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EDITING COMMITTEE

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ACKNOWLEDGMENTS

We are grateful to the Director, Forest Products Research Laboratory, Princes Risborough (Department of Scientific and Industrial Research) for permission to reproduce extracts from *Forest Products Research* 1961, and *Properties of* 30–37 *Year Old Sitka Spruce Timber*. Also to the Kenya Forest Department for the "Note on Forest Areas in the Samburu District", and to the Northern Ireland Forest Service for permission to use the "Report on Rationalisation Course in Arnhem, Holland", by Mr. J. R. Speers.

The journal *Parks and Sportsgrounds* kindly gave us permission to reproduce the article "Problems of Soil Erosion and Stabilisation in Coastal Areas" by Mr. E. W. B. Gale; while the cartoon showing the Busy Beavers is reproduced by courtesy of *American Forests*.

The photograph of the Newland Oak is by Mr. J. D. U. Ward, a former member of the Commission's staff. The views of charcoal burners in the Dean, and of the Ledmore lining-out plough, are drawn from the Commission's own collection. Mr. W. L. Law, our Conservancy Mechanical Engineer for North Wales, took the photo of the Hendre Ddu Log Cabin, while the view of the opening ceremony there was provided by the *Birmingham Post and Mail*. Mr. Richard Prior took the picture of the Commission's display at the Game Fair, and the series of pictures showing the life, and death, of the coypu are by Forester J. W. Parker.

We are indebted to Head Forester R. J. Jennings for the Cat-swinging Cartoon, to Head Forester A. Rose for the sketches of the Ledmore Lining-out Plough, to Assistant Forester R. A. Lancaster for the pictures of the Tool Storage Racks, and to Forester D. T. Patterson for the diagrams showing Power Saw Chain Maintenance. Mr. Marc Sale made the fair drawings for most of these pictures, and also provided the illustration for Mr. Connell's article on "Forestry and Landscape".

EDITORIAL

The Commissioners

The constitution of the Commission is now as follows:

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

Major Sir John Stirling, K.T., M.B.E., who had been a Commissioner since July, 1948, retired in August, 1962. The Earl Waldegrave, J.P., was appointed a Forestry Commissioner to fill the vacancy left by Sir John, and was later in the year made Deputy Chairman; he was formerly Joint Parliamentary Secretary in the Ministry of Agriculture, Fisheries and Food.

Honours

In the 1962 Birthday Honours List, Mr. B. Kinnaird, who was Chief Clerk at Glasgow until his retirement in September, was appointed an M.B.E. as a tribute to his long and active service to the cause of forestry. Mr. Kinnaird joined the Commission in 1920 as a Temporary Clerk and, as well as working in the war-time Home Timber Production Department, served in our Aberdeen, Edinburgh, Shrewsbury and Dumfries offices.

We are also proud to note that Mr. George Holter, who was a Forester at Friston in South East England, until his retirement in March, 1962, was awarded the B.E.M. Mr. Holter, who had been 35 years with the Commission at Friston Forest on the South Downs near Eastbourne, can be credited with much of its creation.

In the New Year Honours List for 1963, we learned that Head Forester Hugh Macmillen of Kirroughtree Forest, South Scotland, was appointed an M.B.E. Mr. Macmillen joined the Commission in 1924 as a Foreman and has served in South West Scotland throughout his career. He has been in Kirroughtree since his promotion to Head Forester in 1946 and is now the most senior Head Forester in Scotland.

Senior Staff Changes

Since the issue of the last Journal, the following changes have been announced:

Sir Henry Beresford-Peirse, Bt., C.B.E., who had previously been Deputy Director General from 1953 until 1959, when he was seconded to the Food and Agriculture Organisation in Rome, was appointed Director General. He fills the vacancy left by Sir Arthur Gosling, K.B.E., C.B., F.R.S.E., who retired early in 1962.

Mr. G. B. Ryle, C.B.E., previously Director of Forestry for England, was appointed Deputy Director General in succession to Mr. James Macdonald, C.B.E., who retired on 31st January, 1963.

Mr. J. R. Thom, who had been Director of Forestry for Wales since 1958, took up the post of Director of Forestry for England on 1st March, 1963.

Mr. J. Q. Williamson, M.B.E., previously a Director at Headquarters, has

taken up the appointment of Director of Forestry for Wales. Mr. Williamson, who was formerly the Conservator of Forests for South Wales, will also have charge of Training and Education.

Mr. A. Watt, C.B.E., who has been Director of Forestry for Scotland since 1957, has been appointed Director of Research, based on Alice Holt. Mr. Watt will also be responsible for Publications.

Mr. Watt is succeeded in Edinburgh by Mr. J. A. Dickson, formerly Conservator of Forests for North Scotland.

Mr. H. A. Maxwell, who was a Conservator of Forests at the Office of Director, Scotland, has become Conservator of Forests for North Scotland. His place at Edinburgh is filled by Mr. G. E. Godwin on promotion from the North Wales Conservancy.

Obituary

JAMES MACDONALD, C.B.E., F.R.S.E.

We regret to record the death, on the 28th of April, 1963, of Mr. James Macdonald, who had been obliged by ill-health to relinquish his post as Deputy Director General at the end of January.

Mr. Macdonald, a native of Blairgowrie, Perthshire, was educated at Blairgowrie High School and Edinburgh University. He joined the Commission's Research Branch in 1924, serving in due course as Research Officer in Scotland and in a similar capacity, at Oxford, for England and Wales. In 1936 he took charge of the Commission's former East Anglia Division, and during the 1939–45 war he served with the Home Timber Production Department, first at Cambridge and later in Scotland. In 1946, soon after his return to the Commission, he became a Conservator of Forests in the office of Director, Scotland, at Edinburgh. He moved to London on his appointment as Director of Research and Education in 1948. His foresight and planning were largely responsible for the considerable enlargement, a few years ago, of the Commission's research station at Alice Holt, which is now held in world-wide regard. By his work with and for the International Union of Forest Research Organisations, Mr. Macdonald enhanced not only his own reputation but the Commission's standing overseas. He became Deputy Director General of the Commission in January, 1960.

Mr. Macdonald's duties included the control of all the Commission's publications, and he had a particular regard for this staff *Journal*. He joined its Editorial Committee in 1948 and served as Chairman of that committee from 1959 to 1962.

It is also with much regret that we record the death of Mr. C. O. Hanson, a former Divisional Officer of the Commission who retired more than 30 years ago.

The former Conservator for South West England, Mr. A. H. Popert, writes in tribute to his memory:

CLARENCE OLDHAM HANSON, I.S.O.

One more link with the early days of scientific forestry in this country has been broken by the death last December of Clarence Oldham Hanson. My recollections of him go back over many years, and it is with pleasure tinged with some sadness that I write this appreciation of his kindly nature and of his work in laying, for many, the foundation of their forestry careers.

Hanson was the first Instructor at the newly-formed Crown school of Forestry for Woodmen at Parkend in the Royal Forest of Dean, in January, 1904. He then came to live at Staunton in the Highmeadow woods, through which I often joined him and his family in exciting walks, for Hanson had a great fund of knowledge of natural history, which he was very ready to impart

even to an enquiring youngster. Many years later, when he was Divisional Officer at Exeter, I was fortunate enough to be one of his District Officers, when I again, like many others, appreciated once more his kindness and help both socially and officially.

Hanson's name is well known to all foresters and others in this country by reason of his text book *Forestry for Woodmen*, first published in 1911. This small book, the first of its kind, was planned to give foresters and woodmen the elements of scientific forestry and to be available at a price all could afford; with its subsequent revisions it is still well worth perusal by the young forester.

Trained at Coopers Hill, of which he was I think the last surviving pupil, C.O.H. joined the Indian Forest Service in 1893, from which service he had to retire in 1903 with the rank of Deputy Conservator, on account of ill-health as a result of a very strenuous time as superintendent of a famine relief camp; this, happily, apparently left no lasting ill-effects. On his appointment at the Dean School, he initiated the systematic training of woodmen in scientific forestry, and in effect laid the foundations of a school whose alumni have established its reputation both at home and in many countries overseas.

Hanson combined the post of Instructor with that of Assistant Deputy Surveyor of the Dean, until March, 1916, when he was seconded to the Timber Supply Department for 18 months. After two years as Forestry Inspector, Office of Woods, he joined the Forestry Commission as Divisional Officer, South West, a post which was combined with Divisional Officer, South Wales, in 1922 after the "Geddes" economies. He retired from Exeter at the end of March, 1931.

After his retirement, Hanson lived at Thame Cottage, Warborough, and was survived by one son and two daughters. He had his ninetieth birthday in 1961, and was greatly pleased to get congratulations from so many of his former colleagues. He was always proud to relate that it was in his Division that the newly-constituted Forestry Commission planted their first trees at Eggesford in December, 1919.

Mr. Harry Watson, who was in charge of the Benmore Forester Training School for 23 years, has died. Mr. Watson worked for the Commission for 33 years in all; he was appointed an M.B.E. in 1949 as a tribute to his work on behalf of forestry education.

We are also deeply sorry to hear of the deaths of Head Forester John Jones of North Wales, who had been stationed at Hafren since 1942, and Assistant Foresters D. J. Macrae of Port Clair forest and David Hodgeson, Research Branch, who were tragically killed in a car crash while they were returning from a dance at Spean Bridge.

