, Scotch fir—to give it its old name—Oak, Aspen, Alder and Rowan.

Oak from Glen Tanar was used for the building of ships.

Selective fellings were practised in early times and saw pits can still be identified where the trees were manufactured by hand, using the "rugsaw" and the adze.

Birch bark was a commodity of value in those days, probably for dyeing or tanning.

Evidence of forest fires of the past can be seen as carbon layers in the soil profiles. There are records of forest fires in 1688, 1719, 1748, the latter for 10 days. Then in June 1810 when 200–300 acres were burned. In 1820 a big scale fire occurred. In 1920, 1,362 acres and in 1956, 244 acres were destroyed; the 1920 fire took 10 days to extinguish although hundreds of men fought it.

Towards the end of the 19th century Glen Tanar became a famous Red Deer reserve for sporting purposes and in 1938 a shield fence was erected to control the deer population within the woodland.

For about 100 years prior to 1940, little natural regeneration of the tree species survived, and most of the leaf trees disappeared except where protected. Since 1940 however the progress of natural regeneration has been encouraging, mostly on the fringe where grazing by stock is not concentrated. One can thus observe phenomena which must have been repeated over and over again during many thousands of years in the perpetuation of the great wood of Caledon—the "shift" of Scotch fir—being a light demander it must have seeded out to the natural tree limit, then when part of the parent mass were destroyed by age, wind or fire caused by lightning, the "back in" seeding process commenced.

In recent times, during the 1939–45 war 3,200,000 cubic feet (Hoppus) of timber was felled for war purposes and the gale of 1953 blew down 500.000 cubic feet.

Elevation: 400–1400 ft. above sea level.

Climate: Annual rainfall 35 inches. Snow is often heavy, late spring frosts are prevalent, drought can be severe.

Tree species: Scots pine in the main coniferous tree species, with Douglas fir, Norway spruce, Sitka spruce, *Abies procera*, and Japanese larch, European larch, Hybrid larch on the more fertile and sheltered sites. Leaf trees are represented by native birch, oak, alder, poplar, bird cherry, ash and rowan. Planted trees include Norway maple, sycamore and beech.

Ground vegetation: Chiefly *Calluna vulgaris, Vaccinium myrtillus. Juniperus communis* is common and the most important shrub.

The following give details of stands visited.

Douglas fir 38 *years old* (*elite stems high pruned*)

Standing trees	240 p.a.
Basal area	158·9 square feet p.a.
Mean timber height	64 ft.
Standing volume	5,241 cubic feet p.a. O.B.
Thinning volume removed	520 cubic feet p.a. O.B.
Total yield to date	5,761 cubic feet p.a. O.B.

Mean annual increment at 1960: 151 cubic feet p.a. O.B.

A discussion followed, the subject being the financial aspect of high pruning. It was generally agreed that it should be done. Timber merchants would pay more for knot-free timber. Regarding pruning, elite trees should be borne in mind, rather than correct spacing of final crop trees.

Scots pine (natural regeneration) average age 38 *years (registered normal seed source)*

Standing trees	460 p.a.
Basal area	108·2 square ft. p.a.
Mean timber height	39 ft.
Standing volume	2,037 cubic feet p.a. O.B.
Thinning volume removed	385 cubic feet p.a. O.B.
Total yield to date	2,422 cubic feet p.a. O.B.

Mean annual increment at 1960: 63 cubic feet p.a. O.B.

The Old Forest of Glen Tanar

I have never seen such a wild, remote valley through which we walked, forming part of the old indigenous pine forest which has survived throughout the ages by natural regeneration.

In 1956 a tree was felled which gave a ring count of 266 which showed it was seeded in 1690. We saw a stand of Scots pine formed by natural regeneration and by its age was spared selective felling. This stand shows the potential age of the native provenance when grown at normal density. Details follow:

Scots pine age uneven, average 120 *years*

Stems	220 p.a.
Basal area	144·5 square feet p.a.
Mean timber height	50 ft.
Standing volume	3,516 cubic feet p.a. O.B.
Part thinning volume removed	504 cubic feet p.a. O.B.

Other Plantations Seen

(a) *Douglas fir with a few Scots pine, European larch, Norway spruce and Sitka spruce planted among old oaks.*

Age	33 years
Stems	320 p.a.
Basal area	125·1 square feet p.a.
Mean timber height	48 ft.
Standing volume	3,534 cubic feet p.a. O.B.
Thinning volume removed	409 cubic feet p.a. O.B.
Total yield to date	3,943 cubic feet p.a. O.B.

Mean annual increment at 1960: 119 cubic feet p.a. O.B.

(b) *Oakwood of uneven age believed to be a part remnant of indigenous oak forest.* Both Sessile and Penduculate oak are present with intermediates. *Rubus saxatilis* is one of the many interesting species found among the flora in this wood which is rare in the district. It is known that the oak was indigenous in the district as specimens of canoes hollowed out of solid oak logs by the lake dwellers have been found in Loch Kinord.

(c) *Torphantrick wood showing Scots pine natural regeneration in the thicket stage.* A part had been brashed for inspection. The area was burned in 1932 and the Scots pine seedlings established themselves while the heather was young, i.e. 4–5 years after the fire. This makes the standing crop 23 years old or 20 by planting standards. This area was shielded at that time from deer.

BALMORAL ESTATE
HER MAJESTY THE QUEEN

It was rather dull with showers when Party B visited Balmoral on Thursday May 5th. They were welcomed on behalf of Her Majesty by the Earl of Caithness who outlined the history of the woodlands. Mr. Duff, the Head Forester, dealt with the practical side of forest operations. It is not intended to replant the hillside to the south of the castle. This area of Scots pine was felled during the war. Hardwoods will be introduced among naturally regenerated birch and this will eventually provide a very pleasant outlook from the castle in contrast to the sombre green of the surrounding pines.

The total area is approximately 2,500 acres and lies on the South Bank of the River Dee. It contains felled areas now being replanted and areas planted before 1880, all of which are fenced against deer. The species is almost entirely Scots pine growing at an elevation of between 950 and 1500 ft. The woods contain considerable areas of mature timber.

Garmaddie Woods

These are semi-natural of pre-1880 origin; they suffered severe damage in the 1953 gale and losses of trees through windblow have continued each year. In 1957 and 1958 some selective felling was carried out to promote natural regeneration. This has taken place in certain areas where the ground vegetation have allowed it, but in the main however subsequent ploughing and planting will be necessary.

Aberdeen Haugh

A Scots pine plantation which has suffered a lack of any treatment for the first 65 years; it received a first thinning in 1951 and a second in 1958; it is registered as an approved source of Scots pine seed, classified "almost plus". There are two Forestry Commission increment sample plots established in 1921.

Thinning grades	B	D
Volume cut since 1931 (per acre)	1,834 cu. ft.	3,519 cu. ft.
Number of stems removed	822	1,082
Number of stems standing 1961	373	160
Volume standing 1961	5,848 cu. ft.	4,396 cu. ft.
Volume standing and cut 1961	7,682 cu. ft.	7,715 cu. ft.
Average tree OB 1961	15·7	28·4
Average height and BHQG	68 ft. × 8¾ in.	67 ft. × 11 in.

Ballochbuie

The forest was previously part of the Invercauld Estate. The forest is semi-natural and uneven-aged, but with the predominance of the oldest age classes. The trees in the greater part of the forest are in the 150 to 250 age class. The maximum age attained is about 300 years. The mean height is about 50 to 55 ft. and the mean girth at breast height is 6 to 7 ft. Extensive damage was caused by gales in 1879, 1883 and 1953 and at the end of the last century certain areas were replanted. Experiments were carried out to promote natural regeneration, but had little success. Natural regeneration in the 18th century would appear to be sufficient to ensure the perpetuation of the forest, but today there is very little. This is partly due to grazing by deer though the primary cause is believed to be due to the failure of the seed to germinate and the seedlings to survive. However it is proposed to carry out further experiments in the promotion of natural regeneration by enclosing selected areas.

MAR ESTATE
GLEN DERRY NATIVE PINEWOOD

The isolated pinewoods, which have had no alien Scots pine introduced to them, therefore form an uncontaminated reservoir of Scots pine for the future, for use either directly as seed or as scion material in seed orchards. There is now nowhere else in Europe extensive areas of Scots pine where the trees range up to 300 years or more in age.

Obviously regeneration is imperative if they are to be preserved, and this should be attempted by Natural Regeneration in the first instance, as the best way of ensuring perpetuation of the inherited morphological variations which are valuable in forestry already, or may become so in the future.

The Glen Derry native pinewood grows on a flat alluvial plain and the surrounding slopes from 1,360 ft. to 1,750 ft. above sea level, with scattered trees up to 2,000 ft. (one stunted bushy pine being reported at 2,800 ft.). The stands are mostly open. The tallest trees are beside the River Derry, some being 80 ft. tall and many over 70 ft. and on the more sheltered sites with good natural drainage girths are between 12 and 18 in. B.H.Q.G. These measurements make the bigger trees about 109 H.ft. O.B. The trees are mostly about 140 to 200 years old, the oldest about 250, several trees about 100, and a few seedlings at the edges of the wood under 5 years old. The maximum age for Scots pine to live is about 400 years. At this height above sea level, and these ages, it is not surprising that the current Annual Increment of the old trees is very low, and stems may have up to 50 rings to the inch on the outside.

The Nature Conservancy fenced some areas recently in Glen Derry; one is about 6 acres enclosed in August 1959. Natural regeneration is quite good, groups of trees are carefully marked for future reference but despite the surrounding fence it was noticed that in places the young trees had been nibbled by either deer or mountain hares.

Annual average rainfall: 40 inches
Temperature Annual Average: 42°F
Temperature January Average: 34°F
Temperature July Average: 53°F
Frost: 100 days per year.

At Mar Lodge, lunch was taken in the ballroom—the hall of a thousand heads. Actually over 3,000 stag heads adorn the walls and ceiling. Members of the Royal House and distinguished persons who stalked deer in a bygone era are here recorded with their trophies.

At the entrance to Braemar Castle (the scene of turbulent times after Dundee's rising in 1689) the party was welcomed by Captain Farquharson of Invercauld. A visit was paid to the 1959 Highland Show prize winning stand of 25-year-old Scots pine. This stand has had a first thinning and looks very promising.

The Invercauld woodlands extend to 2,023 acres of which 571 acres have been planted in the past ten years. A new dedication Agreement has been concluded and the programme for the next ten years will cover 806 acres of further planting, giving a total woodland area of just over 3,000 acres. The main species are Scots pine, European larch and Norway spruce, where suitable.

At Great Clunie plantation a very good comparison could be made of conditions inside a deer fence in contrast with those existing outside, which is heavily grazed by deer. Vigorous natural regeneration of Scots pine and European larch is taking place, the vegetation is lush, while on the exposed side no sign of regeneration could be seen and the vegetation is cropped closely. This was the best example seen during the tour of the value of protection. If plastic netting proves successful, it will solve a big problem.

The seed kiln, heated by an industrial type fan heater, was a source of great interest, as was the ingenious, simple reverse process for cleaning the seed.

All plants used in the forest are raised from home seed in the estate nursery (also a prize winning exhibit at the 1959 Highland Show).

The policy woods have some very fine specimens of Douglas fir. The party walked down a section of forest wood through some excellent European larch and examined an estate-made wood bridge of 18-foot span built on tram rails, an economical and serviceable construction for normal estate work.

On Friday morning Party B travelled to Blelack estate where Mr. Peter McAinsh welcomed the party and conducted the tour of the estate. Little systematic thinning was done until 1938–39 except for the removal of a few thousand telegraph poles. There are about 600 acres of very fine Scots pine plantations giving good seed stands. Favourable comment was expressed on the excellent young plantations of Hybrid larch and Scots pine now approaching the thinning stage.

An interesting discussion took place on the economics of forestry and some valuable advice was given by Mr. McAinsh on timber sizes to reduce conversion loss. Stress was placed on the importance of buyer/seller relationship and the continuity of supply.

Excursionists were deeply appreciative of the hospitality shown them on all estates and places of interest visited, and the trouble taken by owners and staff to make the visits pleasant and interesting.

ROYAL FORESTRY SOCIETY OF ENGLAND AND WALES: SUMMER MEETING AT KESWICK, MAY 1961

By

S. CHAPMAN

Forester, South-West England

Tuesday, May 2nd—Visit to Thornthwaite Forest

Thornthwaite Forest was one of the earliest to be formed by the Forestry Commission; planting having commenced in 1920. The forest comprises of 6,307 acres of which 4,906 acres are under plantation, 266 acres awaiting planting and the remainder farm land or unplantable.

The soil is free-draining and friable, derived from Skiddaw Slate of the Ordovician age. Vegetation consists mainly of Calluna, Vaccinium, moorland grasses with bracken on the lower slopes. Rainfall from 30 in. to 90 in.

The original pattern of planting was Douglas fir on the most fertile lower sites, then larches, then spruces with pines on the higher elevations. A lot of the European larch was of bad origin and is being replaced by Western hemlock, *Thuja plicata* and *Abies grandis*. Much of the forest is now in the pole stage and thinning is being carried out on a three year cycle. The main market for the produce is pulpwood, chipwood and local sales of posts, stakes and rails; only about 20% of the thinnings are sold standing to merchants.

Some nice stands of timber were seen, at 1,100 feet in Hospital Plantation some nice P.20 Sitka spruce are growing, they are at present according to F.C. yield tables, Quality Class III, with a thinning yield to date of 5,700 c.f. per acre and another thinning is now due. At Dodd Wood were nice stands of Douglas fir, planted in 1929, *Abies grandis* and Beech.

A short tool maintenance demonstration was given by Forester B. S. Thompson including sharpening of power saw chipper type chains using a round file with a David Dominicus gauge.

Extraction and conversion of thinnings was demonstrated using the following machines: Automower Portable Winch, Thompson Portable Winch, Fordson Major Tractor with mounted Winch, Ferguson Linkage Winch, Single Strand Aerial Ropeway, McConnel Mobile Saw Bench, Jo-Bu Chain Saw (Super Model) and Cundey De-Barker (Model E.R.).

A demonstration of loading small millable timber with Crotchline Loading Hooks was given. It was stated that this method of loading is common practice in Canada and the United States of America, and is most efficient with logs cut to a standard length. Although demonstrated with a 2 ton Hiab the usual practice is to have a separate loading crane. The hooks, of local design and manufacture, are carried by chains from a fully swivelling hook on the crane lifting rope. Attached to the hooks are long lengths of small-diameter hemp guide ropes.

Three men are required for loading—one to each hook—plus the crane operator. The two loaders each drive their hook into the end of the log, hold it clear by the guide ropes while the crane is lifting, then allow it to swing into position, pulling the hooks out again by the guide ropes as soon as it has dropped. It is estimated that a time saving of 50% on previous practice is being made.

At the Keswick Hotel in the evening, Mr. Faulkner, F.C. Geneticist (North), gave a very interesting talk on tree breeding followed by an American film which he has on loan called "A Tree is Born" which illustrated some of the work that is being done by the American State Forest Service in the selection of parent trees, collection and cleaning of pollen and spraying the pollen on female flowers on selected "mother" trees, later collection of seed and raising of plants.

Mr. Faulkner in his talk told us of some of the work the F.C. research branch are doing in this field. He said that the main work at present being undertaken was the selection and improvement of seed stands throughout the country. The establishment and maintenance of seed orchards and Hybridisation.

Wednesday, May 3rd (Morning)—Visit to Lowther Estates—(The Earl of Lonsdale)

The Lowther Estate comprises of approximately 72,000 acres of which just under 4,000 acres are dedicated woodland. The soil varies from red sand stone to heavy clay, there are also extensive areas of limestone outcrop. Average annual rainfall is 36 inches.

Afforestation of an Army camp site at Elysian Fields was seen. Holes had been blow in the concrete bases with gelignite and as some earth work was going on nearby surplus soil was carted and dumped in the holes. Cost of blasting and carting of soil was stated to have been £20 per acre. The area was planted with Japanese larch, Scots pine and sycamore and is now established. Last year the area was plagued with voles so it was decided to spray the area using a tractor mounted sprayer with "Toxaphine" at the rate of ½ gall. per acre. Cost of "Toxaphine" was 55/- per gall. Cost of spraying including spray 45/- per acre. No live voles were seen after spraying and two dead rabbits and a dead hare were found in the enclosure.

Opposite Elysian Fields a stand of mixed hardwoods was being thinned by students attending a six week forestry course under the instruction of Forester Instructor S. Betterton (Forestry Commission).

A tour of Yanwath Wood was made and a small stand of *Abies alba* (1922) was seen, also pole stage stands of Norway spruce, Sitka spruce, Japanese larch and Sycamore. A group of Scots pine was seen; these are known as the Barbados Pines, the seed having been brought to this country by a former Lord Lonsdale from the Barbados. They are reputed to be 230 years old, one tree when measured had a Breast Height Quarter Girth of 32 in. and an estimated volume of over 300 cu. ft.

The Estate Sawmill was inspected, a small modern mill with bandsaws for breaking down and re-sawing, a small circular saw for pointing stakes, a morticeing machine and a pressure tanalising plant. Daily output of converted material is around 1,200 cu. ft. and at present they have large orders for sawn and tanalised posts, stakes and rails for fencing Britain's new motorways.

Wednesday, May 3rd (Afternoon)—Visit to Winderwath–(H. W. D. Pollock)

A small estate with approx. 245 acres of woodland. Soil—light sandy gravel with glacial boulders, situated near to the river Eden and subject to early and late frosts. Rainfall approx. 28 in.

Tipperary Wood was inspected, Scots pine which was planted 3 ft $\times$ 3 ft. 6 in. in 1929 and not touched until 1947 when brashed and thinned the following year now responding to thinning. There are some nice Weymouth Pine on ride sides with some patches of natural regeneration. In the same wood a five acre block of European larch was clear felled in 1953 and is now restocked with natural regeneration of Scots pine and European larch.

A walk through Low Moss Wood showed a wilderness of birch and alder on deep peat; drainage is a problem as this wood is about the same level as the river Eden. Odford Wood was inspected which contained a small stand which was planted in 1929 with Douglas fir, thinned 1951 and a large area of birch scrub which has been cleared leaving overhead shade of various densities and underplanted with various species mainly Western hemlock, Douglas fir and Thuja all of which are growing well in spite of the fact that the area is subject to severe spring frosts.

A Wolseley Swipe mounted on a Land Rover was seen and a Jo-Bu brush saw and Jo-Bu weeding scythe were demonstrated.

Thursday, May 4th (Morning)—Visit to Thirlmere Waterworks Woodlands–(Manchester Corporation)

The catchment area of Thirlmere is approx. 10,000 acres, the soil is red-brown and fertile in the valley bottom with bare rock and peat at the higher elevations. The more fertile parts have been afforested, the general pattern of planting being Douglas fir in the valley with larch on the intermediate sites and Norway spruce, Sitka spruce and Scots pine at the higher elevation. Rainfall varies from 80 in. to 120 in. per annum.

A fine stand of Douglas fir was seen at Lowbanks. Age 53 years, average height 95 ft., volume 5,500 cu. ft. per acre, 165 stems per acre. This is a Forestry Commission Registered Seed Stand and has remarkably clean stems; this is probably due to the fact that original spacing was 4 ft. $\times$ 4 ft. and that thinning has been somewhat delayed.

An area known as "The Swirls" was visited and some stands planted from 1909 to 1912, Scots pine, European larch, Sitka spruce and Beech were seen;

growth was generally good but rather poor on the plateau which is just over 1,000 ft. above sea level. We were told that there are some fine views from this area but unfortunately it was raining at the time and visibility was rather poor.

Thursday, May 4th (Afternoon)—Visit to Grizedale Forest

Grizedale Forest is a compact area of 7,364 acres all within the Lake District National Park. 5,800 acres (approx.) are under plantation, approx. 800 acres of agricultural land and the remainder awaiting planting. The soil is free draining and is derived from Silurian shales slates. Rainfall—70–90 inches. Vegetation mainly Moorland Grasses, Bracken, heather and Vaccinium. Planting commenced in 1937; the main species used were Sitka spruce, European larch, Japanese larch and Scots pine.

The Hallwood Hybrid Larch Seed Orchard was visited. The orchard consists of five scattered European larch trees (P.1860) which have been classified as plus trees, beneath these are root stocks which were planted and grafted in 1954 with scions from five Japanese larch chosen for vigour, straightness of stem and relatively narrow crown. The five European larch plus trees already growing on the site have been reinforced by additional grafts planted at random among the Japanese larch.

Flowering on the grafted plants was light, owing to the dull wet summer of 1960. Attention was drawn to:

(a) Controlled polination techniques for obtaining progenies of known parentage.

(b) Gravimorphic flowering responses (Branches tied down to stem to induce flowering).

(c) The good shape of the grafts of certain parent trees (i.e. 301 Glendye).

(d) The shape of the progenies of the parent plus trees which occur as natural Regeneration.

The Propagation Centre was visited. It is comprised of a walled garden, glasshouses, a heated propagation frame and outbuildings. The walled garden is used for:

(a) Permanent Seed Beds—used for raising seedlings for rootstocks.

(b) Raising Rootstocks—by lining out to produce 1+1+1 or 2+1 transplants.

(c) Stool and Layer Beds—containing cloves of London Plane, *Cupresso-cyparis leylandii* and *Metasequoia glyptostroboides.*

(d) *Picea omorika* Experimental Seed Plantation—progeny of good *Picea omorika* from Petworth, Sussex. Various stem girdling and root pruning treatments have been made to initiate early flowering.

(e) Tree display—a surround on two sides of the garden containing established grafted plants or rooted cuttings from some notable trees growing in N.W. England.

The glasshouses are used for grafting and are electrically heated to keep soil temperature above 40°F.; special lighting facilities have been installed to extend the natural day length. Storage of grafts was explained and different types of grafting demonstrated. The heated frame is used for the mass propagation of Leyland cypress by rooted cuttings. Part of the frame is electrically heated and part is used for bedding out and hardening off successfully rooted plants.

A brief visit was made to the Deer Museum which contains mostly the heads and skins of Roe and Red Deer both of which are common at Grizedale.

"Gourock" 8 ft. polythene netting for Deer fencing was demonstrated. Cost £8 10s. 0d. per 100 yards obtainable from Gourock Ropework Co., Liverpool.

Friday, May 5th (Morning)—Visit to Lingholm Estate-(Viscount Rochdale O.B.E.).

The estate contains about 400 acres of woodland. The soil is sandy and gritty overlying Skiddaw Slate. Rainfall approx. 65 inches.

A walk up into an area known as "Swinside" was taken and European larch, planted 1925, which had been heavily thinned and underplanted with Douglas fir in 1953, was seen. The meeting agreed that most of the larch should be removed as soon as possible. Further up the hill Japanese larch had been planted with Beech groups in 1953. The site was apparently too good for Japanese larch and their vigorous growth had shaded out most of the Beech.

Near to the shore of Derwentwater some fine specimens of Silver fir. and Scots pine were seen, one silver fir measured 40 in. Breast High Quarter Girth, estimated height 130 ft. and stated to be approx. 130 years old.

There was also a very colourful and interesting collection of special rhododendrons and azaleas.

Friday, May 5th (Afternoon)—Visit to Manesty and Brandlehow Woods-(National Trust)

This property was bought by public subscription in 1902 and was the first property acquired by the National Trust in the Lake District.

In Manesty Wood some fine European larch, planted 1860 approx. were seen, one elite stem was stated to have measured 93 ft. high × 7 ft. girth in 1955 and 99 ft. high × 7 ft. 2½ in. girth in 1960. The Forestry Commission have taken scions for grafting from this tree.

Much natural regeneration of Scots pine and European larch was seen and a lot of work was being done to remove weed species which were mainly Birch and Mountain Ash.

A circuit of Lake Derwentwater was made by launch, when Great Wood, Stable Hills Park, Friars Crag and the Isthmus was seen.

The meeting dispersed at 4.30 p.m.

The tour was full and extremely interesting and instructive; unfortunately there was so much to see and hear that there was little time for discussion.

FOREST MECHANISATION COURSE OF THE NETHERLANDS LAND DEVELOPMENT AND RECLAMATION SOCIETY, ARNHEM–July 1961

By

M. A. COLLEY

Assistant Forester, New Forest

Introduction

This course, one of several run under the auspices of the I.L.O., was held at the very fine College of the Nederlandsche Heidemaatschappij (Netherlands Land Development and Reclamation Society) in Sonsbeek Park, Arnhem. This organisation, a private body, pioneered the vast land reclamation projects undertaken by the Dutch, in their battle against the sea. Non-profit making, its aims are now extended to planting and management of forests and reserves, regulation of water-supply in rural areas, draining and irrigation (surface and sub-soil), land-levelling, building of roads for agricultural purposes, farm architecture, fisheries research and exploitation, and construction of recreation centres and grounds. Above all, the methods of irrigation, drainage and water-levels are constantly under review. All parks, public recreation grounds and roads are constructed in consultation with the society, and all private woodlands administered by them. Particularly noticeable when travelling through Holland is the roadside planting of trees, usually two or three rows of hardwoods; beech, poplar and willow seemed very common. Thus the influence of the Society can be seen throughout Holland, in town and country alike, its guiding hand greatly adding to the aesthetic attractions and amenities of the land.

The College, however, is state-aided, providing comprehensive courses for the technical staff of 2,300 and labouring staff of up to 30,000. The following is a report on the Mechanisation course, attended by three Forestry Commission Foresters, and one Scottish Private Woodlands representative, the remaining twelve being Managers and Assistant Woodland Managers of the Society.

Monday, July 10th

Welcome by the College Principal, Herr van Hattem, and his assistant, Herr Druyff. There followed a general introduction to Dutch methods and use of small hand-operated machines, mainly power saws: the Supervisor must be prepared to instruct and check maintenance and use of machines; the system being for the employer to purchase saws and give to worker, correspondingly reducing rates, which are set by the Government through negotiation between Workers' Unions, Landowners and the Society. These are "minute" rates, thus remaining constant, and including fuel, oil and spares supplied by employer. Mechanical work not always cheaper but easier and quicker, thus *saving in time.*

Advantages: (1) More work.
(2) Easier work.
(3) Cheaper work(?).

Disadvantages: (1) Greater accident rate (not so frequent, but worse accidents).
(2) Deafness caused by noise of power saws.
(3) Work needs to be more highly organised—machines kept employed as much as possible.

Some figures were quoted, which indicated an overall time saving, using power saw, of 22%.

In the afternoon, we were divided into pairs for power saw working, each pair being made responsible for their own machine's condition, cleanliness, sharpness of chain, spares, petrol and oil. Types of saw were:

Solo	Dolmar CP
Stihl	Dolmar CF
Homelite	Dolmar Typhoon
	Jobu

I have followed slides on the 2-stroke engine, then a film on the same subject.

Tuesday, July 11th

Assemble 0800 hours, and travel by car through Scots pine Mother Tree areas to where some S.P. of 10–30 Hoppus content had been felled and, peeled, extracted to rideside, as is the Dutch practice. There, all the saws were laid out with their tools, and an introduction to the saws with instructions and tips for use were given:

(1) Chain must by just tight enough to be pulled round bar, using two fingers only.
(2) Some saws have automatic oiling (Dolmar, Stihl), others manual (Solo, Homelite).
(3) Chain tensioning is by serrated blocks and lever, or screw.
(4) Only essential tools such as plug spanner, chain tensioning tools, and screwdriver, should be taken into wood; others left at a central point.
(5) Old sump oil should not be used for chain lubrication because of metal particles in suspension, but a cheap new oil is permissible.
(6) Use pourer cans, never funnel, because of dirt accumulation in latter.
(7) Always clean off saw after filling.
(8) Use ordinary oil in petrol mixture, as "self-mixing" ingredients cause an incorrect mixture.
(9) Starting—choke out, put foot on one handle, lean weight on other, set throttle and give short, sharp pull.
(10) Carrying—always with blade towards rear for safety.
(11) Commence sawing at tip of tree, work towards butt.
(12) When engine idling, chain should become stationary, otherwise a fault in throttle setting, or the centrifugal clutch, is indicated.

Use of the saws in bucking (cross-cutting) was demonstrated, also the very effective use of the Sapie for taking the weight, and general handling of the timber. We were then let loose in our pairs to continue bucking the ready-marked vast number of trees.

After lunch we were introduced to the extremely popular game of volleyball. In fact, we Englishmen had barely digested our meal, when our comrades slung a net between two convenient trees, then everyone began, with quite horrifying vigour, to beat a football across at one another. However, we joined in, and instead of finding ourselves tired at the end, were remarkably invigorated. It seems this game is widely recommended for cultivating free movement, and is certainly very popular. During the course, we all became quite adept, and as keen as any. Great emphasis throughout was laid on technique and movement, time being allowed for Forest Workers to have Gymnastics and volleyball regularly.

Afterwards we continued bucking until 5 p.m., when we returned to the workshop and cleaned down our saws.