Another tragic death we have to record was that of Mr. Peris Morgan, the Acquisition Officer at Aberystwyth, who died at the early age of 33.

Mr. William Stewart, a Higher Executive Officer at Inverness, has also died at the early age of 44, after a long illness. Mr. Stewart joined the Commission in 1947.

Another loss during the year was Mr. Ken Swinburn, Executive Officer at York in the North East England Conservancy, who joined the Commission from the Post Office in 1949.

Mr. George Brown, Manager of Northerwood House, died early last year. Mr. Brown joined the Commission in 1948 and took charge of Northerwood House in 1953; during his time over 236 courses were held there.

Yet another sad loss during the year was Mr. Thomas Peace, Chief Research Officer. Mr. J. M. B. Brown has contributed the following appreciation:

THOMAS ROWLAND PEACE

I first met Tom Peace in Keble Road, Oxford, in the early autumn of 1930. He was pushing a small truck laden with flower pots and it was characteristic that he took no offence when my older companion, somewhat given to banter, exclaimed "Peace, you look just like a costermonger!". The "barrow" contained young trees (ash, I believe) due to be subjected to freezing temperatures in the main building of the old School of Forestry in Parks Road. One of Peace's most important early publications was the Forestry Commission Bulletin 18 on *Spring Frosts*, which he published jointly with W. R. Day in 1937 (a second edition appeared in 1946). At that time, foresters and fruit farmers were commonly ignorant of the factors—particularly the topographic factors—controlling the incidence of radiation frost damage, and the bulletin resolved much confused thinking and made a sound appraisal of the importance of spring frosts in British forestry. The frosts in the third week of May, 1935 (surpassing in severity those of late May, 1961), provided the authors with a great deal of topical illustration of the influence of topography, and of the relative susceptibility of most of the trees grown in Britain.

In my last meeting with Peace at Alice Holt (I saw him several times at his home during his illness), he handed me half-a-dozen of his field note books, spanning the years 1933–1958, and containing occasional references to Corsican pine disease, which I was particularly concerned with. These two trivial incidents are worth recording, because they illustrate two important aspects of his life and work—his informality; and his careful observation and methodical writing down of what he saw and, equally important, of the tentative inferences based on his observations.

During the eleven pre-war years when he was assistant to Mr. W. R. Day at the Imperial Forestry Institute, Oxford, Peace gained a sound knowledge of the principal diseases of trees in Britain. Apart from the survey and experimental work bearing on spring frosts, he made a special study of the very topical elm disease (*Ceratocystis ulmi*) and gave much attention to canker of poplars and leaf-cast of larch (*Meria laricis*). But his note-books suggest that nothing extraordinary escaped his attention and that he had heeded the counsel of Captain Cuttle in *Dombey and Son:* "When found, make a note of."

While thus laying the foundations of his extensive knowledge of British forests and of trees in health and disease, Peace had the good fortune in 1938 to spend several months in North America, where he made some valuable contacts and gained a better understanding of the trees grown widely as exotics here, particularly of Douglas fir. I suspect that this tour gave him a better appreciation of the significance of genetic variability (expressed as "provenance" of the tree, or "strain" of the fungus pathogen); it clearly brought him face to face with plant quarantine regulations, to which he gave renewed attention after the war. A paper in *Forestry*, 1939, "Forest Pathology in America" summed up his impressions.

Soon after the outbreak of war in 1939, Peace was seconded as District Forest Officer to the Forest of Dean, remaining there until 1942 and then occupying a similar post in Kent and East Sussex until, in 1946, he resumed work on tree diseases and became the first technical officer to settle in the newly-formed (or one may say embryonic) Forest Research Station in Alice Holt Lodge. He tackled with characteristic zest the unfamiliar work of a field D.O. and gained a very useful intimate acquaintance with forest practice. In the Forest of Dean, incidentally, he met his future wife, whom he married in 1940, and their two sons were born during this period of field service.

Paradoxically, I saw more of Peace during the war, and the early post-war years, than when we were separated only by a short street in Oxford. One of the first problems to which he gave his attention after the war was the sporadic

death of pines in East Anglia, associated with *Fomes annosus*, and in 1946 I took part, with P. C. Gough, in a survey designed to provide some basic data. It was with Peace's full concurrence that Rishbeth's study, which shed much light on the biology and control of the fungus, was undertaken at Cambridge in 1946.

Mr. W. H. Guillebaud, under whom he first served in the Forest of Dean, was concerned about the many young stands of malformed beech which occur there. Were they due to faulty silviculture, or misguided collection of seed from crooked, twisted, local trees? It was arranged that Peace, who also knew the Forest of Dean beeches well, should spend a fortnight in the Hanoverian beech forests in September, 1946, and I accompanied him, partly as interpreter, partly as recorder of site factors. G. D. Kitchingman, soon to be the first Librarian at Alice Holt, and then stationed with North German Timber Control in Hamburg, made the local arrangements for the itinerary, during which we were fortunate to have as guide Professor E. Wiedemann—another distinguished forest scientist, whose boundless enthusiasm and great gifts would likewise have served Forestry much longer, but for his untimely death in 1950. Nineteen forty-six was a beech mast year in Germany, and a regular sight in the woods we visited was the party of half-starved nut collectors, who would later exchange their harvest for a little cooking fat. Ours was necessarily a rather perfunctory survey, but it was conducted systematically on a wide range of soils in the heart of the European beech zone and it was most regrettable that the report was not published. Nevertheless, the tour was an enrichment of experience and Peace took the opportunity of visiting Forest Research Stations at Reinbek and Hannoversch-Münden, as well as the Plant Sociology and Cartography Station directed by Tüxen in Stolzenau.

Assisted at first only by Research Forester Hugh Loughborough and Miss K. M. Turner (now Mrs. Tinson), Peace set about the considerable task of organising the work of the Pathology Section, while his Chief, M. V. Laurie (now Professor of Forestry at Oxford), was assembling staff and greatly expanding the scope of the research carried out from Alice Holt and Edinburgh. Since before the war, Peace had taken an active interest in poplars, primarily in the pathology of bacterial canker and the testing for resistance of the innumerable varieties, but subsequently in methods of propagation. As an experienced and enthusiastic gardener, he was familiar with the use of plant hormones for promoting the rooting of cuttings, and in 1939 he published two short papers on this subject. Poplar research at Alice Holt expanded rapidly and Peace took an active part in the work of the International Poplar Commission, which held its conference in Britain in 1951. The work on poplars was later divided, ecological and silvicultural research being the responsibility of the Silviculture Section, while the Pathologist concentrated on testing varieties for resistance to disease. The extensive Populetum to the north-east of the Research Station is a fitting memorial to the pioneering work undertaken by Peace in this important specialised branch of forest research.

The wide-ranging work of the Pathology Section in recent years must be familiar to most readers through the quarterly departmental circular *Entopath*, which Peace, in collaboration with his Entomologist colleague, Myles Crooke, launched in April, 1954. But it may not be generally realised how many additional enquiries for diagnosis of disease, or advice about control, come from private woodland owners. The experience which Peace had gained in the field during the preceding 30 years enabled him to deal adequately with an almost embarrassing flow of enquiries and yet pursue (first with J. S. Murray, then with R. G. Pawsey, as Assistant Pathologist) some fundamental work on several important disease problems. He saw that *Fomes annosus* was foremost among them and likely to become more alarming as pioneer plantations of conifers became due for regeneration; accordingly in 1956 a small team, headed by

Forester J. Low, was appointed to prosecute the *Fomes* investigations with singleness of purpose.

One more event in this period of Peace's career should be mentioned, namely the XIIth Congress in Oxford, in July, 1956, of the International Union of Forest Research Organisations. To him fell the task of arranging seven post-Conference tours, ranging over all parts of Britain; those of us who took part in one or other of these tours can testify to the hard work he put into this task and the patience with which the inevitable "snags" were smoothed out.

When Peace succeeded Professor Laurie as Chief Research Officer in 1959, he brought to his office, besides enthusiasm, energy and wide experience of the problems of forest research in this country, an administrative ability of no mean order. His methodical way of working and his informality (which included intolerance of superfluous "red tape") have already been alluded to. His outlook was markedly practical and he showed a quick grasp of the essential features of a problem and of its practical importance (if any). He acknowledged a great debt to those who had preceded him—Mr. Guillebaud, Mr. James Macdonald and Professor Laurie—and he enjoyed the inestimable advantage of finding the Research Station not only adequately staffed, but conveniently housed; nonetheless, his ability made him a worthy successor to those three pioneers of forest research in Britain.

Peace's publications, too numerous to mention individually, dealt with poplars, Dutch elm disease, butt-rot of conifers, spring frosts, atmospheric pollution, needle diseases of conifers and several less-frequently-occurring phenomena. The culmination of his work was, of course, the 700-page *Pathology of Trees and Shrubs*, published by the Clarendon Press, Oxford, which the author had the great satisfaction of seeing in print only a few weeks before his death. The book takes an important place in forest literature in the English language and fully earned the favourable reception accorded it.

Thomas Rowland Peace, whose forebears came from the Orkney Islands, was born in Cambridge in 1907 and educated at King's Lynn and Cambridge University where he received an honours degree in Botany in 1928. He had a spell of rheumatic fever in boyhood and was excluded from taking part in school games. Instead he spent most of his free time rambling in the Norfolk countryside and it was there that his intimacy with nature and love of plants and animals took root. He was first and last a naturalist, sceptical, until they had proved their value and relevance, of procedures which seemed remote from natural phenomena and not readily susceptible of application in the field.

The presumptive bad health record in youth created some difficulties in later life, in the matter of life insurance, for example. But what other men might have taken too much to heart, Tom accepted as a challenge. In 1941, he applied for enlistment in the Royal Air Force, but was rejected on medical grounds. He appeared to have boundless energy and lived a full and active life, both in forest research and with his wife and two boys in "Woodlands", their Tilford home. The lovely garden, which he tended without other help, was his main recreation; he entered regularly in the flower shows arranged by the Frensham Horticultural Society (of which he was president for some years) and won many prizes. Apart from that he and Mrs. Peace were frequent participants at the various social functions held at the Research Station; the annual children's parties were usually delighted with an array of grotesquely sculptured pumpkins from the garden of "Woodlands", or with some other lively decoration from the same source. Mention should also be made of his active membership of the Roads Beautifying Association; as an expert on poplars and well acquainted with the principal shortcomings of those traditional roadside trees, the elms, Peace was singularly well qualified to advise on the place of trees on roadsides.

Peace's gallantry during his long illness enhanced the esteem in which he

was held by his many friends in the Forestry Commission. Enforced inactivity must have made constant demands on his resources of buoyancy and adaptability, great as these were. He had the generous spirit of those who enjoy life in its fullness themselves and like to see others enjoy it too. His death on 16th September, 1962, left his colleagues mourning the loss of a wise counsellor and chief, taken from them at the height of his career.

Promotions and Transfers

As we go to press we are pleased to report the promotion of Mr. R. F. Wood, Divisional Officer in the Research Branch, to the rank of Conservator.

Mr. John Wharam has succeeded Mr. B. Kinnaird as Chief Clerk at Glasgow, and Mr. George Holmes, Divisional Officer in the Research Branch, has been posted to the North Wales Conservancy, based on Shrewsbury.

Retirements and Departures

Mr. B. Kinnaird, Chief Clerk at Glasgow, whose long and outstanding service has been recorded in the Honours List, retired during the year.

Head Foresters who retired, or left us, during the year included D. Macdonald of Black Isle, North Scotland; T. Morris at Tintern, South Wales, who has been seconded to the War Department to take charge of the Aldershot Forest Estate; J. T. Anderson of Thetford Forest, East England; and F. Watson, M.B.E. of the Dean Forest.

Eighth Commonwealth Forestry Conference in East Africa

The following people represented the United Kingdom in the Eighth Commonwealth Forestry Conference, which was held in East Africa in June, 1962:

Sir Henry Beresford-Peirse, Bart, C.B., B.A., F.R.S.E.,
Director General, Forestry Commission.

Mr. C. Swabey, C.M.G., B.Sc.,
Forestry Adviser, Department of Technical Co-operation.

Mr. J. R. Thom, B.Sc., (For.),
Director, Forestry Commission, Wales.

Mr. R. F. Wood, B.A., B.Sc.,
Silviculturist (South), Forestry Commission.

Mr. R. Chard, B.Sc., (For.),
District Officer, Forestry Commission.

Mr. R. G. Miller, B.Sc.,
Assistant Director (Forestry and Land Use), Directorate of Overseas Surveys, Department of Technical Co-operation.

Mr. W. V. Harris, M.Sc.,
Officer-in-Charge, Termite Research Unit, British Museum (Natural History).

Dr. W. J. Eggeling, B.Sc., Ph.D.,
Conservation Officer, The Nature Conservancy, Scotland.

Dr. A. C. Copisarow, D.Sc.,
Director, Forest Products Research Laboratory.

Mr. W. M. McNeill, M.B.E., T.D., M.A., M.S., Dip. For.,
Lecturer, Forestry Department, University of Aberdeen.

Two of the Forestry Commission delegates, Mr. J. R. Thom, now Director of Forests for England, and Mr. R. Chard, District Officer, East England, have written individual reports of the Conference and Pre-Conference Tours, which appear as articles in our main text.

History in the Scottish Glens

The following information has been gleaned from the columns of the *Glasgow Daily Herald* for 6th September, 1962:

"TOWNSHIPS TO BE MONUMENTS

Relics of Clearances

"Grunmore and Grumbeg, two Sutherland crofting townships depopulated since the Highland clearances early last century, have been listed as ancient monuments, the Ministry of Works announced yesterday. They are the first crofting townships to be so designated.

"The remains of black houses and other structures which constituted Grunmore and Grumbeg were discovered on Forestry Commission land on the north bank of Loch Naver. The Ancient Monuments Board recommended that at least one of the villages should remain clear of trees and be preserved in the national interest."

The land where these ruins lie is now part of our Naver Forest, on the shores of Loch Naver in a romantically wild region of central Sutherland. It is encouraging to report that our planting schemes there, which will extend to 5,700 acres, will bring back some of the people to this distant glen.

New Developments in Utilisation

We are glad to report progress on three major factories planned to make use of the produce from our growing forests. At Thetford in Norfolk, Messrs. Novobord are building a new chipboard factory and sawmill which will run on logs from the extensive pinewoods of Thetford Chase and neighbouring woodlands. At Hexham in Northumberland, the Weyroc company are putting up another chipboard works which will depend, in the main, on thinnings from the spruce woods of Kielder Forest and its neighbours.

The proposal to build a great paper mill at Fort William, to use thinnings from Commission forests and private estates spread over a wide expanse of North and West Scotland, has now received full Government support. In his Budget speech on 3rd April, 1963, the Chancellor of the Exchequer, Mr. Maudling, announced that a substantial loan will be made to the promoters, Messrs. Wiggins, Teape Ltd.

Lament for a Bison

More than six years ago the Commissioners were recipients of a gift from the Polish Government of a pair of young European bison. Such forest animals are extremely rare; indeed, as recently as 1959 it was estimated that the world population was only 300, of which Poland had about one third.

Both our animals were born in May, 1955 in reservations near Cracow, the Pedigree Book showing that the bull, Pustasek (roughly translatable as "Creature of the Wild"), was the offspring of Pumeks and Puzorka, and the cow, Pulanda, whose name was (to us) untranslatable, of Plamiec and Pulonka.

Naturally the Commissioners and officials of the London Zoo, who took the bison into custody, maintained a close interest in their progress and well-being. It had always been in mind that one day our pair might become parents and so help in some small measure to add to the all-too-low world stocks.

Alas, it was not to be. For, without warning early this year, Pulanda was savaged by Pustasek and injured so severely that she died.

Contributions to the Journal

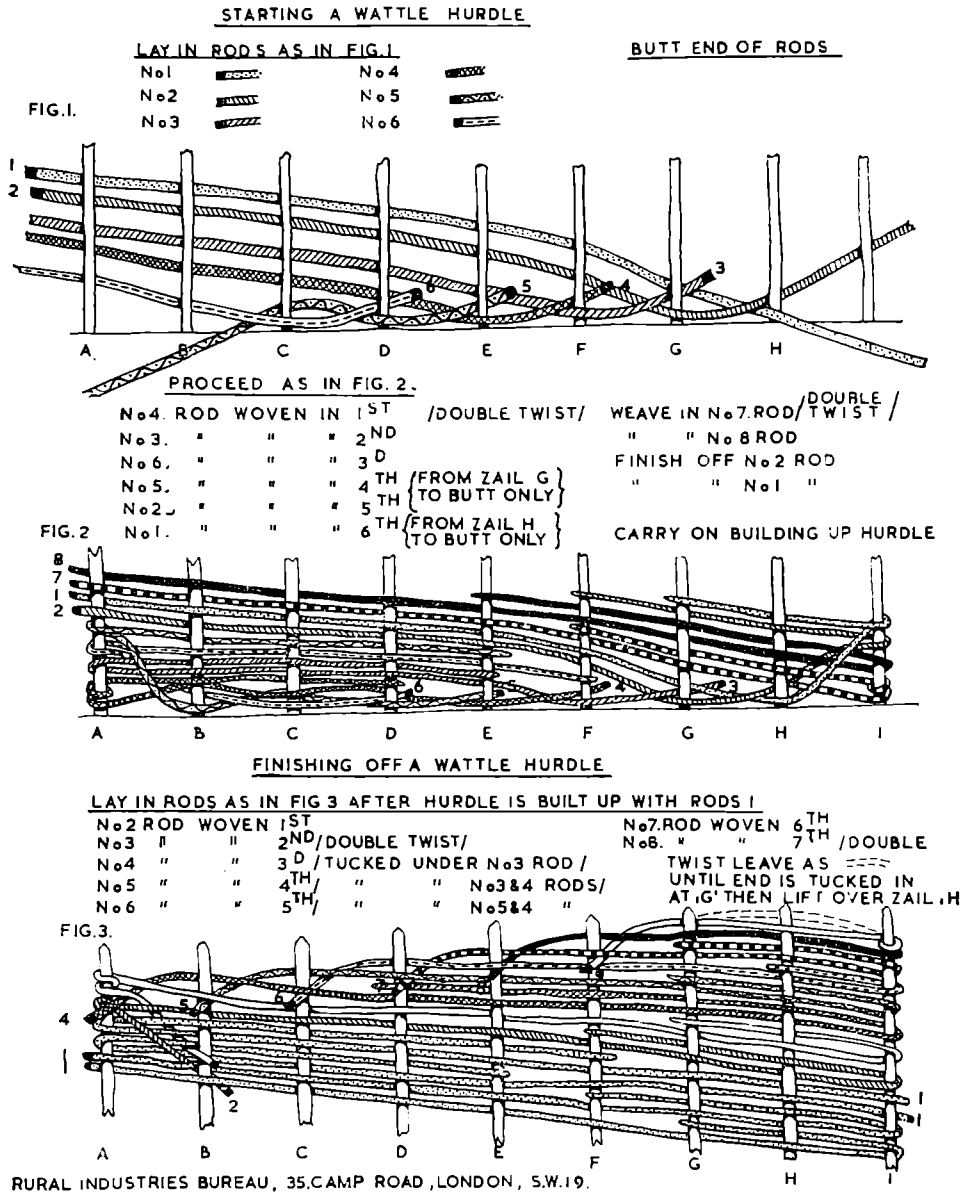
The Editorial Committee makes a special plea for articles by any member of the Commission's staff, on any subject related to the Commission's activities. The usual channel of submission is through the Conservancy (or similar) office,