In the evening, the British contingent was taken by Mr. van Hatten on a tour around Nijmegen area. There, a 1500 acre area of forest belongs to the town, and is run by the Heidemaatschappij, combining practical forestry, and a recreation area for the townspeople, adding greatly to the beauty and facilities of the town. We then visited the Groerbeek Canadian War Cemetery, which was beautifully maintained, as was also the Cemetery and Memorial to the Allied Airbourne Troops. From the former we had a fine panoramic view across the Reichwald in Germany. This was formerly mainly hardwood, but suffered the same fate as many of our British Forests, being heavily felled during the last war, then subsequently planted with conifers. The actual town of Nijmegen was largely devastated during the war, as was Arnhem, and approximately half completely rebuilt on very attractive modern lines. During this tour we passed along some fine examples of the Society's work on the roads, these being finely surfaced, wide, and attractively bordered by hardwoods.

Wednesday, July 13th

Theory and slides on Chain Maintenance. A chain (Oregon type) for a modern power saw consists of cutters, rivets, drive links and tie straps amounting to 350–400 parts. To obtain optimum results and long chain life, correct maintenance, and care, are essential:

(1) Oil new chain continuously whilst idle running at not more than half throttle for five minutes.

(2) Check oil level regularly.

(3) Leave chain in oil overnight.

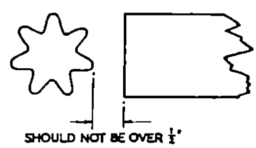
(4) Fit chain on bar, check tension by pulling round with two fingers.

(5) Commence work on small, soft timber.

(6) Stop if bar overheats.

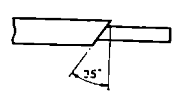
(7) Never file with chain in position on bar.

(8) Always ascertain that drive links fit flush against teeth of sprocket.

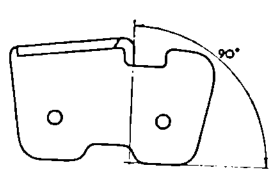


Filing should be done regularly, and the following basic rules strictly observed:

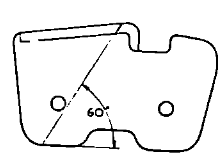
(1) Top plate filing angle 35°. This gives best cutting in a wide range of woods.



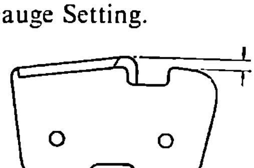
(2) Side plate angle 90°.



(3) Top plate cutter angle 60°.



(4) Use correct Depth Gauge Setting.



There are numerous refinements, such as maintaining 1/10th of file diameter above cutter, and filing with a rotary action, but providing the above four rules are observed, the chain will be sharp.

There followed a practical demonstration of the principles of filing, then we sharpened our own sawchains, finishing by brushing off filings, assembling saw, and packing up tools. Then lunch and volleyball.

In the afternoon we travelled to an area of 40–60 ft. Scots pine marked for a strip felling. Felling and trimming by power saw was demonstrated, after which we continued felling in pairs.

Wednesday evening lecture was on handling of machine: Power saw should only be used where economical—use axe where better; it is difficult to get eight hours' solid work from saw—maximum experienced was six hours. It is possible to use saw all day, but better to have another man to pull aside branches, etc., also more rest time needed. The main causes of trouble are chain, bar, and sprocket—engine gives little trouble. Manual v. automatic oiling—manual preferable for expert operator, cold starting, and heavy sawing. When choosing a machine, the following should be considered:

(1) Weight—not more than 27 lbs.

(2) Cost.

(3) Fuel requirements and consumption.

(4) Servicing and spares—availability.

(5) Centrifugal clutch essential, membrane carburettor preferable.

The Solo has a 125 c.c. engine, thus combining low revving and long life, while still developing 6 h.p. approx. If machine owned by employer, maintenance should be done in firm's time, if workman, in his own time. Operator must be capable of doing own running repairs.

Technique:

(1) Hold saw loosely.

(2) Feet well apart, knees bent.

(3) Let saw feed itself.

(4) Rest elbow on knee.

(5) Keep engine low as possible when cross-cutting.

(6) Avoid running chain into ground.

(7) Always leave uncut hinge when felling.

Thursday, July 14th

0745–0900 hours. Gymnastics under Physical Training Instructor in a school Gymnasium. Then lecture on ignition covering the usual principles of coil and magneto ignition. This was followed by a practical demonstration from 1100–1230. A tip given, new to the writer, was that a reddish or yellow spark at plug points indicates a poor condenser.

For the practical demonstration, a Jobu flywheel magneto was dismantled in the workshop, and fitting and checking of contact breaker points illustrated, then practised by ourselves. Following lunch and volleyball, this work was continued in the afternoon.

Evening theory was on float carburettor—parts and principles, followed by a General Motors film on the 2 and 4 stroke engines.

Friday, July 16th

Assemble in workshop—demonstration and practial work on removal of chain links by different methods:

(1) Sandvik hammer and block.

(2) Oregon "Rivet Spinner". Very efficient, but a bench tool.

(3) Peterson "Vice Grip"—a universal tool for use in the wood.

One point to note was that when fitting new link to old chain, the new depth links and cutters must be filed to same depth and length of the others.

We then travelled to the wood, where back-cutting and wedging a leaning tree was demonstrated. The principle to observe on a small tree is to remove the saw as soon as it is felt to pinch, then wedge over. On a larger tree, saw until bar is far enough in timber to enable a wedge to be inserted, then ease bar back half an inch. Then wedge, and should wedge touch the chain, movement can immediately be observed before any damage is done. *Aluminium wedges* are essential.

We then continued felling for the remainder of the day, then returned to workshop, cleaned off saw, remove bar and chain. Wash latter in petrol, sharpen, brush off filings, then soak in "Molykote" for five minutes. This contains Molybdenum Disulphide, which has well-known persistent lubrication properties, and greatly reduces wear, thus lengthening chain life. Clean air filter and re-assemble saw.

Saturday, July 15th

This account would not be complete unless our memorable visit to the Polders was included. We of the British Contingent were taken by Herr Druyff to the Zuyder Zee, where we saw land being reclaimed by the apparently simple expedient of dredging a channel in the sea, constructing banks, thus making a dyke, then pumping the sea out, reclaiming this land from the sea. These areas are called polders, and in fact constitute a gigantic feat of civil engineering. The story of Dutch land drainage is an impressive one, and its success can be measured from the fact that without the dykes along the river banks, lakes and sea coasts, more than two-fifths of the entire country would be under water. The density of population is 40% greater than Great Britain, so from that fact alone, the importance of land reclamation can be gauged.

We met a State Forester, Mr. Overbeek, who is in charge of afforesting his allocation of the new 130,000 acre Eastern Polder, which was only drained 1957. Naturally enough, the poorer soils (boulder clay, etc.) are allocated to Forestry. Five hundred acres were planted autumn 1957 and spring 1958, including establishment of a highly mechanised nursery, which we visited. Noteworthy points were:

(1) Planting-out machine which set 10,000 plants per hour (5 lines).

(2) A man costs 4 guilders/hr. Tractor 3½ g./hr.

(3) Hoeing, lifting, poplar lifting, drainside mowing, are all mechanised operations.

(4) 110 acre nursery run with only 6 men.

There are ditches every 24 metres, lined with alder windbreaks. Apparently the main plantings at the moment are poplar, as a pioneer species, underplanted with alder. We saw poplars 23 ft. high P.58 ("gelrica", "robusta", "serotina", *tremula:* I.240). The alder is used to keep down weed growth, and because it needs very little nitrogen. The soil has a very high PH value, accounting largely for the poor S.S. we saw. Some very swampy land was sown with *Phragmites* (rush) from the air, and, due to the high evaporation rate, it was possible to work the ground the following year, and plant poplar. These were obtained from a variety of sources, including Oxford, but so far no variety has been found with no attendant troubles: (rusts, canker, crooked growth, etc.).

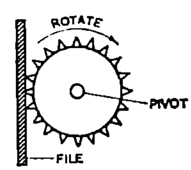
After lunch we visited the older North Eastern Polder, opened 1942. Although the new one had had good roads already, houses were mainly in small groups, with no main towns yet, whereas driving along the North Eastern Polder, it was difficult to believe that only 19 years ago we would have been 15 ft. below the sea; there is a centrally situated main town and many villages and farms—all state-owned. The roads are superb, all lined with poplars, usually three rows, up to 80 ft. tall.

Altogether this was a most memorable visit, it being particularly uncanny to reach the edge of the Polder and have to climb up to look out across the sea, then, looking back, see the land 15 ft. below.

Monday, July 17th

Assemble in filing shop. Here each man has his own vice and drawer containing a full set of sharpening tools: wallet of files, 40° template, ruled card 60° for filing guide, hammer and anvil, carborundum stone, saw set, set gauge, mirror. First of all filing of a circular branchcutter saw was demonstrated in the following steps:

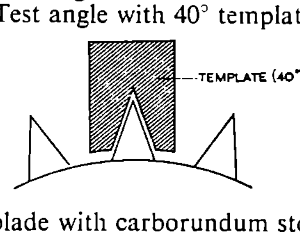
(1) Hold blade in jig—revolve against file to maintain consistent radius



(2) Scribe line at base of teeth to correct depth (14–15 mm.).

(3) File gullets to this depth.

(4) File correct angles on teeth, leaving just a needle-point flat visible. If this point is filed off, the height is reduced, meaning that this tooth is not doing any work. Test angle with 40° template.

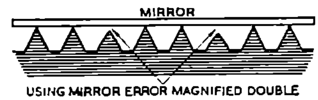


(5) Rub each side of blade with carborundum stone to remove burrs.

(6) Set to ·6–·7 mm.

We were all then set to work applying these principles to filing a variety of saws.

One point that impressed the writer was the use of a mirror to show most graphically how one stroke too many with the file will reduce the height of a tooth, rendering it virtually ineffectual.

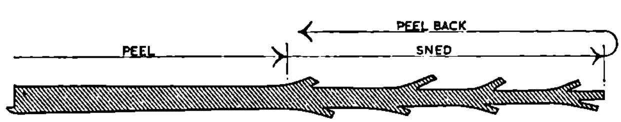


Tuesday, July 18th

Lecture on fault-finding in power saws. The point was made that faults are almost invariably caused by malhandling. Daily maintenance should not be neglected, correct fuel/oil mixture used, and correct heat rating spark-plug fitted. Faults can be divided into two categories: (1) Fuel, usually avoidable by keeping fuel and filters clean, and (2) Ignition—often spark plug. Ordinary oil should be used, as in self-mixing oil, 20% is non-lubricating.

We then travelled to the wood once more, where a demonstration of rationalisation of "one-man" work was given; this is really part of the separate rationalisation course, but was shown for interest:

(1) Commence back-cut with bushman.
(2) Cut small throat (3 lb. Iltis axe).
(3) Continue cut through with bushman.
(4) Push tree down, using lever up the tree (peeler).
(5) Axe off sloven or "beard."
(6) Throw axe to first branch.
(7) Peel from butt to first branch, using correct technique—bending knees, flowing stroke, back straight.
(8) Throw Peeler to end of tree.
(9) Sned out.
(10) Turn tree—locate with cant hook to prevent rolling.
(11) Sned other side.
(12) Peel other side.



We then continued felling with power-saws, trimming and some peeling, to the end of the day.

There was an evening lecture, with slides, on chain saw safety.

Accident Analysis:

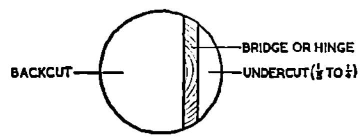
Felling	30%
Bucking	20%
Working too close to others ..	13%
Branching	7%
Changing position with power saw	6%
Miscellaneous	19%

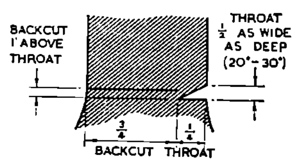
Dress correctly with proper long boots, hard hat, goggles and earplugs when using chain saw, gloves.

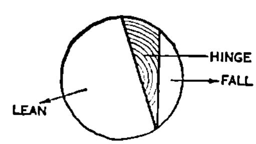
Handling—Always keep back straight if possible, bending from the knees. Use a chain protection (rubber or canvas). Carry with blade to rear.

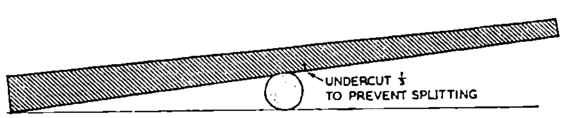
Felling—Use correct methods, bearing in mind:

(1) Direction of wind.
(2) Lean of tree.
(3) Incline of ground.









When pushing a tree down, always use a rod up the tree to obtain extra leverage.

Boring—do as little as possible, as chain, bar and engine take a heavy beating.

Never put one foot on tree when bucking.

Fire Prevention: (1) No smoking when re-fuelling.
(2) Wipe saw after re-fuelling.
(3) Keep containers well marked.

Wednesday, July 19th

Assemble in workshop, service saw, file chain. Then travel to beech wood for demonstration and practice on felling hardwoods. The Dutch rate is 3 cents per cm. of Breast Height circumference. It took Herr Folsche, a very proficient instructor, one hour to trim off buttresses, fell, and completely trim out and cut cordwood lengths of a fair-sized beech tree of 203 cms. breast height circumference.

$$=203\times 3 \text{ (cents)}$$
$$=609=6 \text{ guilders}$$
$$=12 \textit{ shillings in } 1 \textit{ hr.}$$

The rest of day was spent in practical felling, bucking and cording up the marked beech trees.

Thursday, July 20th

0745–0900 hours Gymnastics, followed by a demonstration of an AGRIA 2-wheeled tractor and trailer. This is a very versatile machine incporporating a differential lock, Ground Speed and Engine Speed P.T.O., wheel and propshaft brakes. However, the prices, in Holland, of approx. £450 for the tractor and £250 for the trailer seemed rather prohibitive.

We then travelled to the *Heidemaatschappij Machinery Research Workshops* and offices, some distance outside Arnhem. As far as we could tell, this establishment corresponded very closely to the Forestry Commission Machinery Research Workshops at Alice Holt, Farnham, covering similar fields, but rather more extensive by reason of the vast amount of Land Reclamation equipment. Dealing briefly with forestry machinery only:

(1) The "Rotaspa" Rotary Spade Plough; completely cultivated by an unusual method by which rows of spade-like tines rotate and turn with a simulation of a digging action. Rather complex gearboxes at base of each tine.

(2) Borer used for potholing trees. Bores up to 2½ ft. deep up to 100 per hour. Possibility for Poplars, or larger trees than our usual 1+1.

(3) A type of Buckrake for pushing together brush in prep. ground operations.

(4) English Planting out Machine—somewhat modified.

(5) Swedish scarifier—makes screefs at regular intervals for planting. We saw some work that had been done with this machine, and were not impressed.

(6) German Planting Machine (2 units). Not differing vastly from the English machine.

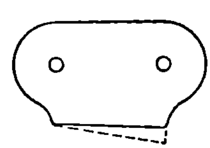
(7) A vast plough for reclaiming moorland areas. This ploughs 3 ft., and mixes upper and lower soils. Drawn by one or two D.6 tractors. There are other ploughs of this type, apparently, which penetrate up to 6 ft.

We then returned to the lecture room for theory on engine fault-finding. The principles expounded were the same as for any I.C. engine.

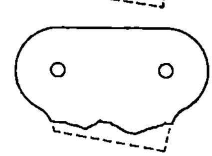
In the afternoon a very informative lecture was given on detection of faults in the Chipper Chain, and their remedy, illustrated with slides. A selection of the faults and remedies is reproduced here:

A. Drive links

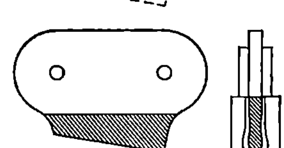
(1) Worn tang.
Cause: Shallow bar groove.
Remedy: Re-groove bar.



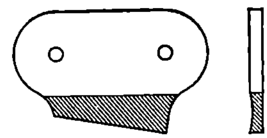
(2) Damaged tang.
Cause: Chain pile up on sprocket when chain breaks.
Remedy: Replace damaged drive links.



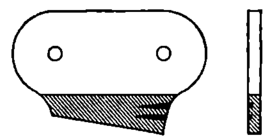
(3) Incorrectly sharpened cutters causing drive links to wobble in bar.
Remedy: Re-groove if possible, or replace bar.



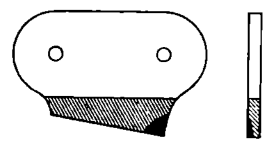
(4) Uneven side wear.
Cause: Incorrect filing of cutters on one side of chain only.
Remedy: File chain correctly. If trouble persists, replace bar.



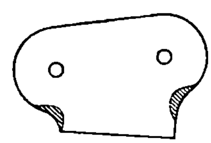
(5) Scars on side of drive links.
Cause: Loose chain jumping bar, or hanging up on hard tip bar.
Remedy: Adjust tension; inspect bar entry.



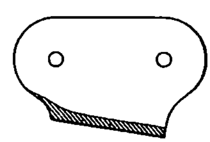
(6) Front point worn on side.
Cause: Stocking inside of bar rails at entry, or dirt behind bar mounting pad.
Remedy: Refunnel baventry. Clean off bar mounting pad to line up bar and sprocket.



(7) Front or back peened.
Cause: Improper chain fit and/or prolonged chain shatter.
Remedy: Replace sprocket.



(8) Back rounded.
Cause: Chain out of pitch with sprocket.
Remedy: New sprocket may help, but chain almost gone.



B. Cutters and Tie Straps

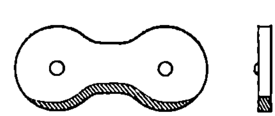
(1) *Condition:* Excessive heel wear on cutters and opposing tie straps.
Cause: Chain too loose; incorrect filing.
Remedy: Adjust chain tension; file chain correctly.

(2) Extreme wear on all cutters, tie straps and drive-links.
Cause: Pushing dull chain with high depth gauges.
Remedy: Adjust chain tension, refile, and re-groove bar.

(3) Concave cutters and tie strap bottoms.
Cause: Chain too tight. Leads to cracked tie straps due to overheating. Obvious loss of power.
Remedy: Adjust chain tension.

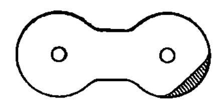
C. Tie Straps

(1) Edges burred and notch peened.
Cause: Chain shatter due to loose chain and improper filing.
Remedy: Replace sprocket; adjust chain.



(2) Notch peened.
Cause: New chain on worn sprocket.
Remedy: Fit new sprocket.

(3) Battered fronts of tie straps and cutters.
Cause: Chain striking bar at entry. Sprocket diameter too small, chain too loose.
Remedy: Proper combination of chain and bar; correct tension; fit new chain if joints too tight.



D. Depth Gauges

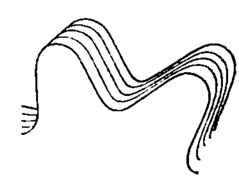
(1) Shiny top of depth gauge.
Cause: Set too high.
Remedy: Lower (file).

(2) Front corner worn.
Cause: Filed too low; loose chain.
Remedy: Adjust chain tension.

(3) Depth Gauges not uniform.
Cause: Incorrect filing.
Remedy: Use Oregon "Guagit" or similar depth setting tool when filing.

E. Sprocket

Worn sprocket.
Cause: Chain chatter.
Remedy: Adjust chain tension; fit new sprocket.



Bar Entry

Wear at bar entry caused by chain striking bar. Funnel bar correctly, (file).

Friday, July 21st

Assemble in workshop. Clean off and file chain saws. Travel to same area of woods as on Wednesday. There we used the Jobu, Stihl and Dolmar scrub-cutters, which are circular saws mounted on shafts attached to the power saw engine unit. These are attached by harness to work at one's right or left side. We had a demonstration, then used all the machines ourselves on a dense area of weed growth including some scrub oak and other woody stems up to 2 inches diameter, with which all the scrubcutters dealt quite easily. There could be some application in England for weeding, particularly in dense grasses, but there has been an F.C. trial and H.Q.M.D.C. Report issued on the Wiesel, a similar type of machine.

We all then returned to the workshop for a demonstration of the A.S.A. Propane Sprayer. This comprises a cylindrical container for weedkiller such as Dalapon, and a smaller cylinder of Propane Gas, which maintains a constant pressure in the main container, difficult with our air-pressure sprayers. Coverage by the usual boom with nozzles, and the whole neatly mounted on a harness and carried by a man quite comfortably. Eight sprays with a 4-metre spread. Cost of complete unit £80–£90.

In the afternoon a lecture on fuel oils and their derivation and processing, finishing with a costing of power saws in Germany.

Costing of Power Saws in Germany

	Per Hour GEAR DRIVE (2,000 hrs. LIFE)	*Per Hour* DIRECT DRIVE (1,500 hrs. LIFE)
	DM.	DM.
Depreciation (cost ÷ hrs.)	0·50	0·50
Repairs	0·30	0·30
Replacement Chains ..	0·40	0·45
Files (6 files to one chain)	0·12	0·12
Insurance	0·20	0·20
Interest	0·09	0·07
Petrol, oils, etc.	1·30	2·15
	2·91	3·79

Average purchase price 992 DM. (Deutsch Marks).

Thus concluded a most informative, well-run and extremely interesting course, throughout which we had nothing but the highest praise for the Instructors in efficiency and hospitality, and for the latter, we must particularly thank Herr Van Hattem and Herr Druyff, both of whom gave up a considerable amount of their private time for our benefit. And finally our thanks to the Nederlandsche Heidemaatschappij, and the International Labour Office for making this course possible.

Regarding application of knowledge gained, the Forestry Commission in general are now turning towards the power saw, and in the writer's area, the New Forest, only very recently. Operation techniques are of course, invaluable, and already knowledge of fault-finding has helped us out of awkward situations, resulting in one case in a defective saw being returned to the Distributor, who remedied a basic fault.

THE WILD PINES OF KIELDER FOREST —ARE THEY TRULY NATIVE?

By

H. L. EDLIN

Publications Officer, Headquarters

with Notes by V. Blankenburgs, Dr. A. Carlisle, Professor H. M. Steven and K. Wilson

About 1955, Mr. Valdemars Blankenburgs reported and photographed some self-sown Scots pines growing on a remote hillside above Kielder Forest. His photo was reproduced facing page 41 in the *Border Forest Park Guide* (Walton, 1958). At the time these pines were believed to be possible survivors of the indigenous forest cover, but this has since been doubted by several people who have heard of them.

On October 19th, 1961, I visited these trees with Head Forester W. L. McCavish. They are situated on the free-range grazings of Scalp Farm, in a narrow gully known as William's Cleugh, which is named on the Ordnance Survey one-inch map. Their position is roughly 4 miles north of Kielder Castle and 1½ miles east of the summit of Peel Fell on the Scottish Border; they are 1½ miles north-west of Scalp Farm, the nearest dwelling. A forest road, recently made to aid the winning of gravel from the bed of the Scalp Burn, comes within ¾ mile of them, ending at the edge of Commission planted sprucewoods. They stand 6 miles from a public road by the nearest practicable route, in a basin surrounded by fells averaging 1,500 feet in height.

This part of Kielder Forest is quite unlike the better-known portions. The glacial drift is here sand and gravel rather than clay, with outcrops of the bed-rock, which is here a Fell Sandstone. The vegetation is mainly heather, and not the *Molinia* grass that prevails on the peat and clay elsewhere. The moor supports a good stock of red grouse as well as sheep. The farm is managed by the Ministry of Agriculture on the Commission's behalf.

William's Cleugh is a narrow gully running east for over a mile down the side of Peel Fell. It originates at 1,700 feet and falls to 900 feet, to join the Scalp Burn. For part of its course, between the 1,000 and the 1,250 feet contours, it holds an interesting patch of natural broadleaved scrub woodland, about half a mile long but only some 50 yards wide. The trees represented are birch, rowan and willow. Owing to the steep sides of the cleugh, in which erosion of the till is steadily proceeding, the trees appear to get some respite from grazing sheep and muirburn fires. Roe deer are known to have visited this tiny wood from the nearest spruce plantations, half a mile off. This wood appears to stand higher than any others of its type in the Kielder region. It is not shown on the Ordnance Survey one inch map, probably because it is too narrow.

On the north side of the cleugh, and about a quarter of a mile apart from each other, stand the two Scots pine "Mother trees". The higher of the two is about 25 feet tall and 3 feet in girth, and—allowing for the poor site, we guessed its age as 100 years. It has given rise to 5 "daughters", the tallest being 10 ft. high and possibly 20 years old.

The "Mother tree" that stands lower down is about 20 feet tall, 2 feet round, and has only 2 "daughters", again about 10 ft. tall and 20 years old.

There is no evidence that this "wood" has ever been fenced; in fact there are no fences hereabouts except for small circular stone sheep folds; the younger trees are clearly the progeny of the older ones.

The Mother trees likewise appear to be self-sown, but there is now no apparent source of Scots pine seed anywhere near. The Ordnance Survey map (Scotland sheet 86, 1925 edition, Revised 1922) shows shelter blocks on Ewe Hill, 2 miles away down the approach valley to the south-east, which have now been felled. Another block appears on Greyhound Law, 1½ miles to the south over a 1,500 ft. fell, and a third on Heather Knowe, in Scotland, 2 miles to the west, over an 1,800 ft. ridge. Allowing for the high winds that sweep over the Cheviots and the possibility that a covering of frozen snow might help seeds to travel without settling,—until they reached a hollow such as the cleugh, it is possible that the parent seeds were blown from one of these blocks.

The date of the planting of these shelter blocks is unknown, but it can hardly be earlier than 1777, when Kielder Castle was first occupied. There has, however, been ample time available for pines in these blocks to have reached seed-bearing age by, say, 1860, when the "Mother trees" may have originated.

About a mile up the main valley of the Scalp Burn from William's Cleugh, there is one solitary sturdy pine, and a mile above that another one. Both appear to be about 100 years old, and are growing amid rough boulders near the stream. Both are in places where a seedling pine might escape grazing sheep, but neither is in a place where anybody would be likely to plant any trees.

Altogether, there were four "mature" and seven young pines in this isolated valley, scattered over a distance of 2¼ miles, and 2 miles from the nearest likely seed source.

If one accepts the idea that Scots pine seed can be effectively wind borne over such distances, their origin is easily explained. Otherwise, it is necessary to consider the theory that—like the birch, rowan, and willow, they are the last survivors of a natural forest. Those in the cleugh are of an unusual type, with small short cones borne very profusely.

There could hardly be a more suitable spot for pines to survive, owing to its remoteness, the gravelly morainic drift suitable for regeneration, and the heathery vegetation. The absence of any older and larger trees at this date could be explained by local farm demands for fuel and fencing timber. Certainly there was little or no pine timber worth harvesting here in 1772, as it is recorded that all the timber used in the building of the Castle of Kielder was "led from Newcastle" (Walton, 1958).

Some light on the survival of pine from prehistoric times is shed by the investigations that have been made on the pollen grains preserved in the peat bogs. Dr. Kathleen Blackburn, of the Botany Department, King's College, Newcastle, found that pine pollen was particularly abundant about 6,200 B.C. at the close of the Boreal Period. Then it declined, but has never disappeared at any time from then to the present day. This pattern appeared at two places: Wellhaugh Flow, some seven miles from the surviving pines (Blackburn, 1944), and Broadgate Fell, near Ridsdale, some 18 miles east of them (Blackburn, 1953).

On the other hand, J. Precht (1953) found only a discontinuous record of pine in a peat bog at Cold Fell, near Brampton, some 20 miles south of the pines; and no pine pollen could be found in the most recent deposits there.

This suggests that pine only survived locally, and not everywhere, over the Border region. The stumps of vanished pine trees are often encountered when the peaty moors are drained or ploughed, but many of these stumps have been there for hundreds of years. As place names sometimes serve as a guide to the character of past forests, it is of interest to note that Scalp Burn is called locally "Scaup Burn"; a likely derivation of this is "Shaw hope burn" from Old Norse *Skogr hopr brunnr*, it means "forest valley burn", indicating a notable woodland.

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Blackburn, K. B., 1953. A Long Pollen Diagram from Northumberland. *Transactions of the Northern Naturalists Union.* Vol. 11, Pt. 1, 1953, p. 40.

Precht, J., 1953. On the Occurrence of the "Upper Forest Layer" around Cold Fell, Pennines. *Transactions of the Northern Naturalists Union,* Vol. 11, Pt. 2, 1953, p. 44.

Walton, J., 1958. *The Border: National Forest Park Guide,* H.M. Stationery Office, pages 3, 8, 41 and 51.