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. No payment is normally made for contributions, but reasonable expenses, for example for special photographic prints, can be met.

If for any reason your contribution does not "fit" the Journal, then the Editor will do his best to find some alternative channel for its publication.

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.



The Hurdle-Makers Craft:
Details of arranging rods at the start of the weaving. *By courtesy* of the *Rural Industries Bureau, Wimbledon.*

JOURNAL OF THE FORESTRY COMMISSION
No. 31, 1962

EIGHTH BRITISH COMMONWEALTH FORESTRY CONFERENCE, EAST AFRICA, 1962

By
J. R. THOM
Director of Forestry for England

The decision to hold the Eighth Commonwealth Forestry Conference in East Africa was a courageous one, and as events turned out, a wholly correct one. One might have had uneasy qualms that the highly explosive political differences throughout Africa at that time might have had repercussions in the Conference chamber, but this was not so. All foresters from twenty-one different Commonwealth countries met in Nairobi to consider and discuss matters of common interest in the sphere of forestry, and to give guidance where possible to those newly-emerging countries, shortly to attain full independence, as to future forest policy, forestry education, forest management and conservation. In brief, by mutual exchange of ideas to strengthen and improve the common bond of forestry throughout the Commonwealth. How successful we shall have been, will be for history to decide.

The headquarters of the Conference was in the offices of the East African Common Services Organisation in Nairobi, and it was in the Conference Room on the morning of 25th June, that the Chairman of the Standing Committee, Sir Henry Beresford-Peirse, called the Conference to order, and welcomed the President, the Hon. Al-Haji T. S. Tewa, M.P., Minister of Lands, Forests and Wildlife in the Government of Tanganyika. The President extended a welcome to all delegates and expressed the hope that their stay in East Africa would be interesting and of mutual value. Afterwards the Conference proceeded to the election of Mr. Christopher Swabey as Chairman of the Conference proper, and to the election of other officers. In the afternoon the Conference was formally opened by the Governor of Kenya, Sir Patrick Renison. The Governor-General of Tanganyika, Sir Richard Turnbull, and other distinguished guests from Uganda, Kenya and Zanzibar were also present.

The Conference then proceeded to discuss the Resolutions made at the previous conference in Australia and New Zealand, to hear Reports from individual countries and to discuss the most suitable arrangement of the Agenda for the formal meetings of the Plenary sessions. This was all accomplished in good order and the Conference adjourned for a period of some two weeks to allow delegates to set out on the Main Conference Tours to Tanganyika, Kenya and Uganda. This was an excellent idea as not only did it allow delegates to get to know one another in the friendly atmosphere of travelling in the forest, but it allowed all delegates to see, at first hand, something of the work being done by the Forest Services in East Africa. To those of us from Great Britain this was of tremendous interest.

Because of the size of the party and certain local difficulties regarding accommodation, it was decided to travel in two separate parties—Party A to start in Tanganyika, thence to Kenya, on to Uganda, finally returning to Nairobi, while Party B did the trip in reverse, Uganda, Kenya, Tanganyika and back to Nairobi. I was with Party A, and we left our hotel in Nairobi at

6 a.m. for the airport to fly to Arusha in the North of Tanganyika. Our first stop was the Forestry Training School, Olmotonyi, where the Chief Instructor, Jack Holmes (ex Benmore, 1943–46) showed the work of the school, and described the training course for Forest Rangers, as well as the shorter refresher course which brings the Rangers up to date on new techniques. It was evident that Tanganyika was well aware of the necessity of bringing on Africans as rapidly as possible to take over positions as Forest Rangers, and we were all impressed by the curriculum and facilities for training.

From the School we moved on to recently-formed plantations of *Cupressus lusitanica* and *Pinus patula*. This was our first introduction to plantations formed as the result of "Taungya" farming, and to one to whom this had been previously simply a textbook phrase, I found its application throughout East Africa to be intensely interesting. Briefly what happens is that the forest authorities allocate a portion of uncleared indigenous scrub land to the African forest workers. In return for clearing this area they are allowed to cultivate it for their own use for some five to seven years. During this time the Forest Authority supplies forest trees for planting, and the Africans have to plant and tend the forest trees as well as look after their own crop of maize, banana, or whatever agricultural crop they may be growing. As the forest trees grow, so does the system of "taungya" gradually move on to other areas. In this way, quick exotic plantations are established cheaply and quickly, and the African has land on which to feed his family for a short period of years, before moving on.

After briefly inspecting damage by Sykes monkeys to young *Pinus patula* plantations, we saw some underplanting experiments in a main crop of lolyondo (*Olea welwitschii*) in an effort to regenerate this species, and also to protect it from the ravages of big game. This was a recurrent theme all through East Africa, the damage from elephant, rhino, pig, antelope and monkey, and considerable thought is being given to the whole problem of game conservation, as it is realised that the existence of big game in Africa is one of the major attractions to visiting tourists, and the preservation of such game must be secured without too big a sacrifice to the forests. Later this day we visited the Ngurdoto Crater National Park to have our first glimpse of African wild life in its natural surroundings. Elephant, buffalo, rhino, and different species of buck all roam within this extinct volcanic crater some two and a half miles in diameter.

Other highlights of the Tanganyika trip were the visit to the Utilisation Section at Moshi where we saw the work being carried out to determine the capabilities of the many timbers now in commercial use. A minor product of the forests of Tanganyika is the production of honey and beeswax, and we saw some of the demonstration bee-houses on the lower slopes of Kilimanjaro (19,321 ft.). A quarter of a million pounds worth of honey and beeswax is exported annually. We reached a height of 8,500 ft. at the Bismark Hut, and enjoyed a breathtaking view of Kilimanjaro with its snowy cap forcing its way through the clouds. A visit to Mombo allowed us to see the Arboretum there with its 32 plots of exotic Eucalypts and conifers. Nearby we visited the sandalwood oil factory and sawmill of Messrs. Akberali Hassanali & Sons to see the process of distillation of sandalwood into oil. Mention must be made of the visit to Mkussu forest where we were entertained to a demonstration of "pit-sawing" by men of the Kisii tribe from Kenya. Initially there was a slight reluctance to commence operations, due to shyness or a local disagreement about bonus rates, but once the two-men gangs got under way, the forest re-echoed to their rhythmic sawing and chanting—a never-to-be-forgotten experience of a form of sawing now extinct in Great Britain for many years.

The visit to Tanganyika finished with a trip to the "World's View", a spectacular viewpoint on the edge of the escarpment of the Usambara Mountains,

looking down a sheer drop of 1,000 feet to the plains some 3,000 feet below this height. Before leaving we paid a visit to the Lushoto Arboretum where some 134 plots of different species have now been established chiefly of exotic conifers and hardwoods. A brief visit to Lushoto market where a most colourful scene was presented to us, with the African women selling their goods, arrayed in the most glorious colours of the rainbow, and ensuring that we departed with warm and generous memories of this delightful country.

Our route through Kenya was by Land Rover from Nairobi into the Aberdare Mountains and Mount Kenya to Thomson's Falls, and thence down the Rift Valley to Nakuru, Molo and Kericho, and on to Eldoret to catch the night train for Kampala in Uganda. The main impression to a forester from the United Kingdom was the deep rich fertile soils on which systematic forestry was being developed. Indeed to one who had but lately come from the infertile soils to be found on the slopes of Plynlimmon, the deep red loams around Kericho seemed to be "Paradise enow". This was evidently the opinion of the owners of the neighbouring Tea Estates because there we saw a most interesting experiment to observe the effect on stream flow, through the replacement of the indigenous high forest by tea plantations. Dr. Dogg and Mr. Kerfoot of the East African Research Organisation gave a most graphic description of what was being attempted and illustrated this with practical demonstrations in the adjoining tea garden.

Various forms of land use were seen throughout Kenya, varying from indigenous forest to coffee, tea, sisal, and pyrethrum growing with differing agricultural uses, from the progressive cattle and arable farming in the Kenya Highlands to the rather more primitive banana and maize cultivations of the Africans. Kenya is experimenting with many of the faster-growing exotic conifers from South Africa and Australia such as *Pinus patula, P. taeda,* and *P. radiata, Cupressus* species chiefly *lusitanica, torulosa* and *macrocarpa,* and various Eucalypt species. The indigenous forests comprising *Ocotea usambarensis, Podocarpus* sps. *Macaranga kilimandscharica,* to name only a few, are now putting on such a small increment, on so few trees per acre, that much thought is being given to raising the potential productivity of the land as rapidly as possible by rapid planting under the "shamba" system—a variation of "taungya" to establish such forests, before other competing forms of land use establish a prior claim. The results as shown both by experimental plots and in the forest are most encouraging.

It was in Kenya that we were shown most graphically the damage that can be caused by elephant and rhino to growing trees. Various forms of preventative barricades had been tried, and these were shown to us, and most fearsome they looked. We were also able to inspect the damage to the trees, after they had been sawn at the sawmill, and indeed some of the large mahogany logs were almost valueless, after being broken up by a circular saw. An interesting visit was paid to the sawmills of Mr. S. M. Shah and Mr. G. H. Patel, where we saw cedar logs of *Juniperus procera* being converted into lumber, cedar wood pencil slats, and cedar wood oil. The safety regulations of the mill might be strange to European ideas, but who could gainsay that the mill was not efficient and paid its way?

One of the most memorable days or nights was the visit paid to the fabulous Treetops Hotel near Nyeri. Some of the party elected to stay there during the tour, and after being driven in a Jeep some 15 miles from the Outspan Hotel in the late evening, we arrived just before dark. Various species of buck were at the water-hole and beside the nearby salt lick, and they were joined at intervals by rhino, buffalo, warthog, wildbeeste, baboon. During the night we were awakened by the arrival of a herd of fifty elephants milling around the

salt lick on which three rhinos had taken up residence, and which were determined not to give way to the elephants. Altogether an amazing sight at 1 a.m. in the morning, the whole scene illuminated by floodlight.

Mention should also be made of the exotic luncheon at the Londiani Club when the two touring parties, one coming East from Uganda, and the other, coming West from Tanganyika, met promptly at 1 p.m. by a feat of tremendous organisation.

From Kenya by the night sleeper from Eldoret to Kampala, there to see some of the work carried out in the Budongo Forest Reserve. Here the main task of the Forest Department is to produce the valuable mahogany species at the minimum cost, and to ensure regeneration either by natural or artificial means. The protection of the forest from wild life was a major concern, and at the same time the Forest Department was aware of the necessity to protect the same wild life from complete extermination. A detailed account was given of the regeneration inducement methods, and this was later demonstrated in the field, an operation which appeared to be extremely complicated for the results achieved. It was probable that this method of management gave rise to most discussion on the whole trip.

We also observed demonstrations of planting in the actual high forest, and inspected trial plots laid down in 1959 of some of the faster-growing exotic conifers. To date *Pinus caribaea, Cupressus benthamii,* and *Cupressus lusitanica* appear to be the most promising. My own appreciation of the problems in Uganda is that it is by the wise use of these fast-growing conifers that forestry will be made to pay, rather than by too much attention to the regeneration of the slow-growing and doubtfully economic indigenous hardwood species.

Space can only allow a brief mention of the Forester Training School at Budongo, the visit to the Kagera sawmill between Masindi and Fort Portal, on our way to stay at the New Ruwenzori Hotel at the foot of Rider Haggard's "Mountains of the Moon", alas shrouded in mist for the whole of the two days there. Finally the launch trip on the Kazinga Channel linking Lakes George and Edward, when we studied elephants and hippo at extremely close range, along with the teeming bird life that remained undisturbed as we passed along. All too soon we returned to Entebbe by car to board the waiting plane for Nairobi, with our flight over Lake Victoria for much of the way.

It is difficult to condense one's impressions of such a memorable tour through East Africa. The term Tropical High Forest now has a new meaning, and one appreciates the skill and knowledge that has gone into the creation and maintenance of these forests. At the same time the newly-emerging Africa requires more timber from its rich soil, and methods must be found to increase production and still conserve the forest. Allied with this is the conservation of wild life both from the ecological standpoint and for the well-being of the forest. Much thought is being given to these problems, and, given their own good time, the Forest Departments of the different countries will certainly not fail in the tasks entrusted to them.

What of the Conference itself? The sober paragraphs of Resolutions and Recommendations of the full Plenary Sessions do not convey the sense of urgency that all delegates felt was conveyed to them by their tour of the forests. Primarily, as far as East Africa is concerned, there is the question of adequate professional and technical assistance to keep the Forest Services in being when full independence is achieved in these countries, and to maintain the present high standard of forest management, and to project this into the years ahead. There is the ever-present threat of excision of forest areas to agriculture, as game reserves to protect the fast vanishing herd of wild game, a precious asset

to Africa, and the complicated relationship between the Forester and the Water Conservationist regarding the effect of stream flow on afforested and disafforested areas.

All these problems, and many others, were discussed in Committee and in Plenary Session. The experience of noted Commonwealth foresters was freely given, and, at the end of the day, the Policy Committee hammered out the Resolutions of the Eighth Conference. Perhaps not very different from previous Conferences, but then should they be? Forestry should not be subject to the whims and caprices of succeeding Governments throughout the Commonwealth, and certainly what is wanted in East Africa above all else at the present time is stability. The experiences of other countries in the fields of Forest Policy, Silviculture, Management, Protection, Wild Life Management and Utilisation have similar application to the needs of the newly-emerging countries of Africa. One hoped, as one regretfully said *au revoir* to this strange and exciting Continent, that our deliberations had been worthwhile, and that out of the tradition and pioneer work of the older Forest Services, will emerge new Forest Services imbued with these same concepts of sound forestry and land use which are more than ever required now in the economic and social life of Africa.

A TOUR IN NORTH UGANDA AND KENYA

By

R. CHARD

District Officer, East England

I. NORTH UGANDA

Purpose. The main object was to show how trials are being conducted to find out which tree species will be most suitable for particular localities. The tour was a pre-Conference one for delegates to the Eighth British Commonwealth Forestry Conference, 1962.

Route. After arrival at Moroto by air from Maralal in North Kenya, delegates spent the first day and the morning of the second in the Karamoja District. They then flew to Gulu for excursions into the Acholi District on the second and third days, before flying back to Nairobi.

Arrangements. The Chief Conservator of Forests, Mr. W. E. M. Logan, led the tour, and he and members of his staff, particularly Mr. R. A. Butt, are thanked for enabling the delegates to see the interesting research being undertaken in these fairly remote Districts. Members of the East African Agricultural and Forestry Research Organisation, especially Mr. O. Kerfoot, who explained the hydrological and land-use research being undertaken on the Atumatak Catchments in Karamoja, are also thanked.

The chartering of light aircraft made it possible to see a great deal in a short time; it is hoped that the fact that this was greatly appreciated will be some compensation to Mr. Logan. He was unfortunate to be in a plane which required him to help push it out of the mud at Moroto after its propeller had been bent in an attempt to take off between the pot-holes.

After travelling in Land Rovers over several hundred miles of Kenya "roads" earlier in the week, the party might have thought that there were no new experiences left for them in this form of transport. The journey up the mountain behind Moroto, however, was yet another lesson in how these vehicles have made it easier to get to places. In this case the scenery alone was ample reward

for the jolting received. Everyone was quite pleased, however, to find that roads in Acholi could be negotiated by cars, and the unexpected luxury of the hotel at Gulu was also welcome.

Very good notes were supplied on the reserves and other places visited.

Comments. One who has no working experience of tropical forestry cannot become informed in the space of a few days, but the following comments may be of interest as recording my main thoughts on being shown the various experiments.

Atumatak Catchment Experiments

Here, I confess, the most lucid speaker would have had difficulty in putting over the finer points to me. My contact with what passes for civilisation had been too recent to enable me to concentrate on the details of flume calibration and one-acre transects, when around me was the scene of tribal skirmishes, befeathered Suk against naked Karamojong, with the King's African Rifles inflicting heavy casualties in order to stop outright war. The basic cause of this fighting, competition for grazing lands, has been known for a long time. It is also known that wooded savanna is deteriorating into steppe at an alarming rate, and that compaction of the soil by cattle is the main reason for lack of water penetration.

What, I wondered, was being done politically and administratively to reverse this process? Nothing, as far as I could discover. The notes issued by the Physics Division, Muguga, said:

"How far controlled grazing will ameliorate the problems created by overstocking and land misuse is not yet known. There may be 10 per cent improvement or 200 per cent. On the measured magnitude of the change rest the political decisions initiating enforcement of grazing control and compulsory destocking."

How many more rain gauges will be stolen to make bracelets before political decisions can be made? How much more bloodshed will there be before all departments get together and decide what shall be done towards improvement?