Comment by Mr. Valdemars Blankenburgs, Kielder

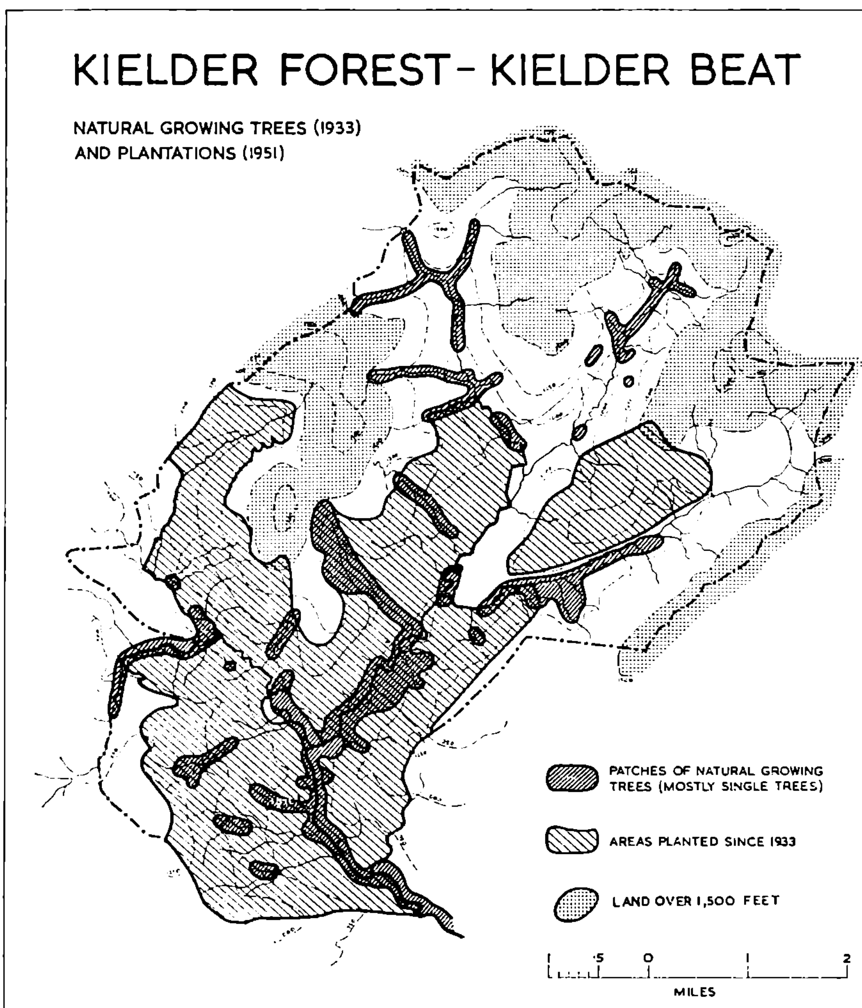
I agree, there is not any exact evidence that those pines are descended from remains of the local ancient forest. And it is also probable that the seed, which raised the mentioned pines, was brought there from some local pine plantations.

If that is the case, it is doubtful if the seed has been carried by wind from Ewe Hill plantations or from plantations over the Border. Although it is generally known, that on hard snow pine seed can travel for miles, in our case the William's

Cleugh pines are separated from the mentioned plantations by many deep and steep-sided ravines and deep streams and the seeds have to be blown long distances *up* steep slopes. Therefore, if we support the view that the seed came from some forest plantations, I assume they have been brought in the wool of grazing sheep or in hay, which was gathered or stored near pine plantations and used as additional food for hill sheep in hard winters. Also some birds can be held responsible for carrying the seed.

But there is also the possibility that the William's Cleugh pines are direct descendants of local native pines, which cannot be ignored, for these reasons:

(1) The remains of the native forest and scrub-wood, mostly birch and alder in Border area occurs much more widely than generally assumed. This can be seen from the one-inch map of Kielder Beat. Therefore it is possible, that in addition to the native birch, alder and mountain ash, also some native pines still exist. Here I would like to mention, that the William's Cleugh pines are not the only self-sown pines in the Kielder



area. In the recent years I have found here more than half-a-dozen places with self-sown pines at various ages. It is an evidence that pine in Border are naturally regenerated in favourable places, where the seedlings are not destroyed by sheep or fire.

(2) Dr. Kathleen Blackburn in her Pollen Analysis diagram of Wellhaugh Flow, which is situated in the middle of the Kielder forest area, shows pine pollen at *all* levels in the peat. It can therefore be concluded that the native pine did not vanish completely, and a few trees, which escaped moor burning, sheep and destruction by men, still exist.

Notes by Dr. Carlisle, Nature Conservancy, Merlewood

A. These trees appear to fall into the category of those small woodlands and groups of Scots pine which I classify as semi-natural woods of unknown origin. The facts are that on such a small sample of trees we cannot say definitely whether or not they are the remains of a primeval forest, in the absence of any historical record. I use as the criteria for deciding whether or not a forest is truly natural and indigenous:

(1) The site history, either from written records or pollen analyses.

(2) The structure of the stand; the range of age classes and their spatial distribution.

(3) The general ecology of the site.

(4) The % of the different morphological variants in the woodland.

(5) Minor evidence such as annual ring data, place names, etc.

None of these is valid evidence on its own, except No. 1.

As you can see, most of these need a forest to study. If you come across a person (and there are many of them) who goes up to a group of two or three pines and says "Short glaucous leaves, red buds, typical habit. These trees are definitely *var. scotica*," you can be assured he does not know what he is talking about. All the variants occurring in Scotland and England also occur in Norway and Sweden. The point of differentiation is the frequency of occurrence of the variants. Thus the "spitzkiefer" with a narrow, spire-like crown occurs in Scotland, but rarely. In Sweden, Norway and E. Germany and the Engadine Alps it is very common. You can tell differences in regional populations but not regional differences in individuals except perhaps between such extremes as N.W. Europe and S.W. Asia, and even this is doubtful.

No matter how closely you examine these pines at Kielder, you will not be able to say with any confidence that they are the remains of an indigenous primeval forest if you have no written records or a convenient peat bog nearby for a polynological study. Scots pine seed can travel great distances over the snow and by other agencies such as birds. Four miles is not out of the question. It seems possible that the pines you mention are either self sown trees from the nearby plantation, or their progeny. I am not saying that they are *not* truly primeval, as there is no evidence either way. There are a great many similar stands. We have a Scots pine area near here on a peat bog. The stand is uneven-aged by groups, is obviously from natural regeneration, and some trees are very old. But we cannot regard it is primeval as we can only trace it back 200 years. Very likely it originated from self sown ancestors originating from planted parents on nearby estates. It may be primeval. We do not know. We can only guess, and guesswork is very dangerous in this field.

I hope that my views are not a disappointment to you, but I have seen so many "natural" pine woodlands which I have later shown to be either planted or self sown from plantations, that I have become exceedingly (even excessively) cautious in this matter.

B. Perhaps I gave the impression that Scots pine seed is only dispersed by wind. This is quite true broadly speaking, but I am almost sure that birds and small mammals (as well as man) play their part. I have found Scots pine seedlings in the most unlikely places, miles from any tree cover, which could not have been wind blown. One must, however, take into account the aero-dynamics of the region. In the Cairngorms, for example, those terrible winds which sweep the valleys in winter, forming violent eddies like small tornadoes, must scatter seeds great distances. I have seen them raise small stones and twigs a few feet above the ground, and seeds with wings would get caught up and swept away for miles.

These Kielder pine may well be authentic relics. We just cannot say one way or the other on the available evidence.

C. Kielder Scots Pine Specimen

Buds: Reddish grey brown.
Leaf length: 31 mm., i.e. short.
Leaf colour: Grey green. Not as glaucous as is usual.
Leaf persistence: 1–2 years.
Female cone (Nov.) Colour: Greenish brown. Not quite ripe.
Cone length: 32 mm.
Cone apophysis type: *F. gibba* Christ.
Seed length: 3·7 mm.
Seed wing form: Normal (i.e. neither short nor long).
Seed wing colour: Brown. Faint stripe.
(For definitions see Steven, H. M. and Carlisle, A., *Native Pinewoods of Scotland*, Edinburgh, 1959).

From the evidence, it can be said that this tree is of the *F. gibba* Christ cone type; and that its short leaves, 1–2 year leaf persistence and small cones suggest that it is not particularly happy in its present situation.

Pines with these morphological characteristics occur in Scotland's indigenous woods, but they also occur in other parts of Europe and Asia.

D. I have received some fresh specimens of the Kielder pine. The leaf colour, leaf length, cone form and seed wing type come within the *scotica* range of variants, but they also occur elsewhere in Europe. The needles are only being retained for 1 to 1½ years on female shoots and this suggests that the trees are not standing up to the exposed site at Kielder. *Scotica* trees, particularly from the east and central areas of Scotland, would be quite hardy on this site. This makes me a little more doubtful of the native origin of these trees, although the evidence is very slender.

Comment by Professor H. M. Steven, Aberdeen University

I was interested to learn about these Scots pine trees and also the natural broadleaved woodland because in 1928 when I was doing the original survey of the north Tyne valley, on which that section of Kielder Forest was later acquired, I visited most of the shelter belts and scraps of woodland right up the valley but I missed this particular area.

It is, of course, possible that these pines are truly indigenous, that is to say are descended from natural regenerated parents and backwards through the millennia in the same way. In the absence, however, of some earlier historical records to support this view, I think that it is much more likely that they are self-sown trees from planted trees. As you have no doubt observed, both in the Dee and the Spey valleys, Scots pine and other species have been regenerated far distant from the nearest trees of the same species and this may be due as you indicate to wind dispersal of seed, but also, in some cases at least, to birds carrying seed on their feet, etc.

A Note from Keith Wilson, District Officer, Kielder

On the question of wind or bird disposal of seed, we came upon three young Sitka spruce last week in a steep sided section of the Rooken Sike on Emblehope. A juniper is included in the group. Elevation about 1,000 ft. The oldest trees nearby (¾ mile) are 19 years old, otherwise within a radius of ½ to 1½ miles plantations are all in the five to ten year age class.

The Sitka spruce group seems to be about seven to eight years old and must have arisen when the present P42 plantation was eleven to twelve years old, i.e. an age when coning was unlikely. If trees grew from wind or bird dispersed seed then seed must have been obtained from a more distant source, but there is the possibility that somebody amused himself by planting the trees.

TIMBER BUILDINGS FOR BRITAIN

By

HENRY J. HOOPER, Q.A.L.A.S.

District Estates Officer, North Wales Conservancy

It seems strange to attempt to introduce timber buildings for permanent use in this country for we possess, as an envied heritage, some of the oldest and finest timber buildings in the world. Early in the 17th century, during the first real growth of building development in south east England, timber was the principal medium of construction. Many of the charming weatherboard houses of that period—now more than 300 years old—may be seen today not, as one might imagine, in a state of museum preservation, but as coveted and highly-prized dwellings. And as well as dwellings, the builders of those days constructed huge barns with tarred walls, white weatherboarded mills and other functional buildings, all from timber, which today are fulfilling the purposes for which they were designed hundreds of years ago.

Unfortunately, from the beginning of the 19th century, building in timber was allowed to decline until it became almost non-existent. The romantic explanation is that timber was desperately needed to construct ships for the fight against Napoleon—but the more prosaic and probably more accurate reason is to be found in the increased production of cheap bricks which followed industrial development at this time.

Other countries, more consistent than our own, have never forsaken the tradition of timber building. In America, from the days of the Pilgrim Fathers, its tradition has grown gracefully through the Colonial style to the modern frame house with its sitting porch, warm, spacious, well-lit rooms and bright, clean paintwork. Canada, Sweden, Switzerland, Finland and Japan, among other countries have not forgotten how to build in timber. Is it not, then, all the more remarkable that today in England the words "timber building" should conjure up a vision of a shanty to supply lorry-drivers with snacks, or an unsightly colony of army hutments? It seems that our eyes are so dazzled by brick and stucco that we forget the glorious heritage those 17th century craftsmen gave the world.

Compare the harmonious weather-boarded villages of Steyning, Northiam, Mayfield, Groombridge—to mention just a few—with almost any modern suburban development. In the light of present-day requirements, and developments a fresh approach to the subject of timber buildings is clearly overdue. It would be as well to begin with an examination of some of the uninformed prejudice which surrounds the subject—prejudice concerning durability and fire risk, for example.

That a timber building can be durable is evident from the reference already made to the number of timber buildings in England that still stand after 300 years. Individual instances can be given even further back. The main walls of the church of Greenstead, in Essex, are still of the original timber which was used during the erection in Saxon times, more than 1,100 years ago. In Massachusetts and Connecticut, there are large numbers of the original 17th century timber buildings still standing. At Gothenburg in Sweden, there are streets of houses which are between three and four centuries old. Many more examples could be given, all clearly showing the permanence of timber buildings.

The fallacy, common today in England, that a timber building is a temporary building has probably originated from the wide use of the material for low-grade temporary structures such as military camps. Much is also heard about dry rot in connection with the durability of timber, but it is interesting to note that a serious outbreak has never been found in an all-timber building. While there may be local patches of decay, the natural qualities of timber enable it to dry out before serious damage is done, provided there is no masonry or brickwork keeping the wood in a chronically damp state.

On the other hand, modern needs do not usually demand that a building should be constructed to endure for centuries. Planning requirements and internal equipment change so quickly that a contemporary building may soon become obsolete. In general, half a century of useful life is probably all that is expected from most buildings in these days. Costing less to build, renovate, remodel, move or dismantle, a timber building is easily the most "economically" durable structure which can be built.

Probably the chief disadvantage which springs to the popular mind when considering timber buildings is a supposed increase in fire risk. However, we must remember that the origin of fire risk is nearly always internal, starting among contents such as curtains, carpets, fuel, clothing, etc., so that the risk of fire breaking out bears no relation to the type of construction involved. Furthermore, anyone who has stood inside a brick house before tiling has begun, and has looked up through the joists and stud partitions to the rafters, will realise what a mass of timber goes into the usual "non-timber" house, and so, to some extent, the fire risks of the one are the fire risks of the other. Normal precautions in the construction of flues must obviously be taken when solid fuel heating is to be installed, but these are no more than in any other type of building.

Perhaps it is enough to say that the safety of timber buildings against fire risk is accepted by the insurance companies in this country, since they will insure approved timber houses, properly constructed, at a rate little, if any, above that for brick houses.

In the past, some of the most satisfying buildings ever made were designed in timber. American houses, churches and public buildings of colonial days, the beautiful homes of Canada, genuine Swiss chalets and the great country houses of Sweden, quite apart from the magnificent examples our own ancestors have given us, all speak for themselves of the aesthetic possibilities of the material.

For modern developments we must look almost entirely overseas. To Sweden, where the ultra-modern ideas of lightness and flatness are given full scope and find happiest expression in wood; to Japan and Finland and, above all to the United States. In America the wood-built home is a symbol of comfort, from the elegant proportion of the spacious architectural mansions to the succession of small towns and villages with their comely white-painted wooden buildings settled on smooth green lawns. The typical American frame house is far ahead of the bungalows and villas developed by the speculative builder in England today, many of which are in the so-called "Tudor" style with brickwork or stucco painted to resemble timbers—a sincere, if not edifying, form of flattery, and a tribute in itself to the fact that, at heart, all Englishmen are lovers of wood.

One of the most impressive facts about timber is its adaptability to modern planning methods; the wide spans and the flexible plan forms of modern buildings might well have been evolved for a timber style rather than for steel or concrete. Timber does not limit architectural forms to certain set patterns and it can provide a smooth and agreeable elegance.

While it is possible to offend good taste with any material, it is difficult to be raw and offensive with wood, for it is a friendly, decorative and warm material and unlike brick, it is always alive. Wood gives an impression of snugness, it merges harmoniously with the natural setting and surroundings of the countryside, and its texture and colour have everything to gain from time and weather.

So far as the decoration of wood is concerned, the great variety of stains or the wide colour possibilities of paintwork provide unlimited scope of variety and individual expression to achieve an agreeable blending with the character of the immediate scenery.

Medical opinion in North America is practically unanimous in the opinion that a properly constructed timber home is the healthiest type in which to live. The greater comfort and superior hygienic qualities of wooden homes are due to the fact that they are always drier than brick houses; they are also cooler in summer and warmer in winter since wood, a cellular material, is an excellent and natural thermal insulator. Indeed, a 1 in. timber board is roughly equal in heat-insulating value to a 9 in. brick wall. Normal timber construction invariably includes a cavity wall which, with timber cladding, provides an almost unrivalled insulating wall structure.

It is always difficult to give comparative costs between one method of building and another—there are so many external facts and governing conditions that a scientific comparison is almost impossible. However, the general conclusion to be drawn is that the saving in cost in constructing a timber house as against brick might be 10% or even 15%. In buildings where the proportional cost of services as against shell structure is lower, such as school buildings, barns, halls, etc., the saving may, in favourable circumstances, be even greater.

At this point we must consider the question of prefabrication (see Note 5 of References, page 48). In many ways, timber is ideal for this form of construction, since it is easy to cut and fashion by machinery, both in the factory and on the site. It is one of the lightest materials available for prefabrication, its weight in relation to its strength being extremely small, consequently units can be the largest possible, which means that fewer man-hours are needed to enclose any given space. The rapidity and ease with which prefabricated timber buildings can be erected is one of their strongest attractions. Complete erection of a village hall for example, can take no longer than three to four days, working on a prepared site.

It is important to understand that there need be no stereotyped buildings by this method, for it is the sections, not the buildings themselves, which are mass-produced in the factory. By use of standard sections, it is possible to build individual and original layouts and, at the same time, to take full advantage of a low-cost, completely dry method of construction. In this way, taking full advantage of modern design and production developments, timber buildings really become completely economic (see Note 1 of References).

There can be no doubt that historically the case for more timber buildings in Britain is very strong. There is evidence that excellent timber buildings are at present being erected, but regrettably only in small numbers. Suitable timbers are readily available now for building purposes. The home grown trade is perhaps only developed enough to cope with a modest fulfilment of the need for a progressive turn towards building in timber as a fully revived tradition. This market would however be very vulnerable to competition.

Many architects (see Note 2) would support the use of timber in all forms of building. Perhaps all architects are not experienced in the application of timber as a traditional building material, for cladding dwelling houses for example; but timber lends itself to flexibility of design and this must surely appeal to the architect.

Various recently erected timber buildings have been reported on. These reports (see Note 3) could be readily gathered together to form a basis for a manual dealing with timber buildings, and constructional detail could be based on the excellent American publication (see Note 4). In order to show the satisfying appearances that timber buildings present, illustration of elevations could be incorporated in the manual. Emphasis should be placed on the wisdom of adequate preservative treatment to combat insect and fungal decay. Such treatment at present costs approximately £11 per standard, but this is a desirable investment.

The use of Sitka spruce as a home-grown external cladding material could receive greater attention. Canadian literature (see Note 6), as well as a great deal of our own, is available dealing with the physical and mechanical properties of this timber. Sitka spruce is being used as external cladding for a timber house which is being erected for the Forestry Commission at Craignant Mawr in Cardiganshire, and it is proposed to use Sitka spruce in this way for other Forestry Commission farm and forest buildings in North Wales. In the timber house at Craignant Mawr the cladding consists of 1 in. $\times$ 3 in. nominal section tongued and grooved vee-jointed and secret nailed boards which are fixed vertically. All sides of the building are cladded from the eaves (or verges) to damp proof course level. The structural timbers are also of Sitka spruce. All the timbers have been preservative-treated with Boron salts. A solution of these salts was applied to freshly sawn green timber by the diffusion process using spray tunnel equipment and it has been found that the preservative salts have diffused through the full thickness of the sawn timber.

In the new structural forms of today, there is a tendency to get away from the old traditional block building or common industrial shed, and to look for shapes and façades expressing the demand for individuality, functional efficiency, and suitability to an age when man is looking very much to the future. With his mind attuned to new ideas and motivated by a desire to break away from traditional practices, the designer is creating a diversity of shapes for our new buildings based on arches, prisms, pyramids, plates and shells (see Note 7).

What place has timber in this new approach? First it is a suitable basic material for these new shapes, and secondly, the new technological advances in design in this material have made it possible to achieve any desired shape without limitations as to dimension, other than those imposed by considerations of fabrication, transport and erection. For example, the new glued laminated components may be constructed to any shape and cross-sectional size which the designer may demand. Stressed-skin plywood panels provide scope for the construction of flat facets, which can be applied to prismatic and pyramidal shapes and even to shells composed of many small facets. The simple process of covering an area against the elements presents possibilities for unusual and stimulating shapes if thin shell construction is brought into play with its many forms of thin warped plates or curved shells, which in timber are simply constructed by nailing and gluing together layers of planking, and which are economic in prime cost. Framed and connectored assemblies in timber widely used for the more simple and traditional form of structure, are also capable of being applied to new and exciting shapes depending upon the functional purpose of the building and the overall effect desired.

The development of new methods of construction to achieve these shapes is achieved by close co-operation between the architect, engineer and research scientist.

In conclusion, there is no need to look beyond the many millions of people in the world living happily in timber homes to realise the obvious case for such a form of construction. The timber building need no longer be limited by past experience—timber has been brought up to date as a structural material and, with modern methods, it becomes a highly competitive material. The simplicity of plant and equipment required, the speed with which it is possible to get into large-scale production, the ease of transport, handling and erection the fact that it is a dry material which does not need to be poured or moulded, or built up block by block—are all factors giving lower constructional costs in comparison with other materials.

There are immense opportunities for the proper use of timber in building. For housing, perhaps more particularly for rural housing, it offers an attractive and economic solution to present-day problems; for industry and agriculture, for pavilions, shops and halls of all types, well-designed timber buildings can play their part in harmony with local building traditions. For schools, particularly, timber can provide modern, attractive buildings, ideally suited to their purposes. The importance of adequate timber preservative treatment should be remembered.

It is more than time we discarded prejudice based on uninformed half-truths and recognised not only the economies intrinsic in this form of construction, but also the contribution timber can make to the architectural amenities of our country.

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ROGATE NURSERY

By

A. R. SUTTON

District Officer, South East England

Situation

The nursery forms part of the Forestry Commissions Rogate Forest, which lies one mile north of Rogate village and three miles north east of the town of Petersfield.

It is well served by public roads and the nearest railway station is at Liss, a distance of one and a half miles.

It is thus well placed to serve the forests of South East England.

Extent

The main block consists of 34 acres and the outlying Tullecombe block is 4 acres in extent, making a total of 38 acres.

A further 28 acres are to be cleared for use as a nursery on a new acquisition five miles to the north east.

Geology, etc.

The underlying formation is Lower Greensand, giving rise to light sandy soils capable of being worked at almost all seasons. Both blocks lie on the top of a ridge at about 500 ft. above sea level. Slopes on the nursery blocks are mainly gentle though a limited amount of erosion has occurred in the main block.

Climate

In general the climate is mild. Extremes of cold are rare and heavy snow unusual. Frost is not a factor of importance on the nursery sites. Dry periods in the Spring and summer are more common, and a high organic content in the soil is needed to conserve moisture during these periods. The main block in particular can be a bleak place to work in, but the exposure does not have a bad effect on the growth of the trees. No local rainfall figures are available but the rainfall in the region as a whole is comparatively low.

Choice of site

The main reasons influencing the choice of the site for a nursery were:

(1) Convenient situation relative to the main forests to be served.

(2) Ease of communications.

(3) Soil of adequate fertility and good working properties in most weather conditions.

(4) Gentle slopes.

(5) Good drainage.

(6) Absence of frost.

(7) Availability of labour and services.

Preparation of Site

The nursery was prepared in three stages:

1. *Western half of the Main Block* (22 *acres*)

The work was done during the spring and summer of 1954. The area was mainly open heather ground with scattered birch, Scots pine, oak, etc. There were some old tree stumps but the biggest obstacles were the concrete blocks and huts of a wartime searchlight station. A bulldozer removed the stumps and blocks. The heather was skimmed off with the giant rotovator and collected with a tractor-drawn rake. The area was levelled by the bulldozer and the initial cultivation done by the rotovator.

It was first cropped in Forest Year 1955 mainly with seedbeds.

2. *Tullecombe Block* (4 *acres*)

This was prepared during the spring and summer of 1958. The area carried birch, Scots pine, etc., scrub with heather and grass patches. Stumps of chestnut made preparation rather costly.

The scrub and stumps were pushed out by a bulldozer and burned. The ground was then ploughed, cultivated and levelled with the nurseries own Ferguson tractor and implements.

This area was first cropped in Forest Year 1959 for transplant lines.

3. *Eastern Half of the Main Block* (12 *acres*)

This area was prepared during 1959. Eight acres carried a crop of mixed birch and natural Scots pine which was sold standing and felled by the purchaser, who left the stumps long to ease the work of removing them. The rest of the area was open ground carrying mainly heather.

It was prepared in the same way as Tullecombe.

Manuring

The main treatments are:

Seedbeds		
	Hopwaste	20 tons per acre
	Fisons 37	7 cwts per acre
Lines		
	Hopwaste	12 tons per acre
	Fisons 37	7 cwts per acre

(Fisons 37 is an artificial fertiliser giving 16% P_2O_5 and 16% potash.)

Standard Commission practice also provided for top dressings of "Nitro-chalk" twice in the growing season if required. It has not been found necessary to do this at Rogate.

Fallow areas are kept bare and are cultivated regularly through the season. No green-cropping is done.

The pH of the nursery varied from 4·0 to 5·0 with most sections at about 4·4 when the acidity was last tested in December, 1958.

Methods of Working

These are best described on the ground but the following notes are offered as a summary:

1. *General*

The working system has been designed around the Ferguson tractor which with standard and specially developed implements is used to provide a considerable degree of mechanisation.

2. *Cultivation*

Carried out by the Ferguson with plough, harrows and rotovator.

3. *Manuring*

Hopwaste moved on the Ferguson trailer and spread by hand. Artificial fertilisers applied with a Sisis Coultas hand drawn manure distributor.

4. *Sowing*

The seedbeds are thrown up and rolled with the Ferguson. Broadcast sowing is done with a specially adapted Sisis Coultas manure distributor. Covering with non-calcareous non-caking grit is done with the Ferguson.

5. *Lifting*

Done by hand, sometimes after undercutting with the Ferguson.

6. *Lining-out*

Done by hand.

7. *Spraying*

Weedkillers, insecticides, etc., done by Plantector sprayer mounted on the Ferguson.

8. *Weeding*

Seedbeds are weeded by hand.

Transplant lines weeded by the Ferguson supplemented by hand weeding.

9. *Storage of lifted trees*

In polythene bags from the time of lifting to the time of planting in the forest.

10. *Transport*

(a) *Within nursery* by Forester's van and Ferguson with trailer.

(b) *Between nursery and planting forest* by lorry or by train.

Results Obtained

Details of sowing yields and lining out results are given in the tables which follow. In general it can be said that a high level of fertility has been built up which combined with good organisation and techniques have given good results. (See Tables A and B.)

Sowing yields have varied but in general have been above the average for the Commission. The standard sowing densities recommended for all nurseries have been found to result in overcrowded seedbeds which have been prone to fungal attacks, and as a result a series of local sowing densities have been evolved to avoid this trouble.

Transplants have shown very good root development throughout. A drawback not yet overcome is that in wet seasons the growth of species such as larch and Douglas fir has been so great that the trees, though not seriously out of balance, have been almost impossible to plant by the normal notch methods. The normal lining out spacings have proved inadequate and wider spacings are being used.

A new development designed to eliminate transplanting and its attendant cost and losses has been the sowing of seed at a very low density with the object of producing a 2 year seedling fit to plant in the forest. To check excessive height growth and promote good root growth, it is intended to carry out undercutting. A newly developed type of undercutter has given promising results and we now have to find the optimum times to carry out the undercutting and compare results obtained with those obtained from transplants.

ROGATE NURSERY—LINING OUT

Percentage of trees lined out fit for use

Species	F.Y. 56%	F.Y. 57%	F.Y. 58%	F.Y. 59%	F.Y. 60%
Scots pine			100 75	95	82
Corsican pine			90	95	70
Japanese larch			93	100	33
European larch				90	82
Hybrid larch				91	88
Douglas fir			72	67	90
Norway spruce			96	100 87	88
Lawson cypress	37	55	100	85	96
Western hemlock	12			80	75
Western red cedar	17		90	98	80
Abies grandis	35	40	50 100		68
Cryptomeria japonica			75	90	
Picea omorika				88	71
Austrian pine				90	57
Abies procera					50
Sequoia sempervirens					28

NOTE: F.Y. 60 figures are stocktaking figures and not actuals.

ROGATE NURSERY YIELDS

Seedlings per lb. of seed sown (in thousands)

Species	*Yield F.Y. 55*	*Year of Seed*	*Yield F.Y. 56*	*Year of Seed*	*Yield F.Y. 57*	*Year of Seed*	*Yield F.Y. 58*	*Year of Seed*	*Yield F.Y. 59*	*Year of Seed*	*Yield F.Y. 60*	*Year of Seed*
Scots Pine	6·3	51			27·0	56	16·0	55	37·0	57	31·0	57
Corsican pine	9·3	53			17·75	56	18·0	56	6·0 14·0	57 58	14·0	59
Douglas fir	3·5	55	4·2	55	11·5	55	17·0	55	7·0	56	12·0	56
European larch			1·3	54			14·0	57	13·0	56	8·0 8·0	58 56
Japanese larch			11·0	56	7·9	55	19·0	56	7·0 4·0	55 56	24·0	55
Hybrid larch							17·0	56	12·0	56		
Norway spruce			1·0	55	4·5	56	23·0	56	33·0	58	18·0	58
Western hemlock	6·0	55			25·0	56	152·0	57	8·0	56	14·0 18·0	58 56
Western red cedar			30·0	56	23·0	not known						

PLANT SUPPLY AND THE NURSERY FORESTER

By

R. E. BARTLETT

Forester, North East England Conservancy

Every year, during the months of March and April, a similar problem occurs in our forest nurseries. In the early part of the period the nursery is cluttered up with plants that people cannot or will not take. The nurseryman cannot make headway with his work because he still has plants heeled in or unlifted in practically every section of his nursery.

Then, about 3 weeks later, the poor fellow, straining to get on, is delayed with orders from people who are screaming that they have not the necessary plants to carry on with. These are the same people who so shortly before had scorned or simply ignored the hand that would feed them.

Is there a remedy? I think so. The intelligent use of polythene!

Coupling polythene use with "plant storage in the sheugh" we surely could not only ease the nursery forester's perennial problem, but also give the planting forester a freedom he has never before enjoyed.

At present, what are the nurseryman's methods of creating nursery space when demands do not materialise?

(1) **Lift and Heel-in Loosely (Sheughing).**

(2) **Lift and Bag in Polythene.**

(1) This is most useful for seedlings which are to be lined out in the home nurseries. Transplants for export, which are heeled in pending orders, although they suffer no deterioration, cost up to 2/- per 1,000 extra when subsequently bundled and bagged for despatch. This is perhaps a small price to pay for the space gained, but is it necessary? Is it the best way?

(2) Lengthy polythene storage is only a safe policy when it is known that the finishing date will not extend into a period of plant activity. How can the nursery forester know these facts in January or February when the planting forester is himself not sure to 3 or 4 weeks when he will need his Larch or Spruce or whatever it is. He cannot, and therefore, unless he is prepared to bag and heel-in plants not demanded at the critical date, large scale bagging is out.

Now, we do know that many species can be successfully stored loose in the sheugh for quitė long periods and right up to and beyond the start of root, and in some cases shoot, growth. Results in the nursery even indicate improved results from plants which have been taken from the sheugh and lined out when root growth is well under way.

We also known that many species can survive for long periods in polythene providing the proper precautions are observed and the plants remain completely dormant.

These two methods used together could provide the remedy we are seeking.

In the first place there seems no reason to me why it should be necessary for all plant storage to be at the nursery end of the proceedings. I would argue that the nearer the plant store is to the scene of planting the more use it is to the planting forester.

Surely at most major planting forests a central storage shelter, for polythene, could be either found or devised at a reasonable cost. This, together with a small area of cultivated ground, say 1½ sq. chains for the largest programmes, is all that is required.

The procedure could then be as follows:

(1) The planting forester places his demands, giving priorities, early in the season, with information as to when planting is expected to start.

(2) There are often many weeks of good lifting weather from December to the end of February. The nurseryman, selecting his weather for lifting and despatch, lifts, bags and passes the plants on to the planting unit. He may have to hold them through a period of bad weather after lifting. No matter!

(3) When the plants are received by the planting forester he holds them in polythene until he has the time and the weather is suitable for sheughing. At this point all is as it would be under the present system except that the plants are at the planting end of the pipeline. (The nursery forester would almost certainly have been lifting and sheughing on the section.)

(4) Now we have the plants at the right place at the right time. On the very first day that the forester wants to start planting, he can collect plants from the sheugh and without delay, without the worry that if he orders plants the weather will probably have gone sour before they arrive, he can away to the hill and plant.

(5) In the meantime, the nursery forester, freed at last from the chains which have so long banned him, can work prodigous feats in his hitherto unknown freedom.

The cost, did you say? Perhaps 2/– to 3/– per acre planted.

P.S. One danger: The receiving forester may leave his plants in polythene bags as they arrived from the nursery and forget that, due to unforseen circumstances, his work has been held up and that the plants should therefore be removed from the bags and put into the sheugh. But what can we do with a forgetful forester anyhow? Don't blame the nurseryman!

G. B. RYLE

DAMAGE TO YOUNG PLANTATIONS BY THE BANK VOLE AT BERNWOOD FOREST, 1958-1960

By

B. KEELER

Forester, East England Conservancy

Vole damage, in places very serious, has occurred in young plantations at Bernwood Forest (East Conservancy of England) during the past three forest years. Over this period, establishment under heavy coppice cover (now known as "planting through") has been the standard practice and it has become clear that the damage is closely related to the peculiar ecological conditions created by this technique. However, the evidence suggests that the technique can be modified so as to reduce the risk of damage. The merits of "planting through" heavy coppice cover, compared with complete clearance or leaving the traditional "dapple shade", are still very arguable even where one is concerned, as at

Bernwood, with heavy clays on which theoretically the practice is of the most silvicultural benefit. For this reason it is thought that some notes on experiences of the technique in relation to vole damage might be of interest.

Planting in Forest Year 1958

The preparation of the ground for Forest Year 1958 planting was done in the late spring and early summer of 1957. On approximately 25 acres the resulting debris was placed in windrows of which the distance apart ranged from 9 to 60 ft. depending on the amount of debris which had to be disposed of. Over most of the remainder of the area, the debris was trimmed out so that it would lie more or less flat and scattered about generally, with the idea that it would then rot down quickly and would not form cover for vermin. On a small part of the total area there was so much debris that it had to be burned. This course was avoided wherever possible on account of the extra cost involved. The planting, which was a two row/four row mixture of oak/Norway spruce respectively throughout, was begun in November 1957 and completed in February 1958, and a total of 87 acres was planted. An assessment of plant survival made in July 1958 showed an overall take of 98% for oak and 96% for Norway spruce. Towards the end of August the Norway spruce over most of the area showed signs of what, for want of a better term, has been called "damping off", as a result of which a second assessment made in September showed a survival of only 61%. The oak, however, continued to thrive and survival was adequate. The Forest Year 1958 growing season will long be remembered as an exceptionally humid one and it is highly probable that the effect of cover under these conditions was to maintain the humidity at a higher level than average. Losses due to "damping off" are generally ascribed to this.

At the end of November 1958, it was observed that the tips of the leaders and laterals of a great number of the surviving spruce were being nibbled. All buds were removed from many of the plants and the laterals of some were removed completely, leaving the main stem intact. No damage to oak was observed. At the same time, considerable damage was being done in the earlier plantings (particularly those planted in 1954, 1955 and 1956 onwards) over 100 acres in one particular part of the forest which had been completely cleared of scrub before planting. Here damage was of the same type as under cover, but some Norway spruce stems were also girdled, a form of damage which was not observed under cover.

Under cover little or no damage was observed in those areas where it had been necessary to burn the debris. Where the debris had been put in windrows, the intensity of damage was greatest on trees which were planted close to the windrows and trees remote from windrows were only slightly damaged, if at all. Where the debris had been strewn about, damage was general.

The conclusions reached at this time were that the density of cover was generally rather too great for tree establishment because of the risk of "damping off" due supposedly to high humidity, but that it would in itself give satisfactory results if the density of cover was somewhat reduced. It was thought, however, that the losses due to vole damage, where debris was not burnt, were greater than those due to "damping off", and it must be remembered that as well as actual losses due to vole damage, a large number of trees are seriously retarded without being killed.

The density of cover in the Forest Year 1958 planting was reduced in the winter of Forest Year 1959 and the spruce rows were beaten up with spruce. The replacement trees were damaged by voles soon after planting and, in consequence of this, further beating up had to be done in Forest Year 1960 and again Norway spruce was used.

The windrows made three years ago in some of the areas planted in 1958 are still sufficiently intact to provide cover and safety for voles and mice.

Forest Year 1959 Planting

About half of the area for planting in Forest Year 1959 was prepared in late spring of 1958 when the coppice had already flushed, and the remainder in the autumn of 1958 after leaf fall. The density of cover left standing was rather less than in the previous year. Over the whole area the debris was trimmed out and scattered on the ground. Planting started in the middle of November and was completed in early March. Most of the planting was a two row/four row mixture of oak and Norway spruce but small blocks of pure Lawson cypress and pure Western hemlock were also planted.

It was observed that some Norway spruce planted in December 1958 were being nibbled in mid-February 1959, but the damage was not severe and very few trees died in consequence. This damage occurred in the areas prepared in the spring of 1958, i.e., at the time when the leaf was on the coppice cover.

During the summer of 1959, the density of the cover over the whole of the area planted in 1959 was reduced and the debris, with the leaf on, was trimmed out and scattered as during the initial preparation of ground.

In the latter part of November 1959, extensive damage, similar to that in the area planted in 1958, was observed on Norway spruce in the area which was originally prepared in the spring of 1958. As in the 1958 planting, there was no sign of oak being damaged. This area included small blocks of Lawson cypress which was very heavily attacked at the same time, and also includes a block of Western hemlock one acre in extent, on which there was no sign of damage then or subsequently. Damage was not observed in the areas which had originally been prepared in the autumn of 1958 until later in the winter of 1959–60, and it was neither as widespread nor as severe in these areas. The area in which the most severe damage occurred was that in which the original preparation of ground was done when the leaf was on the coppice cover, and it was observed that the leaves persisted on the twigs of the debris throughout the summer in a shrivelled condition. It was concluded that the greater degree of damage on this area compared with the others, which were prepared when there was no leaf on the coppice cover, was due to the presence of a higher population of voles which had resulted from the nature of the debris on the ground. There appear to be at least two possible explanations of this—either the fresh buds and leaves on the debris brought to the ground in the spring provided extra food for the voles, perhaps at a critical time, or the shrivelled leaves on the twigs provided more effective cover for them. It may be that both factors operated.

The areas planted in Forest Year 1959 were all beaten up with Norway spruce in Forest Year 1960.

Forest Year 1960 Planting

The area for planting in Forest Year 1960 consisted of two blocks; one of these (54 acres) was mostly prepared in the spring and early summer of 1959, 14 acres of the other was also prepared at this time and the remaining 20 acres was prepared in the autumn of 1959—after leaf fall. The total area planted was, therefore, 88 acres. Over the whole area the debris was trimmed out and scattered as in Forest Year 1959. The type of cover was somewhat different from that on the area planted in 1959, consisting generally of taller stems with less hazel, but the density of cover left initially was very similar in effect to that left initially in the preparation of ground for planting in Forest Year 1959; but it was done with the full recognition that it would be necessary to start opening the canopy heavily as soon as the planting was completed. The full degree ofopening required was not done in the first instance because this would have allowed the development of a fairly vigorous ground vegetation in the summer of 1959 prior to planting, and so would have nullified one of the supposed benefits of the technique. Rightly or wrongly, it was thought worthwhile going over the ground twice to avoid this. Planting began in mid November 1959, and the first area to be planted was 19 acres of the standard two row/four row mixture of oak and Norway spruce. This was followed by the planting of 7 acres of pure Norway spruce and adjacent to this, a four row/four row mixture of Western hemlock was planted in mid January over an area of 21 acres. This completed the first block of planting. The second block was then planted with an oak/Norway spruce/*Thuja* mixture.

In the last 2 weeks of February, severe damage to the *Thuja* in the *Thuja*/hemlock mixture was observed, affecting 95% of the plants. No damage whatever could be found on the hemlock, then or subsequently, and no damage was observed on the adjacent Norway spruce. The damage to the *Thuja* consisted of the lateral shoots and often the main stem also being bitten through, a small heap of fragments being left at the base of the tree. A large proportion of trees which had been 6 to 9 in. high when planted were cut back to within two inches or so of the ground.

In order to find out more certainly what species were causing the damage in the *Thuja*/hemlock mixture, 12 Longworth traps (kindly lent to us by the Nature Conservancy) were set in two groups of six in each, of which three were baited with corn and three baited with *Thuja* foliage.

Several bank voles (*Cleithrionomys glareolus*) and several wood mice (*Apodemus sylvaticus*) and one field vole (*Microtus agrestis*) were caught. Only the bank voles were found to have particles of *Thuja* in their stomachs. No green food material at all was found in the stomachs of the field mice. Two bank voles were kept under observation in captivity for a full week and during this time lived on a diet of *Thuja* foliage only, water being provided. It was concluded that the bank vole was the principal cause of damage to the *Thuja* and by inference over the forest area generally. This conclusion agrees with what is already known about the several species which are possible causes of damage.

Conclusion

It seems clear that the presence of debris from prep. ground on the forest floor under coppice cover gives rise to conditions which encourages serious damage by voles, apparently by bank voles (*Cleithrionomys glareolus*) in young planted crops. This is especially true where the debris has been cut when the leaf is on and may be due to this debris providing better cover or a food supply at a critical time, or both. The fact that windrows continue to harbour enough voles to do significant damage for a number of years, suggests that cover is the important factor, but I am not certain about this.

While it seems clear that the presence of ground debris encourages serious damage by voles, it should be remarked that such damage has not been found to result invariably from the presence of a large quantity of ground debris, e.g., no damage occurred in the block planted in Forest Year 1960 with an oak, Norway spruce, *Thuja* mixture. It should be obvious that the whole complex of ecological factors controlling population and behaviour must also play its part indetermining whether damage is done and its extent and intensity. It is suggested that ground debris is one of many factors, but an important one.

It was observed that serious vole attack was generally confined to the period November to February inclusive. This observation provides a possible explanation of the absence of damage in the block of oak planted in 1960, Norway spruce, *Thuja* mixture, just referred to, as this was mainly planted during March.

Plate 1. Camp House, Promenade, Bristol. The Headquarters of the Forestry Commission, and of the Assistant Commissioner for England and Wales, during the war years, 1939-1947.

Plate 2. The present Headquarters building, 25 Savile Row, London, W.1, seriously damaged by the war-time Blitz.

Plate 3. Part of a group of new forest houses, one for a supervisor, at Gogerddan, Rheidol Forest, near Aberystwyth. Note the lay-by.

Plate 4. New houses at Ganllwyd, Coed y Brenin Forest, Merioneth.

Plate 5. Timber House on a Forest Worker's Holding at Craignant Mawr, Rheidol Forest.

Plate 6. Wild Pines in Williams Cleugh, Kielder Forest.

Plate 7. **Helicopter lifting fencing stakes at Ennerdale Forest, Cumberland.**

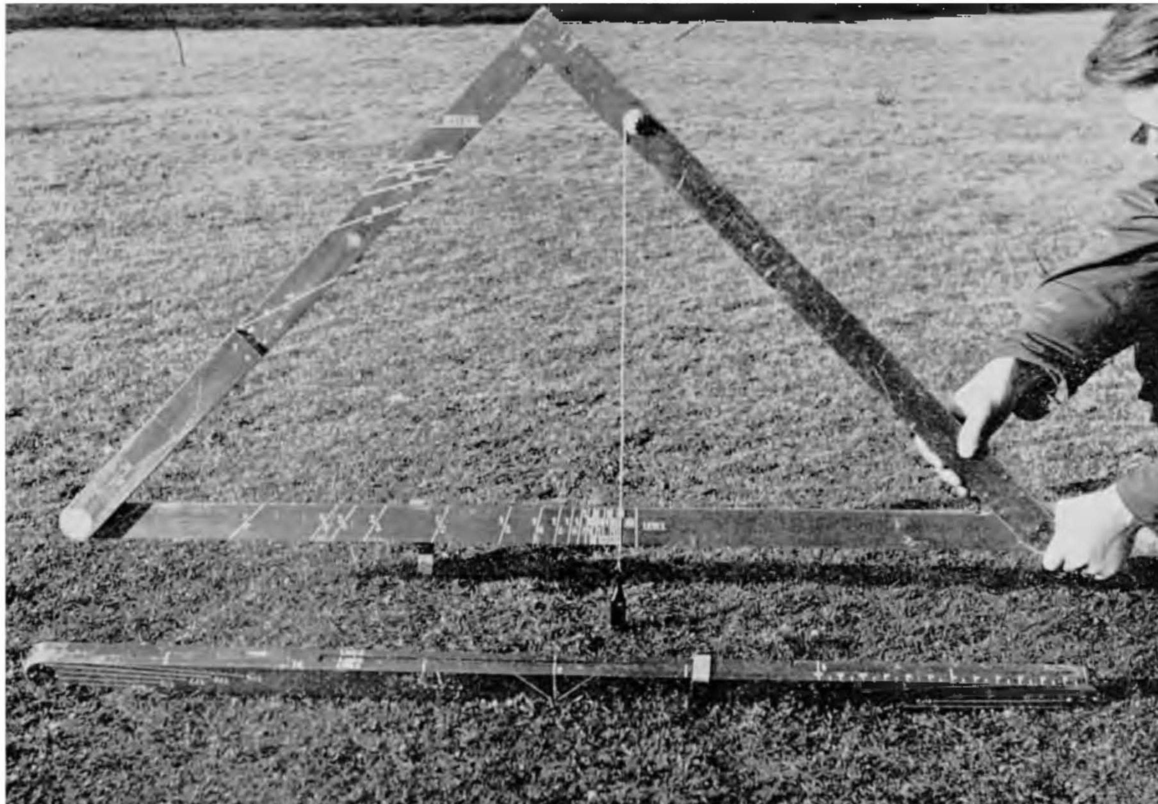


Plate 8. The Royal Engineer Field Level, shown as it would be set up for setting out a gradient. The plumb-line can be seen cutting the scale at almost 1 in 30.

Part of the protractor scale (at each end and the centre arrow), the spirit level (near the 3ft mark), the 4ft rule, the webbing strap, and its neatness when folded, can also be seen.

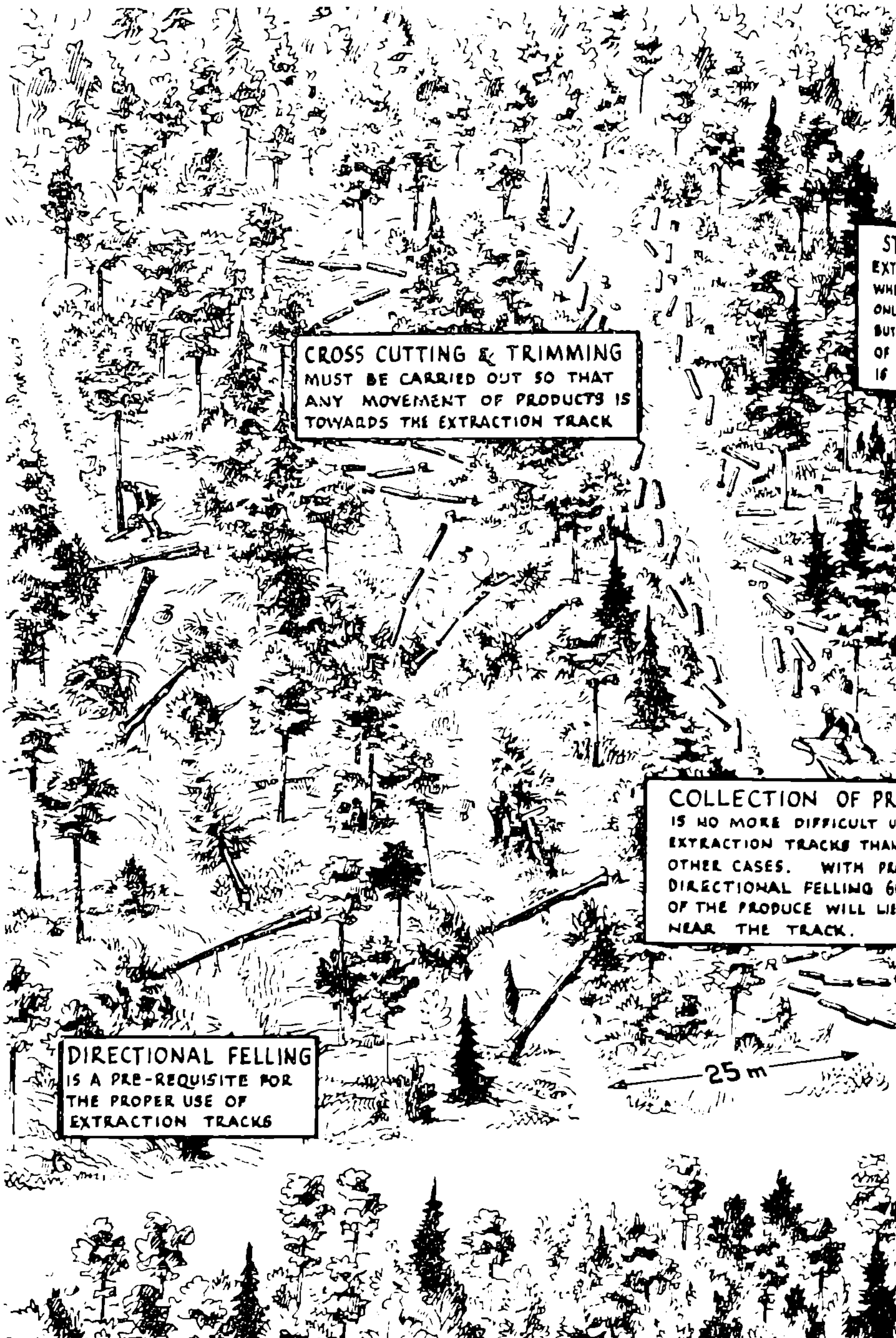


Plate 9. Extract

cks in Sweden.

Plate 10. Road-making at Lyminge Forest, Kent: Tipping the shale.

Plate 11. Road-making, Lyminge: The bulldozer spreads the shale.

Plate 12. Road-making, Lyminge: Diesel roller compacting spread shale.

Plate 13. A finished forest road at Lyminge.

Plate 14. A view in Box Wood, Bramfield Forest, showing part of the mediaeval system of earth banks.

Plate 15. Detail of an earth bank and ditch in Box Wood.

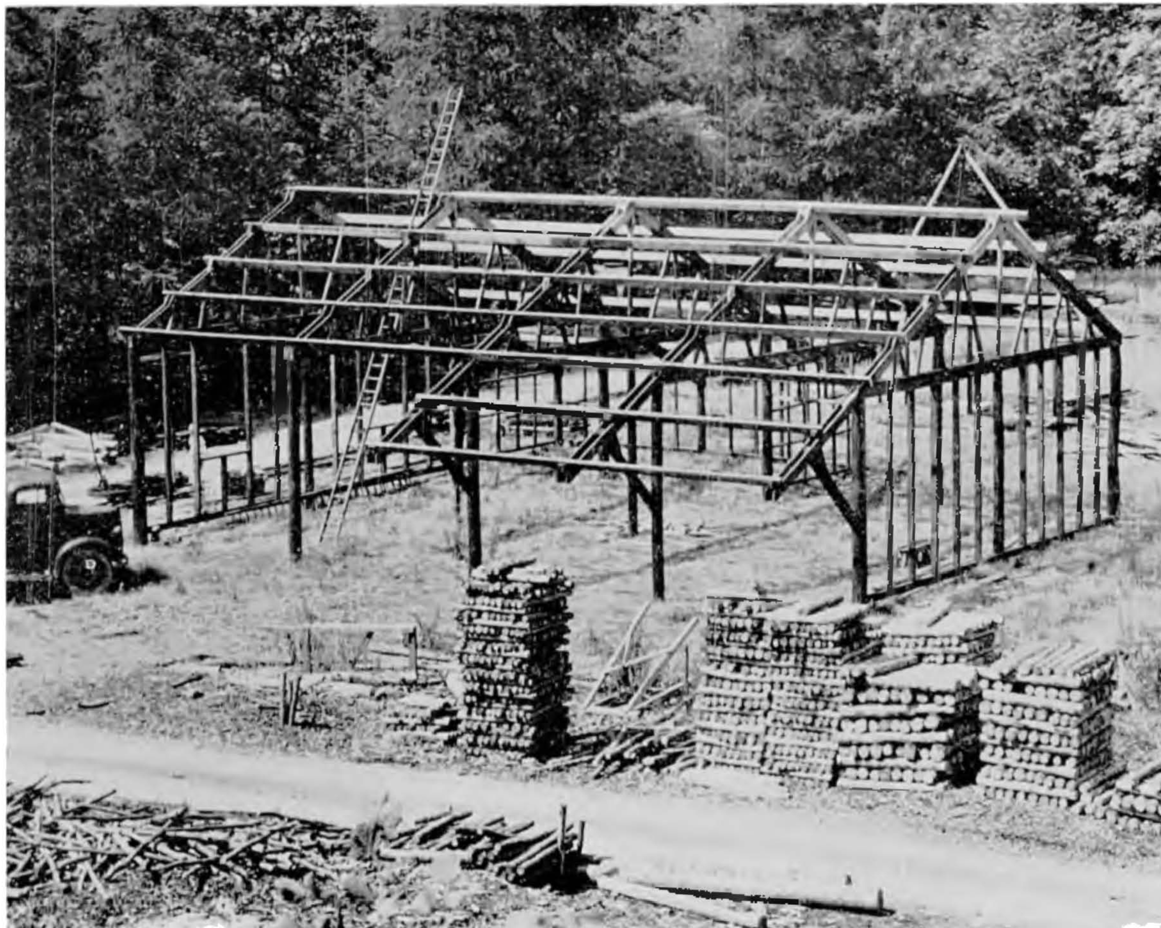


Plate 16. The framework of a timber produce shed at Tynbedw, Ystwyth Forest, near Aberystwyth.

Plate 17. The tallest broadleaved tree in Britain. A lime at Duncombe Park, near Helmsley in Yorkshire which reaches to 152 feet.

Norway spruce, *Thuja* and Lawson cypress under cover have been readily attacked. Lawson cypress planting in Forest Year 1959 were more badly damaged than adjacent Norway spruce, and *Thuja* planted in Forest Year 1960 was severely attacked while adjacent Norway spruce was left undamaged, obviously suggesting that the voles have a strong food preference for these species. No evidence of vole damage has been seen on oak or hemlock, even where these species have been planted in mixture with Norway spruce and *Thuja* respectively.

In March 1960, the amount of vole damage which had occurred under cover at Oakley in the three preceding winters was causing some concern and was regarded as a fairly important secondary disadvantage of the technique of "planting through" dense coppice cover; the primary disadvantage being simply that the planted trees were not thriving in the environment created and that to modify this sufficiently, the canopy would have to be drastically opened, at a high cost per acre for normal hand work; fires would be necessary to dispose of the large quantity of debris which it would not be possible to dispose between the rows of plants (quite apart from the possibility of this harbouring voles), these fires would make gaps in the planted crop and the rate of progress with limited labour would be depressingly slow. In the face of these problems, it was decided to experiment on a field scale with the application of 2-4-5-T as a basal bark spray with the object of killing the scrub cover standing. Present indications are that this is a successful method of killing most scrub species and can produce the same opening of canopy as hand cutting at about half the cost, and that progress in terms of acres per man-week is about four times that of hand cutting; consequently this method has been adopted as the normal means of opening canopy at Bernwood and is also being used after the very minimum of land opening as a means of site preparation before planting. Provided that this method of killing scrub standing, to overcome the primary problems associated with scrub clearance and cover planting, continues to prove satisfactory, the secondary problem of ground debris favouring vole damage has largely been solved.

MARKING TREES: COMPARISON OF METHODS

By

S. FORRESTER

District Officer, Work Study Branch

There are two possible reasons for marking trees:

(1) Marking trees to remain, e.g., the crop trees in a "crown" thinning, for which a permanent mark which does not damage the tree is required.

(2) Marking the trees to come out, for which a temporary, or at least less permanent mark is all that is required; damage to the tree can be accepted.

PERMANENT MARKING

The usual method is to put two or three spots on each tree, using a paint brush and pot of paint. This can result in paint splashing on the operator, and in waste of paint.

Experiments with Aerosol spray tins show that they are convenient, economical, and relatively clean. A 16 oz. tin of "Silver Leaf" paint marked 300 trees or more, equivalent to perhaps two pints of paint by the pot and brush method.

The relative costs are:

For 300 trees:	16 oz. Aerosol. (Purchase in bulk)	6s. 4d.
	2 pts. marking paint at 27/- per gal.	6s. 9d.

A comparison of times shows:

For one tree:	Spotting with brush	Approx. 0·30 mins.
	Marking with Aerosol	Approx. 0·10 mins.

The saving in time represents about 4/- per 300 trees for labour only, and makes the Aerosol well worthwhile using. Its cleanliness and convenience are other points strongly in its favour.

Method of Use

The spray nozzle should be held about 3 in.–4 in. from the tree and given a quick stroke across or up and down the stem. A very short period of spray, one or two seconds, is all that is required. A stripe about half an inch wide and six inches long gives a readily visible mark. Two marks per tree have been found adequate.