Shelterbelt Establishment on the Plains of Karamoja

I thought this one of the most worthwhile projects seen during the whole of the pre-Conference and main tours. The objective of finding species that would be suitable for forming shelterbelts, and producing poles, fuel, and fodder should surely be the objective in a great many other places throughout the vast savanna and steppelands of Africa.

So many of the afforestation projects seen were on easy sites where conifers were not considered to be earning their keep unless they grew six feet a year, and eucalypts ten feet a year. But here we were shown something to test the skill and patience of the forester to a far greater extent. Moreover, when successful, the results will be of direct benefit to local people, an object of management which can never be truly evaluated in terms of cash, but which is often much more rewarding than "economic forestry".

The results of the trials to date I thought far from disappointing, and fully justified further plantings of the most promising species so that a belt of greater width is established. At present all the trees are to some extent edge trees and there is insufficient width for those in the centre to be growing in relative shelter.

Losses from termite attack did not seem to be sufficiently disastrous to be cause for alarm.

Moroto Central Forest Reserve

The trial plots at the foot of the mountain again have the commendable

objectives of discovering the best species to produce poles, fuel, and fodder for local use, and it would seem that the answers will be more readily obtained than at Karamoja. It was not apparent from the stocking of most of the plots that losses from drought and termites had "always been severe" as stated, and I wondered whether too high a standard was being sought.

The results to be gained from the high-altitude plots seemed to be rather less essential in view of the relatively small areas similar to the site being used, and the absence of signs of severe run-off and erosion on these plateau grasslands.

The problems of grazing control, although not so acute as in many other areas, ought nevertheless to be solved before further deterioration occurs. It is deplorable that the Forest Department seems to be the only department attempting to face up to the situation, and more so that security has worsened, thereby undermining controls.

Species Trials in Savanna Woodland at Abera, Opit and Olwal Reserves

My first impression was that with an average of 2 to 3 feet of soil, and 50 to 70 inches of rain, these were not difficult sites on which to grow trees. Subsequently, after seeing afforestation on very deep soils in Kenya and learning more of growth rates expected in East Africa, I retained this view, but realised that, relatively speaking, conditions at Abera and Opit, if not at Olwal, were, by East African standards, not so very favourable.

Chlorophora excelsa certainly seemed a doubtful proposition at Opit and Abera, but *Maesopsis* may yet prove worthwhile, and no one could doubt the wisdom of persevering with this useful species at Olwal. What, I wondered, is known about the physiological processes which make this tree self-pruning? How convenient if this mechanism could be induced in some other timber trees.

As regards the trials of exotics, the reasons for these, and the manner in which they were being conducted, seemed wholly sound. The only pitfalls which occurred to me were (*a*) being unable in future to obtain seed of successful provenances, (*b*) having so many successful species that future large-scale plantings incorporate too many, with the result that establishment of large-scale forest industry is hindered. With regard to (*a*) it is known, for example, that *Pinus leiophylla* is a very variable tree and the good form seen at Opit may not be produced by future plantings unless the seed comes from the same source.

The remarks under (*b*) are slightly facetious, but I do think that someone in the future would be wise to limit the numbers of species to one or two, since efficient marketing is easiest where a uniform commodity is available in quantity.

Staff

The efficiency, high morale, and enthusiasm of staff from Forest Guards upwards was particularly impressive, the more so in view of impending changes. I shall remember this most of all.

II. KENYA

Purpose. This was stated as "to study the interaction of domestic grazing animals and wild animals with the plains vegetation, the forested hills, and water supplies".

Route. The study was made in the Samburu District of Northern Kenya. From Nairobi the delegates flew by small chartered aircraft to Isiolo airstrip, and thence travelled by Land Rovers to Wamba. The first night was spent under canvas in the Ngeng Valley. On the second day a Land Rover journey was made to Maralal, and the third day was spent in that locality. Departure from Maralal the next morning was by the same small aircraft, and the route

to Moroto in Uganda was arranged so that a close view was obtained of the Mathews and Ndoto mountain ranges.

Arrangements. The tour was made under the leadership of Mr. J. B. Smart, the Acting Conservator of Forests (East of Rift), assisted by Mr. T. A. M. Gardner, Divisional Officer, Thomson's Falls.

The Chief Conservator, Mr. E. J. Honoré, and those members of his staff, particularly Mr. Smart and Mr. Gardner, responsible for organising the tour, are warmly thanked for the bold arrangements which enabled delegates to get a close look at the problems in so short a time. The use of four light aircraft not only enabled most of the time to be spent within the Samburu District, but gave a much wider view of the terrain than would otherwise have been possible.

A safari firm was employed to look after the party during its travels by Land Rover, and in the camps for the three nights. This was an admirable arrangement. To one whose first visit it was to Africa, the camp in the Ngeng Valley was particularly memorable. Who in his boyhood has not imagined himself seated by the campfire, listening to the mysterious noises of the tropic night and knowing that beyond the moonlit glade are buffalo, rhino, and elephant? Realisation lacked nothing, and was the more complete by the presence of the red-ochred, spear-carrying Samburu warriors.

If I could find anything to regret in the arrangements for this tour it would be that more direct contact was not made with these people. Their way of life creates most of the problems of land use, and I would like to have gone into one or two manyattas and seen for myself more of how they live. Such a visit was made by one Land Rover party using up spare moments, but unfortunately I was not with it. However, it was arranged for us to meet (with interpreter) an elder of the tribe together with a chief of the Wanderbo during a lunch-time halt near Wamba. Also the District Commissioner at Maralal, in a most lucid address, gave a great deal of information, and generally speaking local staff were fairly knowledgeable, although I must say that here, as elsewhere in East Africa, my impression was that a knowledge of game was rated higher than a knowledge of local people. I learnt most about the Samburu from an educated Masai during a sundowner party.

The Samburu

This tribe of Nilo-Hamites is estimated to number 35,000. They are related to the Masai who, however, regard them as inferiors. There are eight family groups each with its chief, but the groups mix territorialy, so that none of the chiefs has authority over particular territory. Physically both men and women are well proportioned, although small by European standards, graceful in movement, and with proudly handsome features.

They live entirely by grazing cattle and some sheep and goats. They seldom eat meat and live almost exclusively on blood and milk. Donkeys and more rarely camels are used as beasts of burden, e.g. for moving equipment. A family may remain in a particular place for a few weeks only before moving on to better grazing, but usually a manyatta (collection of wooden-framed circular huts roofed and walled with cow dung and protected by a surrounding barrier of thorns) remains occupied for several months. Curved hut poles are difficult to obtain and are carefully taken down and re-erected when the family moves on. The cow dung huts have one small entrance, no windows, and no outlet, except the entrance and cracks in the walls, for smoke. A fire is said to be necessary as a fumigant as well as for warmth.

The women do all the domestic work including the erection of the huts. They wear permanent bracelets of wires and beads. A skirt is traditional,

although it is becoming increasingly common for this to be extended upwards to cover one breast.

The boys, as soon as they can walk, are sent out to herd the cattle. Once every seven years youths between the ages of about 14 and 21 are initiated into the tribe and become warriors (morans). Candidates for initiation wear a black robe. Amongst the tests they have to pass is to stun (but otherwise leave unharmed) a small bird by shooting it with a soft-tipped arrow. They also have to make their way to the sacred mountain of the Samburu, Mount Nyiru, and bring back a stick of bamboo. This in the days of tribal warfare involved running the gauntlet of the warriors of neighbouring tribes. At present it is an easier task. Just a long walk through lion country. The climax of the initiation is the ceremony of circumcision.

Morans wear red togas and paint their faces and upper parts of their chests with red ochre. They always carry a spear and their only tasks are to protect the cattle from lions and other beasts, and if necessary to fight their dreaded neighbours the uncircumcised Turkanas. They are encouraged to associate with the virgins of the tribe, but they are not allowed to marry until about 35 years old. To father a child before marriage results in complete disgrace and is considered the greatest possible anti-social act.

When they become elders they may take as many wives as they can afford. The current bride price is nine cows. Wealth is measured in numbers of cows, regardless of quality. The ambition of every Samburu male is to have a great many gates to his manyatta. Each gate in the thorn fence is the particular entrance for each of his sons and their cattle and eventually their wives. The cattle get to know their particular gates. The gate of the chief elder is the largest and always faces the rising sun. The sun is the chief god, but thunder is also a god. The dead are merely laid out under a thorn bush for the hyenas and vultures.

The Samburu are brave in the face of lions and will occasionally kill big game with spears just to impress their womenfolk. But they are no match for the Turkana. Babies are hushed to sleep by telling them that the Turkana will come if they are not quiet.

Money is of little use. Numbers of cattle mean everything. Unless this is changed overgrazing can scarcely be checked.

The Problems

These, as I see it, are mainly political, administrative and intensely human, and by comparison the technical difficulties are minor ones for which the solutions have probably been found in other lands.

Firstly, is it right to interfere with the Samburu and adjacent tribes to the extent of altering their way of life? The Samburu believe that they are living in their golden age. They have self-respect, dignity, and appear happy with their lot. There are seasons of exceptional drought when cattle die and families do not increase. But there are also seasons of good rains, as recently, when the grazing is good and all the cattle are fat.