In windy weather the operator should keep to windward of the spray to avoid mess and breathing the spray.

Supplies

It is understood that arrangements are being made for titanium paint to be made up in similar packs, under the name "Tree Leaf" by the Secto Co., Ltd., of Blackburn. A note by the Purchase Section will reach Conservators as soon as details are complete.

TEMPORARY MARKING

Slashers, billhooks or axes are the usual tools used, making a slash on two sides of the tree. With some species, and in partially brashed crops, this can be a slow and laborious method.

A paint hammer, filled with a white powder, has been found very convenient, quick and cheap. The one used consists of a flat leather pouch with a hole on one side covered with a gauze screen. Even in the best conditions it saves time over slashing.

The cost of marking by paint hammer works out:

For 100 trees: 2 oz. powder at 4/- per lb. 6d.

The relative times for good conditions are:

For one tree:	Slashing two marks per tree	Approx. ·08 mins.
	Paint hammer two spots tree	Approx. ·05 mins.

In partially brashed crops the difference will be greater.

The costs and savings in good conditions are negligible, but the hammer is convenient. In bad conditions the saving in time will more than offset the cost of material.

Method of Use

A slap with the hammer leaves a round mark about one inch in diameter, which will last for several months at least.

Supplies

The paint hammer described and the powder is marketed by:

Skogs & Flottningsmateriel A/B, Torsgatan 10 Stockholm, 1	*Agents:* J. H. Steward Ltd., 406 Strand, London, W.C.2

The powder costs 8s. 6d. per kilo. (approx. 4/- per lb.) in 5 kilo. lots, plus carriage. (It is even cheaper in 25 and 50 kilo. lots). Details will be covered by the Purchase Section note.

It would appear that the use of these methods should now be extended.

HELICOPTER LIFT OF FENCING MATERIAL AT ENNERDALE FOREST, OCTOBER 1961

By

P. L. WINCHESTER

District Officer, North-West England

1. Location

Ennerdale Forest is situated in the western part of the Lake District in Cumberland. The lift was carried out from Gillerthwaite in the dale bottom at 400 ft. elevation to the plantation fenceline on Lingmell on the southern fell at 1,200 ft. elevation, giving a lift of 800 ft. in distances varying from 35 chains to 94 chains as the crow flies. National Grid ref. 313700/514100.

2. Terrain

The dale lies between High Stile (2,643 ft.), Great Gable (2,949 ft.) and Pillar Mountain (2,928 ft.) and the topography is mountainous with much outcropping rock and many screes. Lingmell is one of the less rugged fells, although littered with large size boulders, and after rising 700 ft. in 20 chains, in a concave slope of approximately 1 in 21 flattens off on top. The plantation fenceline runs between the end of the steepest slope and the top ridge.

3. Reason

The existing plantation fence was erected when European and Japanses larch crops were planted between 1935 and 1938. The fell outside the plantation is let for sheep grazing and the poor larch areas will be enriched during the next few years. Repairs are now ineffectual through extent and frequency, and a replacement fence is scheduled to be erected during Forest Year 1962.

4. Project

On erection some 30 odd years ago, all the fencing material was carried up the fell. There is no track suitable for lorry, land rover or tractor other than that along the bottom of the steep slope at 500 ft. elevation. The long haul and boulderstrewn ground make winching difficult, necessitating stage hauling limited by the rope length, and spreading along the fenceline once the material is up. Suitable horses are not available locally for this type of work, and it was not possible to locate a suitable mule team. Once again the only practical method appeared to be manpack, unless the obvious modern method of an airlift were employed. The proposed use of a helicopter evolved during preparation of Annual Estimates in June 1961.

5. Costings

The comparison is between men lifting material 700 ft. over a distance of ¼ mile from gear spread along the bottom of the fell by tractor at the nearest point, and a helicopter lifting 800 ft. over distances between ½ and 1 mile from a central dump beside hard road.

(a) *Manpack.* Labour potential was assessed at two loads of about ½ cwt. per man/day for which a fair day's pay would be £2, i.e. 20/– per man/load. The material required for this particular 137 chains of fencing was calculated and split into man/loads as under:

	Man/Loads
60 rolls sheep netting	60
26 rolls plain 8 G.wire	26
900 stakes 5 ft. 6 in. × 3 in. top (tanalised)	180
26 straining posts 7 ft. 6 in. × 5 to 7 in. ..	26
65 struts 7 ft. 6 in. × 3 to 5 in.	65
	357 *man/loads*

Neglecting the spreading charge along the bottom of the fell, this is

	£
357 man/loads at 20/-	=357
Add a minimum of 33% overheads	=120
	£477

(b) *Helicopter*. The material involved weighs approximately 10 tons, and quotations for the airlift were received ranging from £630 from B.E.A. using a Westland Whirlwind from Gatwick Airport carrying 1,000 lb. loads at £70 per flying hour, and £340 from Helicopter Services Ltd. using an American type Bell 47 J from Luton Airport carrying 500 lb. loads. Positioning of helicopters plays a large part in quotations, and a direct job from Luton on this operation only would have cost £100 more, i.e., £440, had the machine not had another lift in Scotland. Besides this cost there would also be labour employed on loading and receiving and spreading material along the fenceline, estimated at

Pick Up Area	4 man/days
Dropping Area	9 man/days
	13 man/days at 177/- per week = £23

Total Airlift Costs:

Helicopter	£340
F.C. labour	£ 23
Add 50% overheads	£ 11
	£374

Saving in (b) over (a) therefore is £103 or approximately 22% and so this method of airlift by helicopter was employed in this instance.

6. Preparation

(i) All materials required were assembled at Gillerthwaite and placed in one central dump on the field at Low Gillerthwaite just prior to the operation.

(ii) Short visit by Helicopter Services Ltd. representative to discuss pick up area, dropping area, road access, loads, with local staff and to see the actual locality for himself.

(iii) Preparation of Load Schedule. This involved weighing of various fencing items to obtain average weights of actual posts, stakes, nets and wire to be used. The load limit for the helicopter is 500 lbs. and 10 tons has to be lifted, i.e., 45 loads. The length of fenceline is 137 chains and

60 yard intervals would give 50 drops. To be on the low side of 500 lbs., 48 loads was the figure taken, and by interpolation and manipulation the load schedule was drawn up based on 1 sheep net and normally not less than 18 stakes in each load with 2 rolls of wire every fifth load. The balance up to approximately 500 lbs. was then made up with posts as required, to fit in with positioning and the sequence of drop along the fenceline. (The Load Schedule, which includes average weights and materials used, is attached to this report, see p. 67.)

(iv) The time and date of the operation were notified to the following, all of whom appeared:

The Assistant County Surveyor for Cumberland

The Chief Forester of Manchester Corporation Thirlmere Forest

The Press

7. Operation

Personnel employed

i/c Operation	District Officer (North Lakes)	P. L. Winchester
Helicopter	i/c Helicopter Services Ltd.	W. M. Strangways
	Pilot, Helicopter Services Ltd.	D. Hebrecht
	Engineer, Helicopter Services Ltd.	S. Rousel
For. Com.	Forester i/c Ennerdale Forest (i/c Loading with 4 men)	D. Nelson
	Forester (Ennerdale) (i/c Dropping Area with 9 men)	H. Yates

Machines employed

1 Bell 47 J Helicopter on skids with quick release dropping hook.

1 Thames Van carrying fuel (approx. 12 gallons petrol per flying hour), spares, 4 landing tables, and 4 cordage nets 6 ft. × 6 ft. with 4 in. mesh.

Timing

Commenced 10.00 a.m. on October 2nd, 1961, with arrival of helicopter flying in from Anglers Hotel on Ennerdale Water where it had spent the night. Van arrived at same time. For. Com. personnel had been in position at pick up area and on top of the fell since 9.00 a.m. Operation completed 2.40 p.m. with one 20 minute break for smoke by Pilot. Setting up tables at start took 10 minutes, and flying of Engineer to explain release mechanism, Film cameraman to get shots of drops, and District Officer to inspect completed operation accounted for a further 10 minutes. Thus exactly 4 hours covered the dropping of 48 loads, making an average of 5 minutes between hooking on loads; this started around 7 minutes and quite frequently towards the end was only 3½ minutes.

Method

The 4 lightweight tables were placed two and two in such a way that the helicopter could land and take-off into wind by coming to rest on them on the skids. Wind direction changed slightly just after midday, but was generally down the dale from the east, and was a fresh breeze suitable to the job as a moderate wind is preferred to give extra lift to the machine. The sun also shone brightly, and was unfortunately coming from the dropping area into the pilot's eyes.

Below the helicopter and between the skids was a quick release hook operated by the pilot, but with an outside control to be worked from ground in case it jammed. The release worked on an endless invisibly-spliced steel strand wire strop of about 30 in. in circumference. This was passed through sisal rope loops used to draw the corners of the 6 ft. $\times$ 6 ft. cordage nets (4 in. mesh) together once the load had been made up in the net.

The Engineer controlled the landing and take-off and the actual hooking in, and the Pilot released the load at about 5 ft.–10 ft. at the spot marked by a red flag by the party on the fell top. This party also put empty nets back into the machine to maintain a supply for the loading party as only 4 were used. Meanwhile the Loading Party filled the next net between the landing tables and made up a further load according to the loading schedule from the main dump, the object being to have one load in transit, one in net ready for hooking in, and four loads made up according to the schedule in position between the main dump and the landing tables. It was essential to mark these loads numerically with timber crayon.

On the Dropping Area, the posts and stakes were spread at correct distances as speedily as possible so that the next drop could be flagged accurately before the machine arrived.

All concerned had to work at an extremely fast rate throughout the operation to maintain the flow, and it is to their credit that no hitch occurred.

Mishaps

Fortunately there were no major mishaps. Once the helicopter slipped on the tables but managed to rise before damaging his rotor tips on the ground. Two loads had to be jettisoned on take-off, one because a netting roll was slipping out of the net and the other because one landing table became hooked up with the load. These wasted 2½ and 4 minutes respectively in reloading. On one occasion the Pilot failed to drop on first run-in, because he hit a downdraught and had to circle to gain height before coming in again. This wind coming over the ridge and down was troublesome, and often height had to be gained by flying first over the opposite fell. One roll of netting went a considerable way down the fell but was retrieved; on the whole the old fenceline acted as a good stop. Note that the men must stand above the drop and on higher ground.

Publicity

The operation was well covered by local press. A film was taken by Border Press Agency and this is now, although it has not been shown to date, the property of the Independent Television Network.

8. Conclusions

(i) The operation was much speedier than expected and wholly successful.

(ii) Safety consciousness is most important. Men must stand outside the sweep of the rotors unless doing an essential job, and must also stand above the dropping position. Nobody should be under or in front of machine on take-off in case load has to be jettisioned, and a clear run into wind of 100 yards or so is useful to the helicopter.

(iii) Such operations require very good teamwork, and must be well planned. The crew from Helicopter Services Ltd. were extremely efficient and a pleasure to work with.

(iv) The men's interest in the operation undoubtedly spurred them to great efforts and the team spirit is now even more consolidated at this Forest. They also learned that an efficient machine is a hard taskmaster.

(v) Cost of this helicopter was approximately 33/- per cwt. = £33 a ton-mile of material lifted. Mr. Strangways intimated that Helicopter Services Ltd. could in future offer similar lifts to NW(E) Conservancy at 20/- per cwt. if between 20 and 30 tons were available for lifting at forests within the Conservancy at one time.

(vi) Helicopter Services Ltd. are interested in an arrangement with the Forestry Commission whereby a retainer fee is paid for two or three months in the year when a helicopter would be available for all operations at a much reduced rate per flying hour (at present it is in the region region of £30 per flying hour ex-Luton Airport). This would increase user, and benefit both parties by increased utilisation of machine and reduced costs on jobs where this would be the best method.

(vii) At present lifting of fencing and engineering materials along with spraying for weed and pest control can be counted as normal operations carried out by Helicopter Services Ltd. Fire Patrol over a large area in extreme danger, and control of large fires, are other possibilities.

(viii) A fitting for spreading granular fertilisers will be in action shortly, probably costing in the region of 30/- per acre. On poor sites where G.M.P. is applied at planting this would work out at 0·2d. per tree, compared with 3·0d. per tree by hand application, although more cost would be incurred on the actual fertiliser.

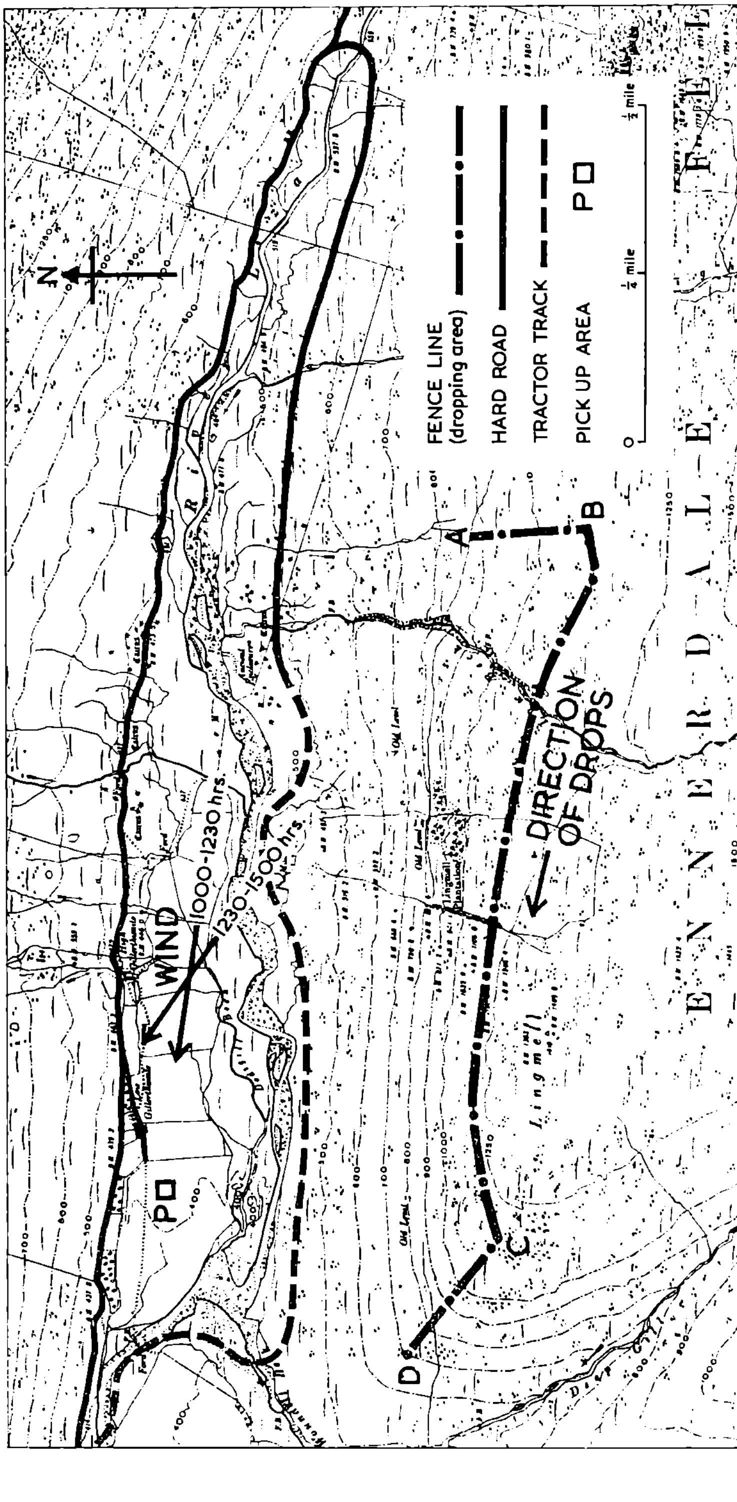
(ix) Mr. Strangways mentioned a possibility in the near future of extracting timber at 50/- per ton/mile (1/8d. per Hoppus feet/mile) which is coming rather closer than previous trials to a realistic figure for difficult country. A larger machine would be necessary and a winch essential so landing was not necessary. The rate at which a machine would work, and the volume of timber to be extracted, would be limiting factors.

(x) There would appear to be numerous jobs on which use of a helicopter would be ideal if the costs were right, and these will only come down with greater use of this equipment. Timber extraction by this method is bound to come in mountainous country, and will be with us earlier than many realise.

(xi) The weather for the Ennerdale lift was ideal, in fact the best day for many weeks, and adverse conditions would have impeded the operation considerably.

General

Load schedules follow, and the general lay-out of the operation is shown on the accompanying map. A photo of the helicopter in action appears on the centre pages.


N
FENCE LINE (dropping area)
HARD ROAD
TRACTOR TRACK
PICK UP AREA P
0
¼ mile
½ mile
A
B
C
D
DIRECTION OF DROPS
WIND
1000-1230 hrs.
1230-1500 hrs.
P
ENNERDALE FELL

LOAD SCHEDULE

(Abbreviated to save space)

Load No.	*Stakes*	*Struts*	*Inter-mediates*	*Strainers*	*Wire Rolls*	*Sheep Nets*	*(lbs.) Load Weight*
1	9	2		1	2	1	460
2	27	1	1			1	499
3	20	1		1		1	438
4	18			1		2	442
5	27	1				1	436
	(Details were given for loads 6–45 inclusive but are omitted here)						
46	19	1	1			2	473
47	12	1	1	1		2	475
48	22	1	1	1			455
48	900	40	40	30	20	60	22,900

Materials Lifted	*Number*	*(lbs.) Average Weight*	*(lbs.) Total Weight*
Stakes	900	12	10,800
Struts	40	42	1,680
Intermediates	40	63	2,520
Strainers	30	86	2,580
Rolls of Wire	20	56	1,120
Sheep Nets	60	70	4,200
			22,900

Comment by Col. R. G. Shaw, Machinery Research Officer

This is a most interesting report particularly as it shows that conditions can exist in extreme circumstances where the helicopter can do a transport job in British forests at a lower cost than using any alternative methods. The machine used, the Bell 47, is the same type that was used in the timber extraction trials at Glenduror in 1956. It is particularly interesting to note that the number of loads per hour over a distance up to a mile and, consequently, the amount transported per hour, closely agree with the conclusions reached on the earlier trial. The whole secret, as the report points out, is ground organisation.

It is encouraging to see such enthusiasm for this form of transport but I cannot stretch my optimism to support the conclusions on cost when it comes to the extraction of timber on a commercial basis. The carrying capacity over a mile is say 3 tons per hour and even at £30 per hour for the helicopter this works out at £10 per ton or nearly 7/- per cu. ft. There is actually a bit more to be added to this for ground staff.

It is perfectly true that with larger payload machines the cost per ton could be reduced but I fear that we are still a long way from the 50/- per ton mile anticipated in Conclusion (ix).

We have kept touch with the helicopter manufacturers in this country and investigations on the Fairey Rotodyne and Westland Westminster indicated that with 5-ton payloads it *might* be possible to do 6 trips per hour over a distance of a mile at a helicopter cost of £120 per hour. This would give an hourly rate of 30 tons for £120 or £4 per ton. Even this would be 2/8d. per cu. ft. and neither the manufacturers nor the Forestry Commission have felt that we were near enough to justify more trials of a method that would not be economic even if our calculations did work out in practice.

In fact it must be fairly certain that 5 tons of thinnings would prove a very unmanageable load lowing to bulk rather than weight. It is these considerations that have put the brake on any further practical trials. Taking a longer range view it is very probable that when helicopter operating costs can be brought down to a quarter of their present level a machine of around 3 tons payload capacity will be an economic proposition. Our contacts with the aircraft industry indicate that this is at least some way off and the hovercraft operating on roughly prepared tracks is probably an earlier possibility.

In the meantime it is encouraging to know that there is so much thought and interest being shown in methods that, in a few years, may appear far less revolutionary than they do now.

METALLING OF FOREST ROADS AT LYMINGE FOREST

By

W. R. HOWELL

Assistant Forester, South-East England

Introduction

The following is a report on the Machinery, Materials and Method used in the construction of metalled roads at Lyminge Forest. The work was carried out in accordance with the Annual Road Programme for Forest Year 61, consisting of 174 chains of new roads and 67 chains of repair work. The land is level and the roads are straight, but the subsoil, a rare Pliocene silt, becomes dust in summer and mud in winter, so cannot support traffic.

Description

Most of the roads had been formed, graded and rolled the previous year and therefore were firm and solid. The metalling was 10 feet wide in the centre of the road, leaving a verge each side of approx. 12 feet. Passing places were inserted at approx. 10 chain intervals on straight stretches of road, more frequently on bends and at the bottom and top of gradients of any length. The passing places were 15 feet or more in length and carried to the edge of the road either to the left or to the right of the 10-foot metalled centre. At all "T" junctions with other roads "turn arounds" were laid out to a radius of approx. 12 ft. from centre of junctions.

Materials

Colliery Shale was used on all roads as a base material to an average depth of 9 inches. This is a slate shale, very hard when freshly dug but deteriorates rapidly on contact with the elements. (This deterioration of the shale on exposure will usually necessitate the use of a suitable top dressing.) The shale was hauled straight from the Colliery so that the material showed considerable variation in size. The very large pieces had to be broken by hand. Consequently it was found advisable whenever possible to refuse any loads consisting of a high proportion of large pieces.

For the top dressing two types of material were used, Hoggin and Ash/Stone mixture to a depth of approx. 3 inches.

Hoggin—Hoggin is a mixture of sand, gravel, stone and clay, and the higher the proportion of gravel and stone with just sufficient sand and clay to bind, the better. Too much sand or too much clay will only make a soft road, unusable in wet conditions.

Ash/Stone—This was ballast from a disused railway line, a local source. Cheaper than hoggin and easier to spread.

Advantages and Disadvantages

Each material has its advantages and disadvantages. Selection depended mainly on the period which could be allowed for the road to consolidate before extensive use; site (whether exposed or sheltered); availability of material; rate and time of delivery.

It was found advisable to use Hoggin on exposed roads which dried rapidly, and where the roads were not liable to be used extensively for a year or so. Given time the surface becomes consolidated and almost waterproof.

Ash/Stone was used on roads which were heavily shaded, either by forest crop or high banks and on roads liable for instant use. My own opinion is that the Hoggin will prove the most suitable top dressing as the Ash/Stone will wear quickly, necessitating constant maintenance.

Machinery

For spreading of material a T.D.6 Bulldozer was hired, together with an 8-ton Diesel Roller. Condition of hire was that only the hours worked were paid for and not hours spent standing because of adverse weather, maintenance, etc. It was necessary, to keep these machines fully employed, which involved detailed planning of flow of materials, utilisation of labour and movement of machinery from one area to another. Crossing of public highways, supplies of fuel, noting of time standing idle, caravan sites, all had to be taken into consideration and noted. As a point of interest Lyminge Forest is intersected by numerous narrow public roads, and it was necessary to cross several by means of laying cordwood across the road, allowing the bulldozer to cross without damaging the tarmac surface. When carrying out this operation two men were detailed to control traffic.

Method

Before metalling commenced it was found advisable to mark out the width proposed for metalling with pegs, starting at the furthermost point from the entry of vehicles to the road and so avoiding running over the base material before it had been rolled. The pegs were spaced to measure each lorry load of material to the required depth, which gave a guide to the person controlling the tipping of materials. This worked out to approximately 18 yards to a 7 cu. yd. load.

The load of material was backed up to the first pair of pegs, tipping commenced, and the lorry driver directed forward to ensure as even a distribution as possible. The next lorry commenced at the second set of pegs and the operation repeated by each lorry in turn. It was found advisable to leave the directing of lorries to a reliable person, i.e., local ganger, who was responsible for tipping operations, collecting and signing delivery notes, correct measure and standard of quality. When not employed with the lorries, this man helped to break the large pieces of colliery shale. When the first two or three loads had been tipped, the T.D.6 began to spread the material evenly to the required depth, assisted by two men, one each side of the road, who broke the big pieces of shale and kept each side straight and to the required width. As soon as the shale had been reasonably spread, the roller came behind and rolled the road base firm. Thus the two machines were kept working continuously.

In theory we planned to have lorries tipping just fast enough to keep the machines going, i.e., one lorry every 20 minutes or so, the average daily rate of delivery being 150 to 160 yds. of material. In practice, however, usually 4 or 5 lorries arrived together with an interval of 2 hours or more before the next delivery, resulting in machinery sometimes being idle. To overcome this difficulty it was found advisable to commence delivery of top dressing material after the first fifteen chains of base had been rolled. The lorries delivering top dressing were brought along one side of the partially metalled road, turned at the most convenient point and backed to the starting point, then tipped in the same manner as the shale. The pegs were moved to fix the appropriate length for each load. Thus when the dozer had spread the shale delivered, instead of waiting for the next load or batch of loads, it moved back to spread the top dressing. By using this method an average of approx. 10 chains of metalling was completed per day.

When the base had been completed, the dozer then finished spreading the top dressing. As the top dressing was applied fairly thinly, it was found advisable to spread the heaps and then "back blade" to ensure an even depth and level finish. The roller then gave the whole ride a final roll.

Costs

The cost of metalling varied from road to road, but average prices were as follows:

Average costs per Chain

	£	s.	d.
Bulldozing	2	1	2
Rolling		14	2
F.C. Labour		12	8
Shale	7	7	10
Hoggin/Ash	4	12	8
TOTAL	£15	8	6

TOTAL £15 8 6=£ 1234 2s. 0d per mile

Material per Chain

Shale	– 10 cu. yds.
Hoggin/Ash	– 6 cu. yds.

ONE APPLICATION OF CROWN THINNING IN SITKA SPRUCE

By

Captain J. MAXWELL MACDONALD of LARGIE
Forestry Commissioner

About ten years ago, the writer changed from the traditional light low thinning, to crown thinning, in his Sitka spruce woods. These are of Quality Class II and III, and because of the very severe exposure to the Atlantic, it was decided to make the thinning fairly heavy. This was mainly in order to help to promote wind-firmness through good crown and root development. It was understood that by crown thinning was meant the removal of trees from the upper canopy with the object of breaking the canopy and helping the growth and development of those that were left standing, as opposed to the removal of only such trees as had no future, from the lower canopy, for, presumably, reasons of hygiene. Thus in so far as anything definite can be said about thinning, the object of crown thinning is the improvement and development of the remaining crop, rather than the removal of trees that have no future. The thinner's mind is fixed on the trees that remain and not on those to be removed.

At first a three-year thinning cycle was prescribed, but, when the second thinnings came to be made, it was found that the crops were not ready again, and the cycle was extended to four years.

Preliminary figures from sample plots indicate the following thinning regime for Q.C.II.

	Stems	*Volume*	*Removed in Thinning*	
	per acre	*per acre (h.ft.o.b.)*	*Stems*	*Volume*
Before first thinning at 16 years ..	1,200	1,400		
After first thinning at 16 years ..	1,020	950	180	450
After second thinning at 20 years	840	1,646	180	398

Most woods divide themselves naturally into groups of trees of varying size, which, with a little practice, are fairly easy to recognise. The thinner approaches such a group and examines it. A good deal of information can be got while walking from the previous group, particularly if the approach is downhill, when the relative heights of the trees can be seen. In the group there will be one, or perhaps two, trees which will stand out from the others for vigour, size, straightness, fine, horizontal branching, with whorls far apart, no upward-tending branches and no forking. Good crown development is also important, but this is not much of a problem, being almost universal in the upper canopy when thinning is not delayed. Such trees are for convenience called crop trees. This means that they are to be favoured in thinning; it does not necessarily imply that they will remain to form part of the final crop. Sometimes, where there are no good large trees, a comparatively small tree must be selected as the crop tree and given room to develop.

Two difficulties arise in selecting crop trees. The first is when all or most of the trees in the group are of good quality. In this case the thinner has to resist the temptation, which is strong, to leave them all, and must harden his heart to remove some, even if they are of perfect form. If he does not do this, he will leave himself or his successor in future thinnings with a group of tall bottle-brushes, which will be difficult if not impossible to thin satisfactorily.

The other difficult case is when most or all of the trees in a group are faulty for one reason or another. There all that can be done is to make the best of the poor material. In such a case, an otherwise good tree with a wavy stem may be selected as the crop tree, as waviness corrects itself to a large extent as the tree grows; or a tree that is coarse but straight may be chosen, particularly if the coarseness is to be corrected by high pruning. This will be discussed later.

It is surprising how often one finds groups that are all of good quality, separated by only a few yards from groups that are 100% faulty. The cause is thought to be very local wind-currents—most of the faults in Sitka can be traced back to wind damage, broken leaders and the like, in early life.

Having selected his crop tree, the thinner looks to see which of its neighbours are interfering with the development of its crown, or will interfere with it before the next thinning. Such trees are marked for removal. Wherever possible, of course, a faulty tree will be selected for removal, but too much stress should not be put on this. The temptation is to look for faulty trees, and then try to find some reason for removing them.

A coarse dominant or "wolf" is often removed to help a good sub-dominant, and this procedure has the additional advantage that the "wolf" provides useful saw-timber even at the first thinning, and adds to the volume removed in the thinning.

Where a smaller tree hems in with its crown the lower crown of a taller neighbour, so that heavy branch development is prevented, the smaller tree is for convenience called a "cleaner". This relationship is to be encouraged, and ideally a crop tree should be surrounded by a ring of perhaps three or four cleaners. This, however, seldom happens in practice. Thinning takes place among the cleaners, to enable the best of them to develop satisfactorily. Sometimes a cleaner can do its work for only a few years, when it will be suppressed by its crop tree, but there may be another potential cleaner, standing further away from the crop tree, which will take the place of the original cleaner. This is called a second-line cleaner; it can often be distinguished well in advance, and be brought on by the judicious removal of competing neighbours. Sometimes a faulty dominant is removed to help a good sub-dominant to act as a cleaner for a crop tree. In other cases it may be a choice between two or more sub-dominants.

It sometimes happens that two good dominants stand side by side, and it is permissible to allow them to grow on together, developing a common crown. In thinning they are treated as one tree, and the double crown is freed from competition in the ordinary way.

There is a tendency in thinning to forget that it will not be many years before another thinning takes place. It is always permissible, and often wise, to leave some problem to which there seems no solution, for the next thinning, provided in the meantime harm will not have been done to the crowns of the trees. This lack of urgency is much more pronounced when the thinning has not been delayed, and one of the great blessings of being right up-to-date with thinning is that it is seldom that a particular course of action is, so to speak, forced upon the thinner. He has much more freedom of selection.

The temptation which is most difficult to resist in thinning is the removal of faulty, ugly trees, for no reason other than their ugliness. Fortunately their removal does no harm, and it is a question of deciding whether to remove them for appearance sake, or leave them to put on increment. The thinner of Sitka should not be too much afraid of leaving even quite large gaps in the canopy: they close up very quickly.

For several years now we have high-pruned about 140 selected trees per acre. The upper limit of diameter at breast height was 5 in.–6 in. A smaller diameter limit has been recommended in order to get the minimum of knotty core, but this is found to be impossible to achieve in practice, as many of the best trees have reached 6 in. or more d.b.h., even by the earliest possible first thinning.

It has now, however, been decided that there be no upper limit of diameter for pruning, so that trees of any diameter (at the time of first thinning) will be pruned, provided they are straight and otherwise suitable. This decision has been based on the premise that, the greater the diameter of the tree, the greater the volume of knot-free timber it will put on in a given period. For example a butt-length of 12 ft. $\times$ 6 in. mid quarter girth contains three h.ft. If this grows at four rings per inch for twenty years, it will then have a volume of 16·33 h.ft. an increase of 13·3 h.ft. which will be free of knots. A larger tree, with a butt-length of 12 ft. $\times$ 8 in. mid quarter girth will contain 5·33 h.ft. In the same time and at the same rate of growth the larger tree will have increased to 21·33 h.ft. of which 16·33 h.ft. will be free of knots. In addition of course, the larger tree will have been growing faster than the smaller, and if it continues to do so after pruning, it will have a further advantage.

Just as in crown thinning the thinner looks to the trees that will remain standing and form his crop, rather than those to be removed, so in pruning interest should centre not on the smallness of knot-free core, but on achieving the greatest volume of knot-free timber. The future is looked to, rather than the past.

The trees are marked for pruning at the same time as the thinning is being marked, but this is merely for convenience, and to save going over the same ground twice. The pruning has no significance so far as the thinning is concerned. Although only trees which are thought to have a future are selected for pruning, quite a proportion of the crop trees are not considered good enough for pruning. Only the very straightest stems are pruned, but in selection, coarseness and upward-tending branches are not a bar—rather the reverse: a coarsely-branched stem, if it is straight and otherwise good, can be turned into a perfect stem by pruning. This leads to the selection of a certain number of coarsely-branched, but otherwise good dominants, for crop trees, in the knowledge that they will be improved by pruning.

Pruning is done with a six-foot pole saw, and a fairly tall man can get up to about twelve feet. The intention is to get up to about twenty-two feet in a second pruning.

Crown thinning is a taxing job requiring a high degree of concentration—very much more so than the almost automatic marking of suppressed trees in a low thinning. After a few hours marking the brain begins to function less keenly, and it is then possible to mark very badly. It has been suggested that the constant looking upwards at the crowns of the trees, which is aggravated when working uphill, tends to cut the blood off from the brain, so that it becomes sluggish and less keen. With this in view it has been found that numerous fairly short sessions of marking give better results than fewer long sessions. Two or three hours morning and afternoon every day, give better results than a whole day now and then.

When a wood is inspected after two or three crown thinnings as described, one gets an impression of the long well-developed crowns. One is aware of greenery where one would expect only the brown of dead branches. Looked at from outside, one is struck by the tall spire-like crowns of the largest crop trees, standing out ten feet or more above the general canopy surrounding them. Lower down the straight stems, free of branches as a result of pruning, give promise of straight-grained, knot-free timber.

HARDWOOD PULPWOOD PRODUCTION: AN APPLICATION OF THE GENERAL TARIFF TABLES

By

S. J. NORTH and J. S. BRAIN

By Forest Year 1958 hardwood pulpwood (3 ft. 6 in.–4 ft. 3 in. lengths, 3½ in. top, 12 in. butts) for the Sudbrook Pulpmill, near Chepstow, Mon., was being produced at the rate of 6,000 tons per annum by the Dean Surveyorship. During this year, the 400 acre block of naturally regenerated oak (chiefly *Quercus robur*) 1901–1918 was due for thinning. The area is part of the Blakeney Hill Beat lying in the S.E. corner of the forest on the Old Red Sandstone. Previous thinning had been somewhat delayed pending the opening of the pulpmill, and prior to thinning, some 80 stems/acre were selected as potential final crop trees which were to be favoured in thinning to encourage crown development. Where necessary pruning was carried out to ensure a clear bole of 20/25 ft. (cost 8d. per tree piece work, 53/4d. per acre).

It was considered that there were possibilities in applying the Tariff system in this large block of fairly uniform crops, provided suitable checks were made

Hummel indicated in Forestry Commission Bulletin 24 (*The Volume Basal Area Line*, page 55) that general tariff tables might also be used in young hardwood stands up to a mean Breast Height Quarter Girth of 6 inches. Since the crop was naturally regenerated, there were no such helpful guides like planted rows to assist in pre-determining the number of trees to be sampled in any one compartment in order to obtain the accuracy required in the tariff method of measurement.

A useful rule of thumb was evolved based on the number of final crop trees multiplied by two. It was expected that this might provide rather more than the 10% of sample required in tariffing conifers, but since the use of the tables in hardwoods was something of a trial, this was regarded as a desirable feature (in this event, the sampling fraction ranged from 10–30%).

The actual marking and tariffing was done by the two of us, and the going was hard since the brambles were waist high and it was not uncommon to find on arrival at the tree to be girthed, that the tape had been left some distance behind in the brambles. Heavy infestations by the Oak-leaf Roller moth *Tortrix viridana* added to the discomfort of the job.

Our pace was a regular ¾-acre/man hour marking and tariffing, which averaged out at 180 hoppus feet per man/hour. On the basis of agency charges (1961) for a forester and assistant forester, the charge worked out at rather less than 1½d. per hoppus foot.

The production operation was carried out by eight men, six on felling and crosscutting (working in 3 pairs) and two horsemen working between the three cutting gangs. Piece work rates remained fixed throughout the operation and the men were paid on the tariff volume. For each compartment:

$$\frac{\text{Total vol.}}{\text{No trees marked}} = \text{Vol. of average pole}$$

and the cutters recorded the number of poles felled weekly, the balance being struck with the total number of poles marked at the end of work in each compartment.

Timber, cordwood and other measured products were paid for separately, the volume subtracted from the gross tariff volume to arrive at a payment for pulpwood. A record of production and tariff volume was kept for each compartment, with the co-operation of the haulier we were able to keep a record of despatches by compartments, and by using a conversion factor of 30 hoppus feet per ton.

Conversion loss (and occasional gain) which included an element for tariff errors was derived.

The results of this operation are briefly discussed under items in the following paragraphs:

(1) **Tariff Numbers**—In view of the range of planting years 1901–18, a variable quantity of beech in mixture with the oak, the range of tariff numbers is very small, 25–32, with no apparent correlation with year of planting, geography or average pole size (range 2·65 . . . 6·21 hoppus feet/pole) that can be readily detected.

(2) **Measurements**—It is emphasised again, that of all the products, only butt lengths were actually measured; cordwood volume was assessed by applying the conversion factor of 45 hoppus feet per cord.

The volume of all forms of pitwood were assessed from "Smiths' Tables"; pulpwood on a conversion factor of 30 hoppus feet per ton (a check on one load of pulp which had been felled some days, revealed a figure of 31 hoppus feet per ton). To check the Tariff system at an early date the felled measure of poles over two whole compartments (some 38 acres) was taken. In one compartment this revealed that the tariff was measuring 10% higher than felled measure, and in the other case 2½% higher than the felled measure.

On those two same compartments, it is interesting to compare the 100% felled measure, tariff measure and converted measure, since it was on these results that it was decided to continue the method throughout the rest of the area.

Hoppus feet	*Acres*	*Felled measure*	*Tariff measure*	*Converted measure*	*Conversion gain (+) or loss (—) on felled measure*	*Conversion gain (+) or loss (—) on tariff measure*
348	16	7,027	7,753	6,905	—2%	—11%
350	22	4,239	4,333	4,373	+3%	+1%
WHOLE AREA: 409 acres			107,030	98,618		—8%

(Production: Pulpwood 85%, timber 7%, pitwood 4%, cordwood 4%)

Whilst these results indicate a quite large range of conversion losses on tariff measure, the conversion loss on felled measure was low, and indicated adequate reliability on the methods of measuring the converted material and the various conversion factors employed. It was, therefore, decided to proceed with the tariff system, but a check was kept on the conversion loss on tariff measure as each compartment was completed.

The last entry indicates an overall conversion loss of 8% with which results we were well satisfied. It is relevant to point out that if the factor used for converting pulpwood had been 31 hoppus feet (the factor obtained in the one check carried out) the conversion loss would have shown as 5·2% only, whereas by using 29 h.ft. per ton would show a conversion loss of 10·4% (see below).

(3) **Seasonal variation**—By separating results for summer and winter felling, the need for "not lagging" in sales by weight is well illustrated.

	Tariff Vol.	*Converted Vol.*	*Gain (+) or Loss (—)*
Winter felling	21,496	21,627	+0·06%
Summer felling	85,534	76,991	—11%
Total	107,030	98,618	8%

In other words 30 h.ft. per ton appears to have been a very fair conversion factor for winter felling, but in the summer, 31 hoppus feet per ton would have been more accurate, and from this the obvious conclusion is drawn, that there was a loss of weight equivalent to 1 h.ft./ton due to drying out in the summer months.

Conclusions

(1) In this type of hardwood crop, the general tariff table can be applied with satisfactory results.

(2) As a system, all the advantages apply that are relevant to the general use of tariff tables, but in this particular instance, its application was found to be particularly valuable in the payment of piecework, and in planning the work ahead, since a very accurate assessment of times and dispositions of labour could be made.

(3) The method has many practical advantages over payment by tonnage produced, but it is admitted that the more recent development of sales (and payment) by stacked lorry load presents a method which may be even more attractive than the tariff system.

THE ROYAL ENGINEER FIELD LEVEL

By

W. J. DAVIES

Forester, South-East England

Since the end of the war an amazing selection of Ex-Service Equipment has found its way into everyday civilian life. Quite a lot has found its use in Forestry, and a list of mechanical equipment would include 4-wheel drive vehicles, Jeeps, low loader transporters, bulldozers, caterpillar tractors and rollers, while Bren Gun carriers have been used in seed collection.

A list of smaller items of equipment would range from the many and varied articles of clothing to haversacks, compasses, binoculars, tools and even maps which have been turned into scribbling pads.

There is one such piece of surplus equipment which has a ready place in forestry, yet which has attracted little attention. Sometimes advertised as the "Handyman's General Purpose Tool", it is the Royal Engineer Field Level.

Made of hardwood, with brass screws and fittings, it is, when fitted up, a right angled triangle with a base, known as Limb "A", 4 ft. long. Limbs B and C of the triangle are hinged on Limb A, and where they meet at the apex, Limbs B and C are held by a locking pin. Limb C contains a SPIRIT LEVEL, a pocket in which is stored a PLUMB LINE, and a brass plate from which the plumb line is suspended when in use, when levelling or setting gradients.

The instrument folds conveniently to 4 ft. $\times 1\frac{7}{8}$ in. $\times 1\frac{1}{4}$ in. and is held by a webbing strap. When folded, it can be used as a 4 ft. RULE and a SPIRIT LEVEL. When opened, one side of the level is marked out as a PROTRACTOR and the other side is marked as a GRADIENT MEASURE or CLINOMETER.

To use the R.E. level to set a gradient, the plumb line is fixed to the brass plate and the required gradient is shown where the plumb line cuts the scale which is marked on Limb A and B. This scale is graded from LEVEL to VERTICAL.

Thus, the R.E. Level can be used as:

(1) 4 ft. RULE

(2) SPIRIT LEVEL

(3) T. SQUARE

(4) PROTRACTOR

(5) PLUMB LINE

(6) GRADIENT MEASURER OR CLINOMETER

This gives it scope for use in Surveying in the field, building, draining, setting up levels for culverts, checking right angles, setting out angles, levelling and marking out gradients on Road Making, and it can be used to measure the heights of trees. See Plate 8.

HOUSING THE FORESTER IN NORTH WALES

By

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District Officer, North-Wales

The number of supervisors needed in any particular forest area will depend upon the size of forest to be managed, and the estimated amount of forest work in the forest management programme. When supervisory numbers have been determined the housing requirements for that particular forest area will be known. By applying this investigation to each forest area a General Housing Programme can eventually be prepared. Priorities can be allocated to each particular project. Thus an Annual Housing Programme can be determined according to the amount of monies granted for housing purposes, and a selection of top priority projects.

Site Selection

Urgent priority projects should naturally receive first attention, but there may be very tangible reasons why a particular project is delayed. For example there may be no good water supply in a particular locality or owners may not sell land. It is desirable therefore for site selection to be several years ahead of the Annual Housing Programme.

Foresters' Houses are best built in centres of rural population. All will probably agree to this. Certain factors may justify consideration to building a house set apart from a village location. A forest beat area may be in an isolated locality and it may be very desirable for a supervisor to live on the spot. The balance against "isolated" sites is very heavy indeed. Availability of schools, churches, shopping facilities, main bus routes and social life are of utmost importance. Moreso, perhaps to the forester's wife and family than to himself.

The particular location of a housing site serving a particular forest area is therefore largely determined by the location of existing village communities within that forest area.

The Site Itself

A housing site needs to meet with the approval of the County Planning Officer. It is normally advantageous to obtain vehicular access into a housing site from a road which is not a main highway. Planning Authorities are very reluctant to allow access entering from a main highway. Early consultation with Planning Authorities is always advisable. Their views on "ribbon development" can sometimes by very exacting. Whilst it may well be desirable to be in an existing community but a little "apart" from same, for purposes of privacy, the planners may refuse a particular site clearance on grounds of ribbon development. A combination of ribbon development and objectionable access will most certainly meet with the planners disapproval.

Site requirements can perhaps be summarised as follows:

Size of Site

The size needs to be of 70 ft. frontage and 100 ft. depth or thereabouts to take the present standard house. This normally allows an adequate site curtilage and is manageable by the average gardener. Ideal shapes and sizes are not always obtainable so that every site must be treated on its merit. The total frontage of the present standard forester's house with garage is 53 ft. with garage access at the end of the house. Sites with a frontage of less than 70 ft. may not be acceptable unless the vehicular access fits favourably into the possible amendments to the standard plan.

Aspect of Site

Aspect when defined in architectural terms means the relationship of a building to the four points of the compass. Certain rooms in all buildings need different types of light. (For example a tool maintenance hut needs north aspect lighting.) In a house it is desirable for living rooms and the dining room to face south in order to gain the maximum amount of sunlight. An east aspect is suitable for a kitchen or alternatively a west aspect, but of course it will only get the sunlight for half the day.

It is not always possible to give a building the ideal aspect, possibly because it is overlooking a nearby building in which case a compromise has to be made. With standard designed houses it is usual practice to design both a *north aspect* and *south aspect* house, i.e., one is designed to receive the majority of sunlight at the back and the other the majority of sunlight at the front. The architect needs to decide which of the plans is most suited to a particular site.

Slope of Site

Vehicular access is invariably necessary on a housing site. A gradient to a garage drive should not exceed 1 in 8, and 1 in 10 is more desirable. Gradients exceeding 1 in 8 must be very critically examined. A vehicular turning bay within the curtilage of the housing site and a lay-by on the roadside, 40 ft. × 12 ft. frontage are often demanded by the planning authorities. Slope of land on the actual house platform does not necessarily render the site unacceptable. A level platform in size approximately 60 ft. long and 35 ft. width, together with the garage drive, can normally be bulldozed. Commission operators take a particular pride in this work and a completed site with its cambered banks is always a credit to the bulldozer driver concerned. Such site conditions naturally add cost to the housing site and also may involve the construction of certain retaining walls. Excessive estimate costs for these preparatory works may well result in the non-acceptance of the particular housing site.

Curtilage Works

The vehicular access drive and turning bay have already been mentioned. A tarmacadam finish is the most satisfactory. Pedestrian and perambulator access are obtained by means of 3 ft. wide concrete paths serving the front and near entrances. Pathways are extended all the way around the house to give general access and to ease the chore of cleaning ground floor windows. At the front entrance the path is generally built up into an apron with canopy cover in the form of an open porch. At the rear entrance the path again is extended in the form of an apron usually of more generous dimensions to cater for domestic needs which devolve around the kitchen and outbuilding entrances. Concrete steps, if required, and a 2 ft. concrete path lead to a clothes line.

The type of fencing around the site depends on the degree of amenity that is desired. Inconspicuous fences, being generally at the rear, can normally be of sheep-net type. Front fences may be similar, but if the locality has adopted a particular frontage feature it may well be desirable to follow suit. Examples may therefore be, walls of rustic brick, rock faced concrete block or chain link fencing. Generally speaking if an amenity fence is required then a timber palisade fence is chosen. This looks particularly attractive if formed by 2¼ in. width oak palisades at 2½ in. spacings and secured to timber bearers with oak pegs. Tanalized larch palisades can also present a pleasing appearance. It is often desirable to omit garage drive gates and then fence up each side of the drive. Wrought oak wicket gates treated with linseed oil, set up where required, look particularly attractive. Hedges of beech or Lawson cypress are normally established as soon as possible. Flowering shrubs add to the general attractiveness of the garden.

The House Itself

In the planning of a building the architect is charged to bring about the best utilisation of the space available which is enclosed by the walls and roof. In addition "architectural expression" will be manifest. The building will be given a character aimed to present the personal equation of the "ego" of both client and architect. If the architect is empty of ideas and convictions, if he is an assembler and not a creator then his work will reflect that fact. The forester's house will stand in the countryside for a hundred years and the designer's contribution to the field of architectural expression will be always evident.

The superficial area of a house is measured from the internal perimeter of the external walls, ignoring all internal partitions. A 2-storied house measured internally 20 ft. by 25 ft. will give therefore 1,000 superficial ft. In North Wales the cost of house building in rural locations is probably higher than the national average. The cost to build a house including curtilage works, is somewhere in the region of £3 per superficial ft. Cost is a great deciding factor and therefore superficial areas for the house are normally 1,000 to 1,050 superficial ft.

The maximum, which would include house, outbuildings, garage, covered ways and office would be 1,360 superficial ft. (Say, about £4,000.)

The internal design of a house is so much a matter of individual tastes and requirements that a general discussion on the subject would fill many pages, and even then it would not be possible to dogmatise on questions of planning and furnishings. Perhaps to mention some of the points is the most that one can hope to achieve in a general discourse of this sort.

The Kitchen

It should not be a passage so that the mere opening of a door causes disturbance. This is an all-electric age and provision for electric appliances is necessary. This includes the cooker, refrigerator, washing machine, mixer, wall heater and clock.

The Living Room

It is important to be able to sit around the fire without being in a draught and without blocking up door openings with easy chairs.

Television and wireless aerial cables can so easily be built into walls at little cost.

Provision should be made for pelmets and curtain rails.

Generous provision of electric points—in the living room for example two two-gang 13-amp power plug units is not too much. Fortunately the electric carcassing of a house is not an expensive item in relation to the overall cost of the house. An extra point here and there will only cost a few pounds in total.

Foresters often return home with wet clothes and muddy boots. They naturally wish to change before entering the living rooms.

The list of details one could compile is almost never-ending. It is a client's privilege to point out as many points as he wishes to his architect.

The final result when transferred from drawing board to bricks and mortar will, it is hoped, result in a pleasant and comfortable home for the forester, and an added structure to the rural landscape which pleases the aesthetic eye of the architect and client alike.

REPORT ON VISIT OF EXTRACTION CONSULTANTS FROM NORWAY AND SWEDEN TO FORESTRY COMMISSION FORESTS, MAY 8th-16th, 1961

By

J. W. L. ZEHETMAYR

Divisional Officer, Work Study Section

Consultants

Professor Ivar Samset, head of the logging section of the Forest Research Institute of Norway.

Jagmastare Ulf Helmers, head of M.S.A.—Mid and South Sweden's Association for Forest Work Studies, accompanied by:

Ingenjor John Soderlund of M.S.A., working on design and use of equipment for extraction.

Terms of Reference

To consider skidding (extraction) to roadside as at present undertaken at the various forest areas as compared to Scandinavian practice:

(a) *Methods:* The place of hand, horse, wheeled and tracked tractor, cables and winches under the varous conditions visited.

(b) *Performance:* To consider the output achieved under the various conditions by the methods in practice in terms of work units (standard times or task times) and daily outputs.

(c) *Costs:* Will be considered only in so far as they are necessary to equate different methods where the contributions—manual and machine—vary. Costs should include labour overheads.

Main Places Visited

KERSHOPE, typical of Border Forests of England and Scotland: Mainly gentle slopes (circa 5°) with occasional gullies. Peat 1 ft. or more in depth with a very soft surface.

COWAL AREA of West Scotland: Steeper slopes up to 15° with peat and rock outcrops.

LAKES: A brief visit to the extraction demonstration set up at Thornthwaite for Royal English Forestry Society visit in the previous week.

GWYDYR AND COED Y BRENIN, North Wales: Similar to Cowal but with less peat, more rock—often loose, and coppice growth.

Alice Holt: *Machinery Development*

In addition Mr. Helmers gave a talk on extraction illustrated by slides to some 70 members of the Home Timber Merchants Association of Scotland, in Glasgow. Professor Samset showed films to members of the Federated Home

Timber Association, Bangor University staff, F.C. staff and students at Gwydyr School. In London the consultants met the Director General, Deputy Director General, Director (Headquarters), Conservator (Headquarters) and Chief Engineer, showed a brief selection of their films and slides, mainly those on double drum winch and horse sledges, and discussed the tour.

In the main areas visited the Consultants were met by the Conservators and their staffs. They were accompanied during most of the tour by Col. Shaw, Machinery Development Officer, and throughout by J. W. L. Zehetmayr, Work Study Officer. In each main forest the Work Study Officer who had carried out an assignment there was present.

Approach Adopted

Typical sites were visited in each forest either in process of extraction or recently extracted. Full details of the site conditions, job, and output were provided in a standard form as a basis of discussion. By limiting the number of sites visited in a day to 3–5, it was possible to have a good look at the terrain in a compartment and to have discussion on the spot. I am sure that all who took part will agree that these discussions were among the most stimulating in which we have participated.

The discussion and suggestions made by the Consultants were in every case prefaced by the qualification that these were their impressions and indicated how they would tackle the extraction on a similar site in Scandinavia.

There was inevitably some repetition on visiting different areas with almost a complete change of F.C. faces daily, so that I have tried to summarise the lines of discussion followed, starting first from the specific terms of reference and developing from them the principles suggested for future investigation. Work Study Sections' observations are noted in brackets.

The recommendations at the end should be considered as those of the Work Study Section, as amended by the Consultants after consideration of the draft report.

Main Points of Discussion during the Tour

(1) Relative status of different methods of extraction

Hand: The Consultants felt that a preliminary hand extraction into a position facilitating the next stage was essential. In Scandinavia the use of strip roads is increasing and hand extraction to them of small sized wood is being developed (up 2m × 8 in. or 3m × 6 in.—a maximum weight of 120 lbs.). Traditionally the feller cut short pieces and stacked them to suit himself; to-day he is expected to move them up to 15 or 20 metres.

Hand extraction implies the use of strip roads (racks) at close spacings—15–30 metres—denser in older than in young stands. These must be set out by the forester for the feller will put them too close and destroy the stand. The determination of the correct spacing to minimise the cost of felling and extraction is an important job.

The size of piece aimed at in early thinnings is however not the 1 and 2 metre lengths cut in the past, but 3–4 metres which gives the best size for many forms of extraction. The Consultants were surprised that we extract so many thinnings in their full length and thought they should be halved both to facilitate hand and other extraction and to reduce extraction damage.

(Hand extraction was used for one quarter of the volume according to the 1960 census of methods. Cutting to shorter lengths would imply knowledge of subsequent utilisation. It might help to overcome the widespread objection to hand extraction.)

An example of the preparation by hand for the main extraction is the "support pile" developed by Professor Samset, a horse sledge being backed under the raised end (see Fig. A, p. 87). Mr. Helmers quoted a 10% increase in feller's time giving a 10–25% reduction of the horseman's time at 200 metres, the horseman's time being probably twice as costly as the feller's.

Horse: The horse was recognised as being at present the main means for extracting thinnings in our hill country. (In the areas visited, Borders, Cowal and certain forests of North Wales, 72 horses were at work in October 1960, and in 1959–60 90% of the 70,000 cu. m. (2,000,000 h.ft.) was skidded by horse. This gives an estimated annual output of 900 cu. m. (25,000 h.ft.) per horse. These forests contributed 10% of the total volume cut in Forestry Commission areas in F.Y.60.)

(a) Horses (and above all tractors) must be confined to strip roads (racks) to minimise extraction damage.

(b) Every horse must be given equipment to lift at least one end of the load on to runners, wheels or tracks. In steep country this means that proper harnesses and shafts must be used. In Scandinavia driving is by reins and the Consultants had seldom seen horses being controlled by voice. In the diagram sketches of a typical sledge with essential features are given at B and C and the latest Swedish device is shown at D; Norwegian equipment is shown at E and F; the last has been tried by Work Study Section unsuccessfully but needs retrial.

(c) In steep country, racks must be straight from top to bottom at a suitable angle, braking being obtained from the shaft ends (C in diagram). In flatter country the longer easier route might be the best since big loads are more important than length of haul.

(d) In several cases it was felt that horses were underloaded. To obtain the optimum output per time unit, the relation between terminal and travelling time must be carefully determined. It is known that loads of 15–30 h.ft. are possible on sledges, while the averages found by work study section were 6 h.ft. (tushing in Borders) and 10 h.ft. (tushing in Cowal).

The Border sledge developed by Work Study Section after earlier visits to Sweden was considered satisfactory. Its use has been limited to the Borders in spite of trials in Cowal and North Wales and this was thought due to the use of chains not shafts. Mr. Helmers and Mr. Soderlund considered it to be at least 25% underloaded during the visit, and undoubtedly Work Study's recommendation of 15 h.ft. (½ cu. m.) is often not adhered to.

Thus the outputs seen on horse extraction were considered low due to:

(i) Lack of knowledge at all levels of the optimum load and combination of terminal (loading and unloading) and moving times.

(ii) Lack of co-ordination between fellers and horsemen.

(iii) Lack of equipment adapted for various conditions and working methods to go with them.

(iv) Lack of training.

Mr. Helmers calculated that in the worst conditions seen, and making all possible allowances, the Swedish piece rate would rarely exceed 4d./h.ft. for man and horse.

Tractors: The only one seen operating was a Bristol at Kershope. The use of normal tracked tractors on the soft and wet ground in the Borders was considered unsuitable. It was thought that this could be replaced with a wheeled tractor with light tracks—now extensively used in Scandinavia.

Two major points raised by Professor Samset were:

"The winch is as important to an agricultural tractor used in forestry, as is the 3-point linkage when used in agriculture."

"A winch is not a forest winch until it has two drums!"

He pointed out that even 35 h.p. agricultural tractors were usually underloaded in forest skidding due to the difficulty of assembling an adequate load. In thinning operations a smaller lighter tractor ought to be more efficient. (Col. Shaw points out that it will not be economic because of the vast output of agricultural tractors in Britain.)