Apart from the Christian answer to this question, history tells us that change is inevitable. Without progress the movement is backward. One cannot stand still. Movement in North Kenya is still backward as overgrazing leads to the spread of desert. The aggressive Turkanas to the north-west have very nearly made a desert of their land.

Now they boast that they will move into the Samburu District. The Samburu would be driven into the mountain forests, the home of the Wanderobo. The forest would suffer further degradation, and in turn dry season water

supplies would be less, and the desert would continue to spread.

Obviously those with the knowledge and power to arrest the destruction of the earth's fertility have a duty to do so.

With this basic question answered the next problem is surely for the Government to state precise objectives. Broadly speaking, these are surely to increase the fertility of the land so that it can support more people and give them an increasing standard of living, but localised detailed objectives would have to be defined in a way which could be accepted by the Samburu and other peoples.

Such detailed objectives could never be satisfactory if left to one department to work out and implement. There must surely be overall land-use planning and general agreement on objectives by all departments concerned with the land.

This is not so at present. During a short tour one can get little more than impressions. Nevertheless, they may be worth mentioning. At Maralal, for example, the strong impression was gained that the Game Department considers that the paramount use of the land should be for game preservation. The Forest Department has as its first objective the maintenance of protection of forest on the catchment areas. The Civil Administration wishes to uphold the authority, such as it is, of the Samburu chiefs which, in an instance described by the District Commissioner, meant release of all control over grazing outside forest reserves. All three could turn to the veterinary service and blame it for reducing disease amongst cattle, and hence directly contributing to overstocking!

The Forest Department's objective is not, of course, open to question. It is only in implementation that some doubts might be raised. In particular could not more of the gentler slopes within existing reserves be grazed without fear of accelerating erosion? Could not seasonal grazing be actually useful within forest reserves in order to assist in the reduction of fire hazard? And looking much further ahead, should not some afforestation be planned on the plains for soil protection, shelter, fuel, and poles?

Outside game reserves, which might not have to be too extensive, fairly tight control of game would have to be exercised, so that the more important objective of domestic grazing improvement was not jeopardised.

Once objectives had been worked out and agreed it would be necessary to persuade the Samburu to accept them. This surely is not such an impossible task. It could, of course, be done only by those who had the full confidence of the Samburu and who fully understood their ways. Perhaps by Masai?

Conclusion

On the evidence seen during this brief tour the inescapable thought is that the spread of desert will not be halted until there is an agreed land-use policy worked out in some detail by all departments concerned.

Definite objectives must be stated and worked for with united energy.

NOTE ON FOREST AREAS IN THE SAMBURU DISTRICT

Prepared by Kenya Forest Department

There are four forested mountain ranges in the Samburu District of northern Kenya which are gazetted as Crown Forest and administered by the Forest Department, namely:

1. **Leroghi Forest,** 344 square miles; gazetted in 1936.
   The forest area is approximately 34 miles long from north to south by 10 miles wide and covers hills which rise gently from the Laikipia/Leroghi plateau to the south-west but which drop much more steeply to the north and east. The altitude ranges from about 6,000 feet to over 8,000 feet in the

north. The District Headquarters of Maralal is situated on the western edge of the forest.

2. **Mathews Forest,** 341 square miles; gazetted in 1956.
This forest is approximately 44 miles long from north to south by 7¾ miles wide and covers the Mathews Range and the outlying mountain of Uaraguess (8,820 ft.) at the southern end. The range rises steeply from about 3,000 feet altitude on the eastern side and from about 1,000 feet higher on the western side. Many of the peaks reach 7,000 feet. The administrative sub-station of Wamba lies at the foot of Uaraguess. The average rainfall at Wamba, over a period of 22 years, was 27·23 inches but 50·48 inches fell in 1961.

3. **Ndotos Forest,** 357 square miles; gazetted in 1956.
The forest is some 30 miles long by 12 miles wide and covers the Ndotos Range. This range may be considered as a north-east extension of the Mathews Range, being separated from it by a large drainage way known as the Milgis or Ilgerai lugga. As in the case of the Mathews, this range rises particularly steeply from the low country on the eastern side and there are a number of peaks over 8,000 feet. This forest is the least accessible and least known of the Samburu forests.

4. **Nyiru Forest,** 167 square miles; gazetted in 1956,
approximately 19 miles by 8¾ miles. This is the most northerly forest and it lies between the Ndotos and the southern end of Lake Rudolf. It includes the whole of the isolated mass of Mount Nyiru which rises to 9,200 feet. The road from Maralal to Lake Rudolf and Marsabit passes through the South Horr valley on the eastern flank.

These forests comprise 17% of Kenya's gazetted forest area but not more than one fifth of the area is covered with closed canopy forest.

Geology and Soils

The hills which comprise these forest areas consist of gneisses, schists and quartzite of the basement complex, with the exception of the northern end of Leroghi Forest which includes a small area of tertiary phonolite lavas. These residual mountains are similar to many others in eastern Africa and are characteristically steep-sided with towering dome-like rock faces. The soils are sandy and thin with much quartz and are very easily compacted and rendered impervious by trampling of stock. The soil's inability to absorb heavy rainfall is strikingly demonstrated in the Mathews where extremely heavy falls in the last months of 1961 have scarred the mountains with innumerable slips and wash-aways even where there is a closed canopy forest.

Climate and Vegetation

As would be expected, these mountains attract much more rainfall than the surrounding plains where precipitation is usually between 10 and 20 inches a year. The rainfall is highest on the south-east faces of the massifs and is augmented at the higher levels by mist. The wettest months are April and May, and October and November in the Mathews and Ndotos, and April to August on Leroghi.

On the high ground over 6,000 feet there is sufficient moisture to support excellent *Podocarpus* forest, while at the slightly lower levels and on the more northerly ridges this gives way to cedar and olive. In humid valleys below 6,000 feet dense bush with scattered *Croton megalocarpus* is found.

On the lower slopes below cloud level a much drier type of vegetation prevails and varies from dense bush to thin grass depending on the extent of the damage that has been done in the past by fires and grazing, including trampling

and browsing by game. Leroghi retains the greatest proportion of forest cover while Ndotos, which has perhaps the most arid climate, has the least. The forest boundaries generally extend to the foot of the hills and include considerable areas of grass and bush on the periphery and up the valleys.

Biotic Factors

All these forests carry a considerable stocking of game including elephant, buffalo and rhinoceros. These animals tend to move out into the low country during the rains and return when water dries up on the plains.

It has frequently been said that game animals do not cause appreciable damage to the forests. This might be so under entirely natural conditions but it is certainly not true in the circumstances now prevailing in Samburu country. There are few permanent streams and during long dry seasons the distance for which they flow is much reduced. The resultant heavy concentrations of big game tend to compact the soil and destroy vegetation, thus damaging the catchment. A system of cropping the plains animals to control numbers, and to make a profit from the natural increase for the African District Council, is now in force, but this has not been applied to the big game.

Many Samburu graziers follow the same pattern, following the water into the hills as the country dries up, and are dependent on Forest Reserve for grazing and water for a part of each year. In the Mathews and Ndotos there are resident Wanderobo who traditionally lived on honey and by hunting wild animals, but their habits are changing to those of the Samburu, thereby causing a problem.

Objects of Management

The prime object of management is that of protection, since the water supplies of a vast tract of country is largely dependent on these catchments.

Management Problems

Because of their remoteness, there is virtually no exploitation of these forests except for a very limited supply of cedar poles from Leroghi for local building.

The idea of closing these forests to grazing is not practicable because of the requirements of the Samburu and Wanderobo tribesmen during the dry weather.

It has been necessary to allow the Samburu to graze the peripheral areas during the dry season and also to have access to watering points in the valleys. A reconnaissance report, made by Dr. H. C. Pereira of E.A.A.F.R.O. in 1958, on the Leroghi and Mathews catchment areas, suggests that no harm is done by Samburu cattle using the lower and flatter grasslands provided these areas are firmly closed during the growing seasons. The upper limit of the permitted grazing is demarcated by a cut and beaconed "Stop-line", and the siting and demarcation of these lines has been a major concern of the Department over the last few years. Blocks are opened to grazing, when conditions warrant, on the advice of the local Grazing Committee.

The resident Wanderobo constitute a second group of graziers who have to be accommodated in Forest Reserve. When they confined their activities to honey-hunting they presented few problems but in recent years they have increasingly adopted a Samburu way of life with the keeping of stock. Because of the overstocking already existing outside the forest areas it has been necessary to allow a limited number of stock to live permanently within the Forest Reserve boundaries.

In the Mathews it was originally proposed that 100 families, each with 10 head of cattle, could live in small glades above the stop-line where, provided

they were well dispersed, they would do no more damage than is currently done by game. However, the Wanderobo considered this number inadequate and chose to live below the stop-line with more stock. A census of stock was carried out in 1958 and revealed 6,844 stock units belonging to the Wanderobo. Permits were given to the owners of this stock and it was intended that no increases should be permitted since the average area of grazing available works out at about 7½ acres per beast, while the average area considered desirable may be double this figure. The position is potentially even worse since a pledge was given under pressure from the Administration to allow a total of 9,100 stock units which would reduce the available grazing per stock unit to 5·17 acres.