Wheeled tractors seen in operation were:

(a) Ferguson with timber arch working on an extraction track from a portable winch to conversion bay at Thornthwaite.

(b) Fordsons with single drum winch, pulling limited distances on to road at Thornthwaite and Gwydyr—the latter worker-owned.

It was thought this was a useful stage before introduction of more advanced equipment as the men would become familiar with the problems and aid in the development work—seizing on improvements as they arose.

(c) The tractor-mounted Isachsen double drum winch under trial at Benmore on a site inaccessible to horses. Here Professor Samset gave expert advice and outlined a number of ways in which the equipment could be used. About 1,000 such units are now working in Norway and output is around 600 h.ft./day.

The main question raised here was that of tractor access to the forest. Either the tractor itself must be able to go in on strip roads, or if this is impossible then it must have a double drum winch so that it can extract to itself down straight racks and then pull out to a conversion site. In either case the whole operation must be planned to suit the tractor. This method of working is in Norway now found more economic than using a horse even on easy ground.

At Alice Holt the Consultants were impressed with the principle of the Alice Holt logger and said it was one they would try to develop themselves forthwith.

They did not feel flotation wheels were worth pursuing, at least for skidding. Light tracks would be much cheaper (£150 was quoted). It was shown in films how the problem of steering with full tracks was overcome by powered articulation with the trailer, Fig. G, p. 87. This principle could possibly be applied to the Alice Holt logger.

Winch and Cable: These may be divided into those based on tractor-mounted double drum winches with skyline as necessary, and the cable crane type with separate motors, complex carriages, etc. It was recommended by Professor Samset that we should not develop the latter until the former has been thoroughly tested because:

(a) On the whole the terrain seen was suitable for roading and use of horses in early thinnings, followed in places by winching at later thinnings.

(b) The high yields made it possible to build roads economically in most places, and recent studies in Scandinavia had shown that half the value of roads was for uses other than logging—cableways in contrast only serve logging.

(c) The area of country on which cableways were likely to be more economic than roads seemed relatively small and would not justify a big effort in the near future.

Professor Samset emphasised his own experience on the need to persevere with winch equipment of all types. It took a long time to bring costs down to an acceptable level and he felt sometimes new equipment was abandoned too lightly. He offered to accept a man from the Commission for several months' training in his experimental forest.

(2) Points linked to extraction

During discussion of extraction a number of points emerged relating to other operations which affect extraction.

Felling direction: Considerable emphasis was laid on directional felling both to reduce the distance of hand extraction to strip roads and also to lay material correctly for direct extraction from stump. Felling might be directly towards the strip road or herring bone as appropriate. Directional felling in early thinnings of spruce could be facilitated by a pre-thinning at the time of laying out strip roads. Directional felling is difficult to implement if fellers do not carry to strip roads.

(Work Study Section has given the matter a lot of attention and we feel that getting trees down is so much more difficult in our conditions that it over-rides other considerations. Also it is most important to trim out downhill on steep slopes hence tips should go down. For winch extraction of thinnings however direction is vital.)

Non-productive thinning: To avoid the production of small material, and to give more working space, pre-thinning, often with brush cutter saws, is becoming common in Scandinavia, taking place when the trees are $\frac{1}{2}$–$1\frac{1}{2}$ metre (2–5 ft.). Natural re-generation is brought down to desirable spacings. In Britain a clearing of this type might be considered, either before brashing or with earlier brashing, to ensure the remains decay before the first commercial thinning.

Small trees and pieces: Mr. Helmers stressed the greater costs at all stages involved in handling small trees or small pieces and considered it worth discussing a delay of the first commercial thinnings to allow trees to reach a more economic size.

The forest access network: Although road spacing was excluded from the terms of reference the Consultants felt there was a need to discuss access in the widest sense. They were greatly impressed with the planning and construction of our road system and were not inclined to place too much weight on detailed calculation of optimum spacing by formulae, which had proved very difficult to apply in practice. They stressed that the layout must consider the extraction method. An obvious example is that winch extraction needs a road at the top of a slope but not at the bottom, while the reverse is true of horse extraction. On the other hand on very bad ground (as at Coed y Brenin-Rhinog) or steep with gulleys (Thornthwaite, Dodd section), if extraction was to be by tractor-mounted winch, there was a case for fewer truck roads supplemented by tractor routes. The tractor must then load itself and haul to conversion site on the road. Such a system was preferable to any double extraction method as it reduced double handling. It was stressed that travelling time was relatively insignificant and the tractor routes could be quite long. Where it was intended to use the tractor for winch skidding, gently winding roads were better than straight. Such a system requires three levels of access route—road, tractor route and rack for the winch. Professor Samset quoted German work to determine whether cutting racks reduced increment, and quoted up to 3–5 m. (10–15 ft.) as leading to *no loss*, when laid out in young stands. In Scandinavia with few rides in natural forest it was difficult to do such research but we could do it easily here with our many rides of varying width, by sampling basal area at right angles across the ride.

Two aspects of production: Samset stressed that there were two bases for the productivity of the forest; first, the biological production controlled and manipulated by man, and secondly, the productivity of the logger and his machines. One must find out if improved efficiency of the latter can be obtained by a slight loss of the former to give the best economic result.

(3) Overall suggestions on Work Study

Finally there were certain suggestions emerging which cover a much wider field than extraction but directly affect it. Work Study in the Forestry Commission has been based, so far, as the principle of making "the best use of existing resources"—finding the best method in use and getting it more widely adopted; very little development work has been done and that of a simple nature, e.g., development of the Border sledge, hand tools and simple equipment. This leads to some improvement in results but is not in the opinion of the Consultants the long-term solution, especially in the present situation of the Forestry Commission with a rapidly increasing amount of commercial timber and a demand for utilising these resources at the lowest cost possible.

The Consultants in their own work consider they have to look further ahead and actively develop new methods and equipment, if necessary modifying silviculture and management. This approach must be even more important in a "new" forest country with very little of forestry tradition and established methods from the logging point of view.

Such an approach needs a wider basis, best perhaps summed up as "Experimental logging". To do this certain features are necessary:

(1) A close integration of Engineering and Work Study resources, the engineering shop being in close touch with actual operations in the development area.
(2) Favourable working areas in which management at all levels are anxious to participate in the development of new methods.
(3) Co-operation by silviculturist and pathologist as necessary.
(4) Controlled experiments to compare different methods.
(5) Skilled workmen, compensated for being on development work, and playing an active part in it.

For various reasons this approach has not been adopted so far in the F.C., largely because of the need to improve results over as wide an area as possible rather than to develop a radically improved method in one particular area. The Consultants declared that they fully understood these reasons at the present stage of the Work Study Section's work. However they strongly emphasised the urgent need of a scientific and experimental research in the field of logging in order to improve methods and equipment, so that economic rebuffs can be avoided in the future. Such an activity furthermore is almost the only basis for a training of both forest officers and workers, without which no real and rapid success can be guaranteed. They were, out of their own experience, quite convinced that the money invested in research and training should give a very good dividend, especially if this kind of development work is started at an early stage and with sufficient resources.

To emphasis the need for this experimental approach Mr. Helmers quoted from Sweden:

Relative costs	*1939*	*1956*
Labour	100	476
Farm tractors	100	172

If this trend was to continue over the next decade or two it was essential to reduce the labour content by all possible means. In addition machines now not economic, or only under certain conditions, might become economic or extend their scope, e.g., the chain saw was considered uneconomic for cutting below

7 in. diameter as recently as 1953, but to-day was economic for 4 to 5 in. Professor Samset felt that horse costs rose as *labour* rather than *machine* charges and that a light skidding tractor must eventually replace the horse even for thinnings.

The Consultants wondered if, since only about one sixth of the British cut is made by the Commission in their own woods, there should not be joint development on logging methods with the timber merchants.

Recommendations by Work Study Section. Based on all the matters discussed with Consultants:

Short term work for the next year or two:

(1) That the following equipment be tested for horse extraction:
- (a) Shafts and harness of Scandinavian pattern with either (b) or (c).
- (b) Swedish sledge with rear wheels (B and C on the diagram).
- (c) Swedish sledge with tracks over rubber wheels (D).
- (d) Norwegian bundle carriers—need fully organised operation (E).
- (e) Norwegian extraction device (nicknamed Norsk on previous trials (F).

(2) That the following equipment be tested for tractors:
- (a) Light tracks on wheeled tractors (G).
- (b) Sledge on 3-point linkage for Border peats.
- (c) Alice Holt logger in combination with light tracks. Tracks to be tested against flotation wheels, also against sledge of 3-point linkage, and compared with the Bristol and sledge.
- (d) Persevere with Isachsen double drum winch; as soon as promising results are obtained, leave it in regular use in a forest and import a second type—preferably with a front-mounted winch.

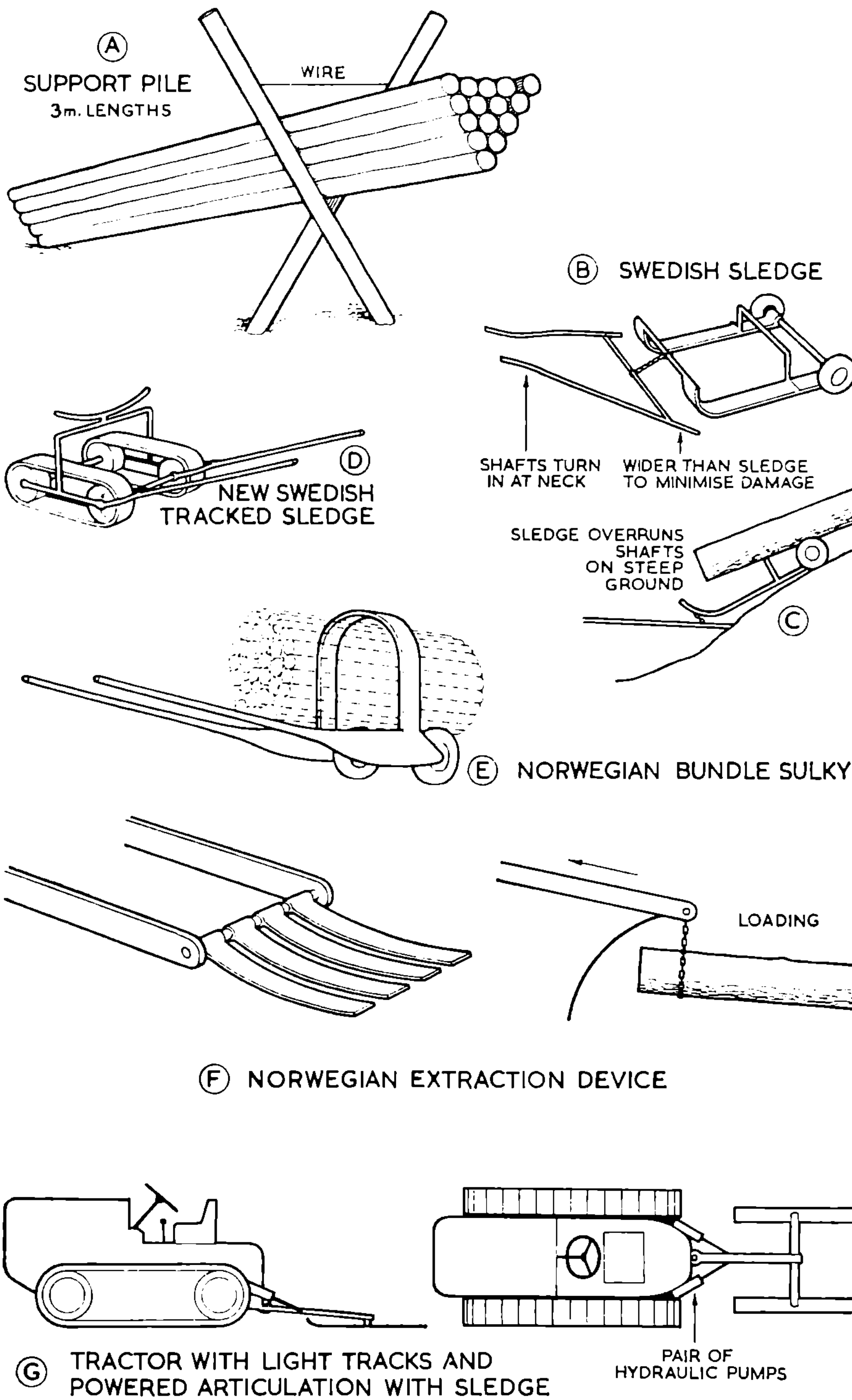
Long term work:

(3) That consideration be given to the following points as experimental logging methods:
- (a) Pre-thinning followed by slightly delayed heavier first thinning.
- (b) Intensive rack layout combined with extraction in 12–15 ft. lengths by hand:
  - (i) Straight racks (vertical or at a suitable angle) for horse/winch extraction on steep ground.
  - (ii) Best working alignment for horse/tractor use on flatter ground.
- (c) Consideration of the use of double drum winch with self loading of a trailer and haul to mill or loading. This might involve a 2-level road system, tractor roads/main roads, and is only suitable when the mill (or big scale transport) is within a few miles of the forest.

(4) The resources available to Work Study Section for such trials are strictly limited—a team under Forrester at Strome, and Crowther in Edinburgh. Many of the proposals however would fit in with the need to study methods for the production of Scottish pulp and it is recommended that work be concentrated there except for soft-ground tractor trials which should be undertaken in the Borders.

The future:

(5) As a long term policy the consultants felt that engineering and forestry resources must be used in fundamental research work, e.g., on tractor power and sliding resistance of loads.


(A)
SUPPORT PILE
3m. LENGTHS
WIRE
(B) SWEDISH SLEDGE
SHAFTS TURN IN AT NECK
WIDER THAN SLEDGE TO MINIMISE DAMAGE
(D)
NEW SWEDISH TRACKED SLEDGE
SLEDGE OVERRUNS SHAFTS ON STEEP GROUND
(C)
(E) NORWEGIAN BUNDLE SULKY
LOADING
(F) NORWEGIAN EXTRACTION DEVICE
(G) TRACTOR WITH LIGHT TRACKS AND POWERED ARTICULATION WITH SLEDGE
PAIR OF HYDRAULIC PUMPS

EXTRACTION TRACKS

Translated by

G. GODWIN

Divisional Officer, North Wales

The following is a slightly abridged version of an article appearing in the Swedish journal *Skogsägaren* (The Forest Owner) of September 1961, which again was largely a reproduction of a brochure and specimen instruction issued by the Swedish State Forest Service (Kungliche Domänstyrelsen). Thanks are due to the Editor of *Skogsägaren* for permission to publish a translation.

The whole sequence of operations is shown in Plate 9 in our centre pages.

Rationalisation of forest costs involves efficient extraction, which forms one of the dearest links in the chain of transport costs. The introduction of planned extraction tracks is a further step in this rationalisation, not only improving the efficiency of horse extraction, but paving the way for economic tractor extraction.

Extraction tracks are defined as tracks cleared of trees and undergrowth, along which extraction by horse or tractor takes place, either on to collecting tracks leading on to hard roads, or direct on to hard roads. The use of such tracks presupposes:

(1) A properly planned road system.

(2) Directional felling.

(3) Hand extraction of smaller lengths and stacking at side of extraction track.

If the feller's job is only to fell and prepare the produce, he will not worry about extraction. As directional felling is in fact the first stage of extraction, it is important when directional felling and a certain amount of hand extraction are made part of the felling job. Co-operation between those felling and those extracting has the following advantages:

For the Feller: System and tidiness in his work. Better control of output.

For the Extractor: Extraction along the most favourable routes. Less wear and tear on equipment. Quick loading. Maximum loads on the most suitable vehicle. Easier planning. More all-the-year-round extraction.

For the Owner: Easier control of output and supervision. Fewer losses. Less extraction damage. Quicker extraction. Possibility of tractor extraction. Better assessment of progress of work as a whole.

The best results from using this system, in the case of horse extraction, are on bad ground, on areas with a small yield, and where the average size of tree is small. The results are less striking on good ground, where the yield is heavier and the trees larger. The system is an absolute necessity for economic tractor extraction.

Planning

It is essential to have a proper exploitation plan from the start, and to divide the whole area into exploitation areas which can be given the same treatment at the same time. Each of these areas should be based on topography, so that all extraction within the area ends up on the same exit roads. The whole area must be divided into these exploitation areas; their size should be no less than 5 acres, and they should be considerably larger if possible. Having planned the exploitation areas, a complete system of extraction tracks is planned for each one.

Plotting of Extraction Tracks

Collecting tracks are first put in on the map, usually running down valleys or epressions to hard roads, and a network of extraction tracks plotted running down on to these so as to cover the whole area. Where the site slopes evenly and not too steeply on to hard roads, the intermediate collecting roads are dispensed with, and extraction tracks run direct on to the hard road.

Extraction tracks must be:

(1) Long, both to utilise the capacity of the extraction equipment fully, and to minimise the total length of road required per unit of area.

(2) Straight and parallel, to minimise extraction difficulties and to enable the tracks to be found again quickly next time they are wanted.

(3) At right angles to the contour, if possible, to avoid extracting along side slopes.

(4) Linked at the upper ends to facilitate through traffic and avoid turning round (time-wasting and damaging to trees), particularly in the case of tractors.

The specification depends upon whether extraction is to be by horse or by tractor.

Horse extraction tracks:

Distance apart: about 25 yds.

Width: 6½ ft., but 8 ft. on bends.

Short adverse gradients can be tolerated, especially near the upper ends.

Undergrowth and lop and top must be cleared.

Tractor extraction tracks:

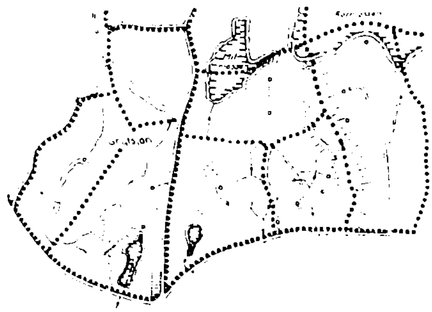
Distance apart: about 25 yds. for thinning, 10–15 yds. for clear felling.

Width: 10 ft., but 11½ ft. on bends.

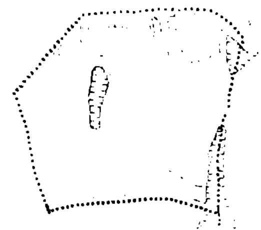
Sharp bends and steep adverse gradients to be avoided. Long gentle adverse gradients can be tolerated.

Undergrowth below 1 in. diameter to be left, but tops and large branches to be cleared.

Tractors should be used on the more straightforward ground, with larger sizes and longer hauls. Extraction tracks should be planned with tractors in mind, even though horses are used at present, to facilitate a future change-over to tractors.

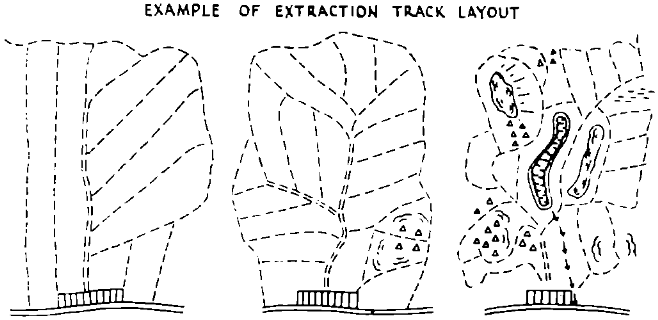


EXAMPLE OF PLANNED EXPLOITATION AREAS. BOUNDARIES DOTTED



EXPLOITATION AREA WITH BOUNDARY (DOTTED LINE), COLLECTING TRACKS (DOUBLE DASHED LINES), AND EXTRACTION TRACKS (SINGLE DASHED LINES).

EXAMPLE OF EXTRACTION TRACK LAYOUT



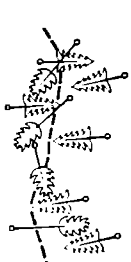
EASY TERRAIN NORMAL TERRAIN DIFFICULT TERRAIN

Laying out

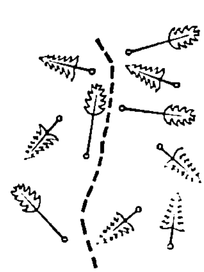
Having decided the main extraction direction on to hard road, collecting tracks (if any) are laid out, followed by extraction tracks running on to these at right angles to the contour and downwards, never upwards. In straightforward country, the extraction tracks are laid out by compass, but the actual track can be cut up to 5 yds. on either side of the marked compass line. A properly instructed feller will vary the track from the compass line according to ground conditions.

In difficult country, the line of the track will obviously depend on its feasibility for wheeled vehicles, and the layout will be more irregular.

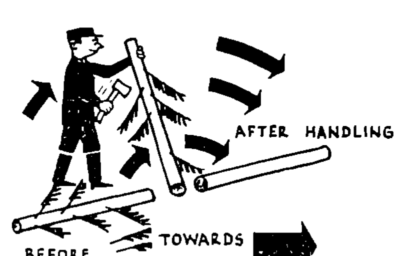
Laying out of tracks can be done by trained workers. There may be several tracks in one drift, and drift boundaries should be *between* extraction tracks.



DIRECTIONAL FELLING



RANDOM FELLING

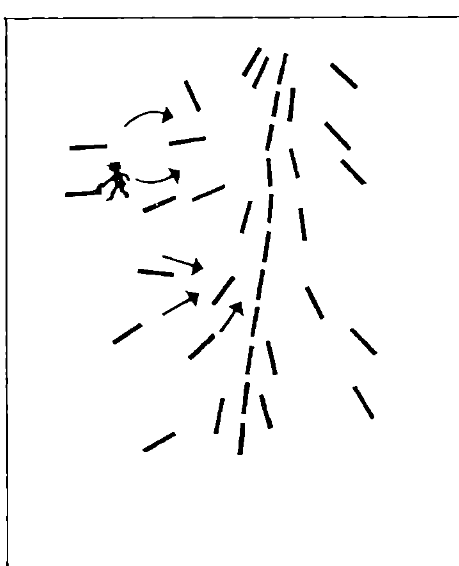


Clearing of Tracks

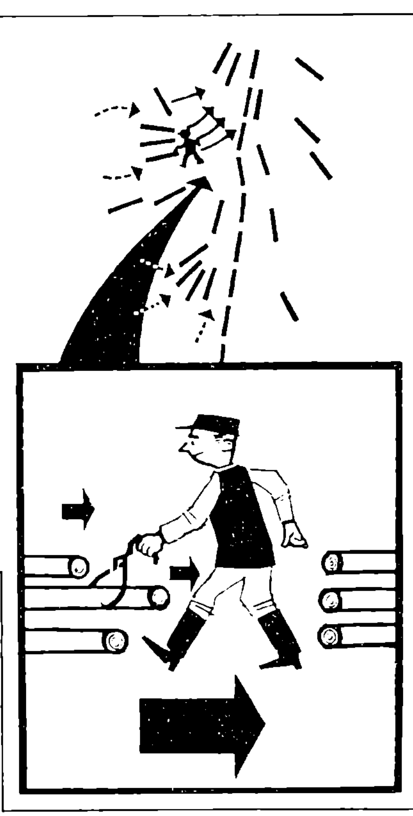
Clearing is done by the feller as the first part of his job. (Clearing and felling/extraction are therefore two separate parts of the feller's job.) Marking of trees on the track may be done beforehand, or it may be left to the feller to remove all trees on the line of the track. All felling should be done by saw to avoid later damage to tyres and hooves. Loose stones of any size should be removed. High stumps should be sawn. There should be no unnecessary clearing of brushwood, which may be useful for extracting-over, on soft ground.

Normally clearing by the feller is the only expense. Some difficult going and adverse gradients can be tolerated towards the upper end of extraction tracks, but towards the lower end easy going for large loads is important. Very occasionally (more particularly on the collecting tracks) it may pay to do a little blasting or levelling to ease the passage of full loads.

To begin with, or if labour is not particularly good, it may be necessary to clear tracks as a special job and not as part of the felling. This will cost more, but it is important to get the tracks right from the beginning.



START HAND EXTRACTION FARTHEST FROM THE TRACK

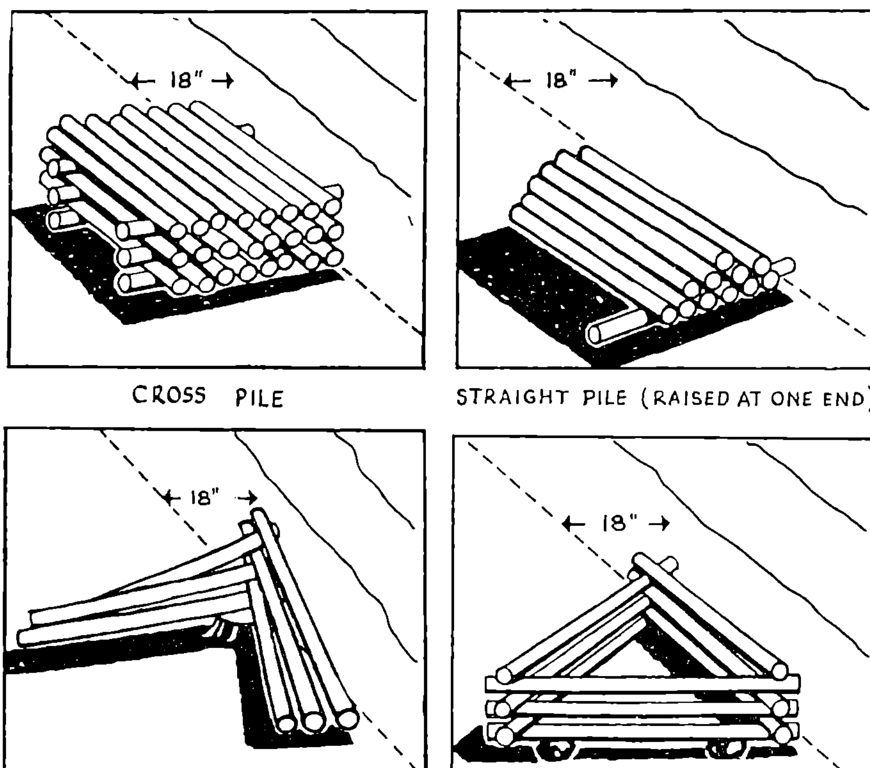


EXTRACT IN STAGES

Felling and Hand Extraction

The feller has to plan his work intelligently. The key to easy extraction is *directional felling*. If trees are felled in the right direction, then 50 to 80% of all the produce will lie within 3 yds. of the extraction track. Trees should be felled so that the actual crown lands outside the track, so as to avoid cluttering up the track and stacking ground with lop and top.

STACKS SHOULD BE MADE 18" FROM THE SIDE OF THE TRACK



CROSS PILE — STRAIGHT PILE (RAISED AT ONE END)

V PILE (POINT TOWARDS TRACK) — TRIANGULAR PILE

When trimming, cross cutting or peeling, i.e., every time the feller handles part of the tree, the lengths are heaved or thrown in the direction of the nearest stacking ground at the side of the extraction track. (The article assumes cross cutting in the wood and not extraction in the length.—Translator.) The lengths furthest away are thrown together and later manhandled towards the extraction track in stages, the feller standing still and pulling each length a few yards at a time by means of tongs. He should *never* carry or drag by hand, which is both less effective and more likely to lead to strain or injury. Saw timber and other heavy lengths should not be extracted in this way, but lifted up on to a stump or stone so as to be visible from the track, and lop and top cleared between it and the track (if extraction is by horse).

Stacking

Produce must not be stacked on the extraction track, but eighteen inches to two feet from it, so as not to get in the way. Time must not be wasted on expensive methods of stacking. For tractor extraction cross-stacking or stacking in one direction (in both cases raised off the ground) is adequate. For horse extraction stacking in a V-shaped pile (see diagram) is adequate for loading. Triangular piling is good for drying, but more expensive and difficult to load. Cross-stacking should give adequate drying. (Straight pile is better for timber to be sold by weight, or "green"—Editor.)

Extraction

The major part of the horseman's or tractor driver's work will already have been planned for him. Extraction should start from the upper end of the track, so that any steep gradients or difficult places tolerated in the upper length can be negotiated with a partial load, to be filled up further down the track. Where possible, loads should be made up of uniform sizes. It is desirable, in the case of horse extraction, and essential in the case of tractor extraction, to stack each size or specification separately.

Any produce stacked on the side of collecting tracks is left for topping up part loads.

It is essential to use proper vehicles for extraction. With horses, a trailer of some sort must be used (or sledge on snow), and with tractors a trailer, possibly a bogie trailer.

Suggested Instructions for Tractor Tracks

Clearing

(1) Clear a straight track along the surveyed line if possible, and over the best ground, within 5 yds. either side of surveyed line.

(2) Width at least 10 ft. (or 6½ ft. for horses).

(3) Clear the best line having regard to slope and ground conditions.

(4) Bends and possible levelling should be such as to avoid extraction damage to standing trees.

(5) Clear undergrowth and unusable trees.

(6) Cut stumps low.

(7) Clear larger lop-and-top and windfalls. Remove any stones resulting from blasting.

(8) If trees are not being felled as part of the clearing job, mark clearly all trees to be felled.

(9) Keep a note, for the supervisor, of any trees felled and not previously measured.

Hand Extraction to Track and Stacking

(See Figs., pages 90 and 91.)

(1) Plan where exactly along the track the produce is to be stacked, and how much at each place (to make sure there is room).

(2) Start felling next to the stacking ground.

(3) Stack the lengths which lie on the stacking ground.

(4) Direct felling towards stacking grounds.

(5) Do not overdo the clearing of small lop-and-top from stacking ground and track.

(6) Prepare all the produce to be extracted and stacked. Extract it later. Do not get it covered with branchwood, but rather extract it in stages.

(7) If lengths are moved during trimming or peeling, move them towards the stacking ground.

(8) Start collecting produce from the furthest points. Deal with everything within convenient reach.

(9) Pull everything within reach, using tongs. Pull it out over lengths laid crossways.

(10) Throw and pull the lengths, carrying them as little as possible.

(11) Stack at the side of the track, not on it. Stack in the right direction for loading (see Fig. 22/D).

(12) Do not drag out saw logs or heavy lengths manually. Lift them on to stones or stumps visible from the extraction track.

Translator's Note:

It is easy to dismiss this as having little bearing on British conditions. Ground conditions and slopes are obviously easier than in the more rugged parts of Britain, but no more so than in many lowland and hill forests. Typical Swedish pine-spruce forests are easier to work in than, say, our Sitka plantations, and trees are less likely to get hung up. Hand extraction is based on conversion in the wood rather than extraction in the length. Horse and tractor extraction is based on the use of vehicles of some sort, and dragging along the ground is looked on as notably inefficient.

It seems to me that the sooner we get round to at any rate partial conversion in the wood, the better, if only to avoid extraction damage to the roots (if not butts) of standing trees which always occurs. Similarly, the sooner we get round to using proper horse and tractor equipment, the better, so that our high extraction costs can be reduced.

The diagrams unintentionally reveal points of interest. Only power saws are in use for felling and cross-cutting. Trimming and peeling are being done *after* cross-cutting, the trimming apparently with a dear little one-handed axe. Handling of lengths is done with tongs (see Forestry Commission Tool List, page 13, No. 1). The horse is in shafts pulling a vast load on a very low small-wheeled trailer. The tractor is loading its own trailer. The lorry is loading pulpwood in bundles with a Hiab-type hoist—unfortunately not using a grab. See Plate 9.

Our forests have the advantage of being vastly over-roaded by Swedish standards, and it should usually be possible to run extraction tracks straight on to hard roads and to cut out the intermediate collecting track.

G. GODWIN

THE DEER OF THE NEW FOREST AND THEIR CONTROL

By

W. A. CADMAN

Deputy Surveyor, New Forest

The greater part of the New Forest was a Royal Forest prior to the Conquest, but it was confirmed as a hunting preserve by William the Conqueror. Until the need for timber for wooden ships for the British Navy became pressing in 1700, the main interest was that of the chase: Deer were Royal Game.

Red Deer

There is no doubt that the red deer was indigenous at the time of the Norman Conquest. However, they became extinct in the reign of Charles I, but were re-introduced by Charles II who imported 375 Red deer from France in 1670 and released them in New Park.

By 1900 there were only 20 remaining but 1 stag and 2 hinds were introduced at Beaulieu in 1908; the stag became troublesome and was shot 2 years later. They held their own and even increased up to the late thirties. Thereafter they have decreased and in spite of a further introduction of 3 hinds in the Beaulieu area in 1959 the total stock to-day is believed to be between 5 and 8 head. They are carefully preserved by the Forestry Commission, but unfortunately neighbouring estates, and farmers, do not protect them.

Sika Deer

Japanese Sika were introduced at Beaulieu by Lord Montagu in 1905; two pairs were released ex-Windsor Park, being a present from King Edward VII. From this stock they have spread throughout the Beaulieu Estate and into that part of the New Forest which lies south of the railway line between Bishop's Dyke and Brockenhurst. The present stock is believed to be in the region of 40, a figure which seems to have been fairly constant for some years. The annual kill varies from six to twelve.

The New Forest Sika carry good heads and they are remarkable for the fact that more than 8 points are not infrequent. One stag of 11 points was shot this autumn. Two good 10-pointers are well-known and there are several young stags which are expected to develop 10 points.

The new Forest Sika stags do but little damage by fraying. But when they mark out their rutting stands, they will scar conifers quite deeply, usually trees of a diameter of over 5 ins.; they do not damage hardwoods in this manner.

Roe Deer

It is reasonable to suppose that Roe deer, being indigenous in Britain, were native in the New Forest at one time. There seems to be little doubt that there was a long period when they were unknown. In fact The Hon. Gerald Lascelles records the first Roe buck known to him at the turn of the century. At about that time there had been importations into Dorset. It is also said that Siberian Roe were introduced on to a private estate (Matchams Park) on the west side of the river Avon. In the Queen's House there is a magnificent Siberian Roe head of unknown origin. This head has been cleaned by inexperienced hands and it may, therefore, have some local significance.

To-day, Roe are widespread throughout the forest, their main stronghold being in the south-west, especially in the Holmsley area. In recent years they have increased. To some extent their numbers fluctuate in direct proportion to the acreage of thicket-stage plantation, this being the most favourable habitat.

Up to 1959 Roe were controlled by being shot indiscriminately during deer drives. Since then a policy of selective shooting from high seats has been in force and already there has been an improvement in the quality of the heads. The New Forest Roe cannot compare with the Dorset Roe heads. Nevertheless some nice heads are produced.

The census figures (which are conservative) for Roe are:

	Bucks	*Does and Fawns*	*Totals*
1960	78	133	211
1961	113	189	302

The Roe numbers have been allowed to increase somewhat, chiefly because the deer control effort is concentrated on reducing the fallow deer which are considered to be too numerous. Roe numbers can be reduced drastically and quickly at any time when required, as they are easy to control. Also, foxes kill a number of fawns, and the all too numerous stray dogs also take a toll of Roe deer.

Damage is by browsing, which is always less serious than that of fallow deer, and by fraying, which is usually less damaging than that of fallow buck. Sometimes an individual buck will do undue damage in a given area. When this happens the culprit is shot by a rifle from a suitably placed high seat. A folding, portable high seat has been specially designed for this sort of problem.

Fallow Deer

The introduction of Fallow deer into Britain is generally attributed to the Romans. When the deer came to the New Forest is unknown, but they are, and have been for many generations, the principal species in the forest.

The New Forest Fallow deer have heavily dappled light coats in summer and are dark, mulberry brown in winter. Black Fallow deer are very rare but white ones are not unusual. True albinos are very rare. The fawns of white deer are cream coloured the first year. The antlers of white bucks are usually of good form.

The Fallow deer of the New Forest carry a good type of head. They are probably the best Fallow deer in Britain, outside a park. There is some indication that the quality of the heads has improved since the nineteenth century. There is a strong belief that when deer parks were turned over to agriculture during the second world war, releases were made in the forest and thereby new blood introduced.

Numbers have fluctuated greatly in relation to the impact of man's influence. Early census figures are:

1670	7,593
1787	over 6,000
1845	4,582
1846	3,552

In the hard winter of 1777 no fewer than 300 were found dead of starvation in Bolderwood Walk.

After the passing of the Deer Removal Act of 1851 the deer were very seriously reduced, but not eliminated. The Hon. Gerald Lascelles gives the number in 1900 as only 200.

The latest census figures are:

	Bucks	*Prickets*	*Does*	*Fawns*	*Totals*
March 1960	174	113	324	177	788
(white)	(7)	(3)	(12)	(4)	(26)
March 1961	191	128	344	194	858
(white)	(9)	(4)	(11)	(3)	(27)

The figures are known to be an under-estimate.

Methods of Control

The Buckhounds came into being shortly after the 1851 Deer Removal Act and they have hunted regularly ever since.

Up to 1959 the main form of control has been by driving. The forest keepers, very experienced and knowledgeable in the habits of deer, used 12-bore shotguns and S.S.G. shot. Each keeper has one or more beagles trained to hunt deer and on the rare misfortunate occasion when a deer was wounded, the beagles would be used to hunt it down. It is extremely rare for a wounded animal not to be accounted for by this means.

From 1959 control by selective shooting was instituted. The drive is still the main method, all good bucks being spared, but considerable use is being made of selective shooting by rifles from high seats. (The large indiscriminate human population of the forest makes it impossible to use only the rifle.)

Probably for the first time in Britain an attempt has been made to draw up a definite shooting plan for 1961.

The fallow census figure gives:

$$\left.\begin{array}{ll}\text{Bucks} & 319\\ \text{Does} & 344\\ \text{Fawns} & 195\end{array}\right\} 858$$

Assuming even sexes of fawns, this gives:

Males	416
Females	442
	858
Add ⅓ for 1961 fawns	286
	1,144

Kill for 1961–62 (one third of population)=not less than 381.

This figure has been split into

Bucks	*Prickets*	*Does*	*Fawns*	*Total*
70	30	190	91	381

The bucks and prickets are all to be inferior animals, but an addition of 8 Great Bucks has been allowed. These figures are in turn split into an appropriate target for each head keeper.

It is of interest to compare the Fallow deer kill for previous years:

Year	*Bucks*	*Prickets*	*Does*	*Fawns*	*Totals*
1956	45	24	41	31	141
1957	27	13	43	40	123
1958	60	31	31	19	141
1959	42	26	87	72	227
1960	36	41	100	92	269
1961	42	45	117	98	302

(These figures are based on the Forest Year October 1st to September 30th.)

The position is complicated because there are many islands of freehold land within the forest and adjoining the perambulation. In these areas the deer leave the forest to feed on the grass fields and many are killed. A small number is also poached within the forest. The total of these kills is unknown but it is thought to be well over three figures.

Deer Damage and Preventive Measures

Damage by deer affects Forestry, Agriculture and Horticulture.

(A) Forestry

Damage is caused by:

(i) Browsing.

(ii) Fraying.

Browsing damage is directly related to the deer population, the natural food supply, the vulnerability (i.e., the age, height and species) of the crop, and the weather conditions. Certain tree species (e.g., Chestnut, Oak and Beech) are preferred to others (e.g., Birch, Sitka Spruce, Lawson Cypress and Thuja). Deer will tend to go for anything new—to the exasperation of the forester.

Browsing is worst on:

(a) Grassy areas; the deer are attracted to the grass and eat the trees as well.

(b) Young crops close to dense thickets where deer harbour during the day.

(c) Young crops adjoining the main deer paths.

(d) On all vulnerable areas during hard weather, or, sometimes, during periods of drought.

Preventive methods are:

(i) Shoot the culprits or leaders on the site. (The use of a suitable rifle from a high seat is the most efficient method.)

(ii) Spread brash, or cut holly, between the planted trees. Deer do not like to browse where they cannot walk easily.

(iii) Leave as much natural food as possible, e.g., brambles (which are a major food of all species), young coppice.

(iv) Tie wool, hessian or twine round the leading shoots of the best trees. (This is being tried experimentally.)

Temporary measures to which deer soon become accustomed are:

Flags, tin cans on strings, animal oil, renardine, creosote, etc. Electric fences can be effective, but if deer are stampeded it takes more than an average man's patience to unravel the result!

Fraying damage is done by male deer, first when cleaning their antlers or velvet and secondly when marking out their territory. They also tend to do it in play. Such damage may be quite serious but it usually looks worse than it is, since very frequently the thinnest tree is selected, one which in later life would become suppressed.

Damage can be reduced by leaving the odd sallow, birch or other weed species on the ride sides. Deer tend to select ride side trees and if all weed species have been cut, then there is no choice for them other than the planted crop.

This type of damage by Roe bucks varies with the temperament and antler formation of the individual. Some bucks will work over many trees in a small area, others will only rub one or two. Roe bucks are so regular in their habits—one can set one's watch by them—that they are easy to outwit, provided one regards them as a very alert and wary quarry.

(B) Agriculture

Young green corn is eaten freely. I suspect that although this looks bad, it may in fact cause little harm.

Fresh grass ("the early bite") is a certain draw for deer and causes the farmer much annoyance. This happens at a time when female deer should not be shot and control should be by shooting poor bucks and prickets. The deer may be repelled by the use of "bangers".

Ripe corn is often eaten, the deer wandering through and eating the tops. They may do much harm by trampling.

Root crops are sometimes attacked and kale or green crops damaged.

(C) Gardens and Horticulture

Damage takes place in late spring at a time when neither male nor female deer should be shot. They go for roses and runner beans!

It is, I think, obvious that garden fences should be made and kept deer-proof.

Close Seasons

Traditionally a close season has always been observed in the New Forest. In 1959 the Forestry Commission instituted a close season applicable to all English forests and the dates in force in the New Forest are now:

Male deer	*Close season*
Roe	1st October to 30th April
Red Fallow and Sika	1st April to 31st August
Female deer	
All species	1st March to 31st October

It is a shameful thing, and the greatest wild life scandal to-day, that there is no legal close season for any species of deer in England and Wales, nor for Roe, Sika and Fallow in Scotland.*

In Britain stringent game laws have been in existence for many years and even the Jack Snipe, a bird scarcely larger than a sparrow and one which does not even breed in Britain, is given the privilege of a close season. Yet deer, our largest wild animal, may be shot or killed by any means at any time. Male deer are frequently shot before they are clean. Female deer are butchered when heavy in young, or when the fawn has been dropped. Often the fawn is left to die of starvation.

* In Scotland, the legal close seasons for *red deer only* are: Males, 21st October to 30th June; females, 16th February to 20th October.—Editor.

The lack of knowledge of deer amongst country folk (foresters, keepers, farmers, agents, many landowners and even naturalists) is so widespread, that deer are often treated as vermin. When they are brought down, as often as not no-one present can identify them: whether they are old or young, good or bad, is a matter of indifference. Often the beast is badly skinned and inefficiently carcassed, so that the venison is poor. As a result, in many areas there is no sale for venison because the ignorance of the general public has been accentuated by having been supplied with inferior meat!

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At 1st December, 1961

Notes: The stations of individual officers are shown only where they are different to that of their main office. The list should not be read as a seniority list; it has been compiled from returns submitted by the various offices to the Establishment Section.

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Bristol, 4.
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DISTRICT OFFICERS, II:	Cassels, K. A. H.; Drummond, J. A. (Fort Augustus); Huntly, J. H.; MacRae, F. M. (Leanachan); Marnie, R. J. R. (Leanachan); Massey, J. E. (Glenurquhart); Ogilvie, J. Y. (Culloden); Paterson, D. B. (Dingwall); Ray, A. (Fort Augustus).
SENIOR EXECUTIVE OFFICER:	Nicolson, M.
CONSERVANCY ENGINEERS:	Gaskin, A. J.; Halliday, J.
MECHANICAL ENGINEER:	Ross, R. B.
ASSISTANT ENGINEERS:	Davidson, K. T.; Mckillop, E. R.
SURVEYORS:	Urquhart, T. D.; Clark, W. J.
HIGHER EXECUTIVE OFFICERS:	MacBeath, T. S. B.; Stewart, W.
CLERKS OF WORKS:	Dargie, J. H.; Fraser, G.; MacLennan, A. M.; Noble, A.; Ward, A. A.

EXECUTIVE OFFICERS

Birrell, A. J.; Foley, F. M.; Fyfe, J.; McRitchie, J.; Oswald, A.; Wagg, H. C.

HEAD FORESTERS

Frater, J. R. A. (Inchnacardoch); MacDonald, C. (Portree); MacDonald, D. (Black Isle); Mackay, A. (Affric); Mackay, J. A. (Glen Urquhart); Mackenzie, J. (Glenhurich); MacLeod, D. M. (Salen); McLeman, A. (Ardross); MacRae, D. J. (Craigs).

FORESTERS

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ASSISTANT FORESTERS

Auld, J. B. (Glenurquhart); Beaton, D. A. (Millbuie); Boustead, J. C. (Naver); Cameron, F. (Dornoch); Campbell, D. (Glenrigh); Campbell, J. (Raasay); Clark, J.; Coutts, D. S. (Sunart); Denholm, J. (South Strome); Douglass, R. (Salen); Evans, R. (Farigaig); Flynn, D. T. (Port Clair); Forsyth, A. (Port Clair); Gibson, A. (Torrachilty); Gordon, J. M. (Kilcoy); Grant, W. M. (Inchnacardoch); Green, A. A. (Ceannocroc); Howard, R. L. (Craigs); McCreadie, F. (Achnashellach); MacGregor, T. B. (Morangie); MacInnes, A. (Queens); MacInnes, D. F. (Kilcoy); McIntosh, D. C. (Inchnacardoch); McIntyre, J. A. (Slattadale); Mackinnon, J. (Culloden); Mackinlosh, L. W. (Salen); MacLennan, D. (Affric); MacLeod, A. D. J. (Salen); Millar, J. (Fiunary); Munro, A. (Millbuie); Murdoch, R. K. (Strathmashie); Patience, W. M. (Helmsdale); Thom, H. (Culloden); Watson, G. A. (Oykel).

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SCOTLAND, EAST CONSERVANCY

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CONSERVANCY ENGINEER: Malcolmson, P.

ASSISTANT ENGINEER: Auld, J. M.

HIGHER EXECUTIVE OFFICERS: Edward, C.; Reid, J. L.

CLERKS OF WORKS: Clark, J. D. (Roseisle); Forbes, C. (Bin); Logan, G. Mc. F. (Perth); Rothnie, W. (Drumtochty).

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Allison, R. A. (Speymouth); Anderson, D. (Clashindarroch); Fraser, E. D. (Craigvinean); Gilbert, G. (Durris); Grubb, J. A. (Newton Nursery); McDonald W. (Drumtochty); Milne, W. G. (Culbin); Murray, G. J. A. M. (Glenlivet); Rose, A. (Ledmore Nursery); Reid, J. (Drummond Hill); Urquhart, D. J. (Bin); Watt, D. M. (Monaughty).

FORESTERS

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SCOTLAND, SOUTH CONSERVANCY

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Telephone: Dumfries 2425–6–7

CONSERVATOR: J. A. B. Macdonald.

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DISTRICT OFFICERS, II:	Fergusson, W. S. (Barr); Findlay, T. S. L. (Newton Stewart); Robertson, S. U. (Gatehouse of Fleet); Steel, R. P. (Longniddry); Whitaker, J. D. (Newton Stewart).
SENIOR EXECUTIVE OFFICER:	Farmer, T., M.B.E.
CONSERVANCY ENGINEER:	Walker, P. H. F.
MECHANICAL ENGINEER:	Muddle, W. J.
ASSISTANT ENGINEER:	Clarkson, W. H.; Drummond, R. W.; Ruthven, G.; McMillan, J. G.; Shearer, R. B.
HIGHER EXECUTIVE OFFICERS:	Burnett, A. G.; Cowan, A. A.
CLERKS OF WORKS:	Fergusson, J. M. (Kirkudbright); Johnston, F. J. (Dumfries); MacLaughlan, A. M. (Jedburgh); Meek, I. G. N. (Newton Stewart); Shaw, A. (Dumfries); Smith, W. B. (Straiton).

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ASSISTANT FORESTERS

Bagnall, J. A. (Ae); Beaton, J. (Bareagle); Brookes, C. (Penninghame); Bryson, J. L. (Dalbeattie); Burgess, W. (Mabie); Cooper, J. A. M. (Glentrool); Dinsdale, E. (Wauchope); Fligg, P. (Carrick); Grieve, W. J. (Fleet); Hibbard, B. G. (Greskine); Jordan, R. D. (Cairn Edward); McArthur, A. (Arecleoch); McBurnie, A. N. (Ae); McClelland, P. W. (Glentrool); McIntyre, C. (Dalbeattie); MacKenzie, P. (Cairn Edward); Macneill, J. B. (Elibank); Marshall, A. H. (The Garraries); MacRae, A. D. (Glentrool); Parley, C. W. (Bennan); Graham, P. (Carrick); Watson, J. (Dalbeattie).

FORESTERS

Anderson, M. (Wauchope); Armstrong, H. O. (Barreagle); Broll, J. L. (Yair Hill); Campbell, D. (Cairn Edward); Carruthers, J. (Fleet); Carruthers, M. F. (Elibank); Chisholm, M. R. (Carrick); Cochrane, A. S. (Dalmacallan); Cooper, B. (Ae); Davidson, J. R. (Duns); Drysdale, N. (Carrick); Duncan, D. (Kirroughtree); Edward, R. M. (Brownmoor); Edwards, O. N. (Dundeugh); Gallacher, J. M. (Upper Nithsdale); Gallacher, P. (Cairn Edward); Goodlet, G. A. (Newcastleton); Gutch, J. H. M. (Stenton); Harkness, J. R. (Castle, O'er); Harvey, T. S. (Eddleston); Hogg, J. L. (Kirroughtree); Hope, T. C. (Fleet); Hunter, J. (Greskine); Kirk, D. M. (Mabie); Leishman, A. (Changue); Liddell, A. T. (Juniper Bank); Lloyd, S. (Laurieston); McGeorge, R. (Ae); McGivern, W. M. (Edgarhope); McLaren, A. R. (Glentress); MacMillan, A. M. (Devilla); McNaught, D. J. (Arecleoch); Melville, J. (Selm Muir); Murray, D. M. (Bareagle); Maxwell, N. (Cairn Edward); Mowat, P. (Newcastleton); Murray, T. M. (Cairn Edward); Nelson, T. (Kilgrammie); O'Mara, J. P. (Greskine); Paterson, W. G. (Castle O'er); Pearce, J. S. (Kirroughtree); Pickhall, H. M. (Cairn Edward); Priestley, P. E. B. (Greskine); Ramsey, K. J. (Carrick); Reid, J. M. (Glentrool); Robson, A. (Corriedoo); Taylor, J. W. (Wauchope); Thomson, W. (Glentress); Veitch, T. H. (Newcastleton); Walsham, J. A. (Laurieston); Waters, D. C. W.; Waugh, G. (Glentress).

FOREMAN:	Harris, R. C. (Glengap).

SCOTLAND, WEST CONSERVANCY

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CONSERVATOR:	J. E. James.
DIVISIONAL OFFICERS:	Davies, E. J. M.; Robbie, T. A.
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DISTRICT OFFICERS, II:	Goodlet, J. A. (Benmore); Illingworth, R. P. (Benmore); McNeill, I. (Stirling).
SENIOR EXECUTIVE OFFICER:	Kinnaird, B.
CONSERVANCY ENGINEER:	Adams, W. S.
MECHANICAL ENGINEER:	Atkins, F. C.
ASSISTANT ENGINEERS:	Bennett, D. (Benmore); Gibson, W. (Aberfoyle); Nisbet, J. D. (Cairnbaan).
HIGHER EXECUTIVE OFFICERS:	Ettles, W.; Hogarth, J.
CLERKS OF WORKS:	Stark, W. (Cairnbaan); Dagleish, T. (Benmore); McClory, J. (Benmore); MacDougall, H. (Barcaldine); Mackellar, D. L. (Cairnbaan); McLay, J. D. (Aberfoyle); Robertson, J. R. (Barcaldine).

EXECUTIVE OFFICERS

Benoy, D. W.; Brunton, I. A.; Clelland, Mrs. I. M.; Griffin, J.; Liddell, A.; Macniven, Miss B. B.

HEAD FORESTERS

Calder, J. M. (Carron Valley); Cameron, A. (Strathyre); Crosier, R. (Loch Ard); Fairbairn, W. (Devilla); Jackson, J. (Benmore); MacKay, A. (Barcaldine); McKenzie, I. H. M. (Inverliever); MacKinnon, H. (Knapdale); MacRae, D. J. (Glenbranter); Murray, R. G. (Glenfinart).

FORESTERS

Allan, J. S. (Barcaldine); Angus, R. S. (Glenbranter); Barker, G. J. (Carron Valley); Beaton, K. A. (Torrie); Blake, G. W. (Glenduror); Cairns, J. M. (Loch Ard); Calder, A. M. (Loch Ard); Campbell, W. W. (Loch Ard); Cowie, F. R. (Ardgartan); Cramb, J. (Glenduror); Cunningham, A. J. (Leapmoor); Dye, W. E. (Ardfin); Francey, G. S. (Ardgartan); Fraser, T. S. (Rowardennan); Gillies, A. (Glenbranter); Hamilton, J. (Lennox); Harland, J. (Devilla); Henderson, W. (Loch Ard); Johnston, C. R. (Inverliever); Keiller, W. C. (Carron Valley); Lawson, D. M. (Tulliallan); McCallum, D. (Achaglachgach); MacCaskill, D. A. (Inverinan); McFadyen, D. (Inverliever) McGeachy, R. H. (Glenrickard); MacGregor, D. R. (Garelochhead); Mackay, D. J. (Asknish); McKeand, J. W. (Inverliever); Mackenzie, J. S. (Benmore); McLarty, H. C. (St. Fillans); McLaughlin, R. S. (Loch Ard); MacLean, A. (Kilmichael); McLean, R. (Kilmory); McMillan, J. (Minard); MacNicol, I. (Fearnoch); McNichol, P. (Tulliallan); MacPhea, C. J. (Strathyre); McRavie, J. P. (Glenrickard); Martin, W. C. (Creran); Morrison, A. (Inverliever); Morrison, I. (Carradale); Morrison, N. (Corlarach); Munro, D. (Carradale); Polwart, A. (Glendaruel); Proudfoot, L. O. (Devilla); Rattray, W. D. (Garadhban); Robertson, D. A. (Strathyre); Robertson, N. (Tighnabruaich); Rodger, J. H. (Loch Etive); Ross, D. H. (Loch Ard); Ross, I. (Kilmichael); Simpson, A. A. C. (Carradale); Sinclair, L. (Glenduror); Smellie, A. (Cumberland); Stout, H. C. (Knapdale); Stuart, A. M. (Loch Eck); Young, A. (Strathlachlan).

ASSISTANT FORESTERS

Beaton, J. M. (Loch Ard); Boyd, R. D. (Glenfinart); Caird, G. D. (Whitelee); Campbell, M. M. (Barcaldine); Campbell, D. McL. (Kanpdale); Crawford, W.; Cruikshank, A. (Inverinan); Elgar, W. (Garelochhead); Fergusson, P. D. (Glenbranter); Fraser, J. M. (Devilla); Fryer, K. (Knapdale); Gelder, J. S. (Benmore); Graham, A. W. (Strathlachlan); Graham, H. (Minard); Graham, M. J. C. (Ardgartan); Hart, C. W. (Inverliever); Harvey, R. (Corlarach); Irvin, D. C. (Strathyre); Lyon, J. H. M. (Tulliallan Nursery); McCallum, D. F. (Kilmichael); McDonald, W. (Inverliever); MacDuff, R. J. A. (Inverinan); McGavin, J. M. (Loch Ard); Macintosh, A. (Glenduror); Macleod, N. (Loch Eck); MacRae, D. J. (Inverliever); Main, D. (Inverinan); Mason, W. A. (Glenbranter); Maule, S. G. (Glenbranter); Murray, J. T. H. (Saddell); Oliphant, R. (Glenfinart); Pollock, I. (Glenrickard); Proctor, W. A. (Asknish); Queen, T. G. (Rowardennan); Rowlinson, A. S. (Knapdale); Reid, I. L. (Knapdale); Robertson, J. B. (Loch Ard); Ross, D. A. (Kilmichael); Sallie, J. L. T. (Achaglachgach); Sanders, P. R. W. (Strathyre); Seniscal, B. (St. Fillans); Shaw, M. (Glendochart); Sinclair, D. (Dalmally); Smith, A. K. (Loch Ard); Solway, D. F. (Glenfinart); Turner, A. S. (Benmore); Weir, A. H. (Loch Ard).

FOREMEN: McEachern, J. (Kilennan); Rose, W. (Strathyre).

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CONSERVATOR:	G. Forrest.
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CHIEF EXECUTIVE OFFICER:	Taylor, G. F.
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DIRECTORATE ENGINEER:	McMahon, C. D.
HIGHER EXECUTIVE OFFICERS:	Barcham, F. C.; Pope, H. J.

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WALES, NORTH CONSERVANCY

15 Belmont,
Shrewsbury.
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MECHANICAL ENGINEER:	Low, W. L.
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HIGHER EXECUTIVE OFFICERS:	Bowers, G. H.; Henderson, F. S.
CLERKS OF WORKS:	Dummet, E. J. (Gwydyr); Redford, H. (Hafren); Bollans, L. (Gwydyr); Ellis, T. (Hafren); Griffiths, W. E. (Dovey Corris); Vincent, P. E. (Dovey Corris).
SURVEYORS:	Price, C. C. (Gwydyr); Williams, L. V. (Llangurig).

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FORESTERS

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