On Leroghi the position is somewhat different as no seasonal graziers are allowed, and in place of the Wanderobo we have permanently resident Samburu who reside on Permit with a fixed number of stock. In this case the pressure is not quite so acute as in the other forests and it is possible to rotate the available grazing seasonally. There are no cut stop-lines as the glades are fairly well defined. Stock are not allowed on steep slopes or in closed forest.

The basic problem is one of overstocking of cattle, sheep and goats in the Samburu District as a whole. Although various schemes for removing the annual increase have been introduced in the past, it is doubtful whether this, let alone any reduction of the number of livestock, has ever been achieved.

There seems no doubt that increasingly difficult times lie ahead as political events are bound to make it harder to enforce satisfactory measures for the control of livestock, and unfortunately the local people have little appreciation of the value of these forests in maintaining stream flow.

Administration

The Samburu Forest and also Marsabit Forest are run by a Forester based on Maralal with a second Forester permanently on safari under the general control of the Divisional Forest Officer, Thomsons Falls. Forty-five Forest Grades are employed and the present labour force is about 100 men.

As the forests, with the exception of Leroghi, only came under Forest Department control in 1956, they are still in the development stage and all the effort in the past few years has gone into boundary demarcation and survey, construction of roads and staff housing, and the demarcation of stop-lines.

The annual recurrent expenditure is about £14,000 (or -/10 cts. per acre) and as this has been spread over such a vast area it is not surprising that the Department's efforts may not be immediately apparent in any particular area. (In the current year additional funds have been provided by ALDEV to assist on increasing grazing control measures.)

FARM FORESTS IN AUSTRIA WITH SPECIAL REFERENCE TO STYRIA

By

G. B. RYLE

Director, England

Over 40% of the surface area in Austria is forest—roughly 8½ million acres, and of this rather more than half is owned in small areas by farmers.

Styria, which it would appear is as keen on its national entity as is Wales in Britain, has slightly over half of its area under forest, most of which is in farmer ownerships. In general the Styrian farms range around the hundred-acre

mark and include between 30% and 60% of their land as forest: thus the industry is a very vital one indeed to the farmer.

It is interesting, too, to find that in a country where mutton is considered to be quite unfit for human consumption, rural depopulation, such as it is, by young folk moving into the towns is being followed by *increases* in the forest area without any significant variation in the farm ownership pattern. The British argument that change from sheep grazing to forestry creates more rural employment is undoubtedly sound. But in Austria, where the hill farm is primarily one of milk and beef production with very intensive patch cultivation by spade-work on the steep hillsides, depopulation has been met by change-over to forest as requiring *less* labour. The rough pastures are rapidly going. In recent years it is estimated that 630,000 acres of new managed forest have been created in Austria and the change is continuing steadily. The countryside is losing about 30,000 workers to industry every year but as the birth rate is obviously fairly high it is difficult to see what this means in actual depopulation. Anyhow it is definitely not resulting in derelict land. In fact with an increasing urban population to be fed, agriculture on a diminishing area has begun, as with forestry on an expanding area, an extremely vigorous race for improved efficiency. Apart from modernised methods, it is very obvious that the self-employed farmer and his family are all working hard from daylight to dusk, as did their more primitive forebears. T.V. has not yet upset them!

The pattern of land occupation in the lowlands is very obvious, when viewed from the air, and is based on the old feudal strip system with the farmsteads clustered in hamlets. One of the problems now, which faces the agriculturalist rather more than the forester, is to organise re-allocation of these scattered strip freeholds into consolidated farms.

In the hills the farms tend to be more compact and based on the land configuration but here the agricultural and forest officers have another problem in organising land adjustments where, in the past, a degree of sporadic de-forestation had taken place in an endeavour to form grazing patches wherever a few trees had been felled or where, due to uncontrolled forest grazing, the forest itself had become degraded.

The amost universal custom of farm ownership and inheritance is interesting and all the modern improvements are being designed to enable it to be perpetuated. On the death of an owner the property passes to one of the sons, not necessarily the oldest, who is under obligation to pay out fair shares in cash to his brothers and sisters, but this without selling up any of the land. He also continues to maintain the aged relatives. This has quite a profound bearing upon forest management. The tendency is to treat the forest as a bank for storing up timber, with the minimum of felling, between the deaths and to pay out the rest of the family at each generation by a major timber sale.

Central European politics too have encouraged the farmer to treat his forest as a capital store-house. He feels that whatever upheavals there may be, if his money is locked up in his own soil he is the less likely to be ruined. Here again he is being encouraged to continue a policy which proved successful twice in this generation.

Each Province in Austria has an organisation known as the *Landeskammer für Land und Forstwirtschaft*, which may be translated as the Provincial Chamber for Agriculture and Forestry (or *Landeskammer* for short) whose function is to help small landowners with their farm-forest development and management. It is financed partly out of Central, Provincial and Local Authority funds and partly by subscriptions levied on its farmer members. The forest subscription is about 4d. per acre.

In Styria the *Landeskammer* is extremely active and apparently it causes some trouble to the Ministry of Agriculture and Forestry in Vienna because of its persistent demands for funds over which the Minister subsequently has tenuous control. The Chamber has a headquarters in Graz with several district outstations consisting of professionally trained agriculturists, foresters and domestic economy advisers, with machinery, equipment and the skilled operators to use and maintain it.

Up till 1939 the value of the forest to the hill farmer had been very largely for its grazing, the provision of litter and bedding for the cattle and the provision of fuel and timber on the farm. Its market value, except for occasional bulk sales on inheritance, had been small and, due to inaccessibility, timber prices were extremely low. The standard of management was leading to very steady dereliction with periodic clear fellings which became rough grazings or worse. This was also having local quite serious effects in creation of landslides and flooding. Within the past decade, however, timber has become a commodity in increasing demand at increasing prices both for home use and more particularly for export to Western Germany and to Italy, so that the farmer owners are finding that both on their farmlands and in their forests is an unexpected source of wealth which is enabling them to develop an entirely new life. The political need for higher food production is urgent. To achieve this the hill farms must be modernised and made accessible: this can be and is being attained very largely by using some of the locked-up capital in the forests. The important forestry function of the *Landeskammer* therefore is to help farmers to understand that their woods are a growing capital storehouse, to make them even more so by introducing proper management, and to prevent further deterioration by putting an end to the old practices of forest grazing, removal of forest litter and clear fellings leading to soil erosion.

Typically the *Landeskammer* endeavours to work in geographical regions, comprising a whole valley or group of valleys, which they call "conversion areas". The beginning is an intensive period of local education and propaganda in pubs, schools and farmhouses, in which farmers from adjoining areas which have already been converted take an important part; tours are arranged to improved farm-forests; finances and domestic problems are discussed; the whole theme being to improve the farm first but to show that the forest can and should play its important and permanent part in doing so.

Education and propaganda is combined with the first attack on a co-ordinated road scheme for the whole conversion area. The "main "road will probably be a function of the *Gemeinde* (the Local Authority) entirely financed out of public funds. Leading off from this the joint advice of the agricultural and forest officers will be given to show how branch roads should be planned the best to serve the whole group of farms and their individual woodlands. These roads are constructed by the Forest Officers of the *Landeskammer* working as contractors for the farmers, but there is a subsidy repayment of 20% to 35% of the cost (or up to 65% in places where heavy blasting is needed). The *Landeskammer* in Styria has 14 dozers fully employed on this work (and needs many more to cope with a growing demand), together with a few graders, compressors, rock drills and other equipment. The standard of both the *Gemeinde* and the private access roads is pretty low: the latter cost about 15/- a yard plus the value of farmer help. However, the fact that the Austrian farm-forest roads have been increased by about 900 miles in three years is no mean achievement. Maintenance troubles may lie ahead of them. But each farmer is responsible for his own section where a few days' work with a shovel can achieve a lot, especially when the farmer's wife and family add their mite!

Having got the road up to the farmhouse and probably thus into and through

some of the forest, it becomes possible to plan the improvements. Here the *Landeskammer* works as a completely integrated team, the agriculturist to help on the farm and farm equipment, the domestic economist to advise on the house modernisation, and the forester to educate on proper forest management and to assess how much timber can wisely be felled to provide cash for the farm and house improvements. Every farm-forest member is encouraged to let the *Landeskammer* staff prepare a proper forest Working Plan, which includes a detailed enumeration of the growing stock and estimate of increment and lays down the maximum which should be permitted for felling, in addition to the generally fairly minutely detailed needs for the improvement of degraded areas and the afforestation of the rough grazings which are uneconomic for continued food production. The cost of such a Working Plan is about 6/- to 8/- an acre but on very small estates or those where the prospective yield is small the owner is subsidised to the extent of 30% or even up to 70%. Generally, however, the woods are sufficiently rich so that no subsidy is allowed. It takes years, a lot of education and the practical recommendation of more advanced neighbours to make a farmer realise what this Working Plan means and how the *Landeskammer* is going to help him to carry it out.

Several schools have been set up for the education of farmers and more particularly their sons in farm and forest management. These have typical demonstration forests attached to them where training in the proper use and maintenance of the right tools forms an important part of the curriculum. Correct measurement of timber and a basic knowledge of valuation is enabling farmers to bargain more efficiently with the timber merchants. The principles of soil conservation are taught in order to put an end to the shocking effects in the forest of over-grazing, litter removal and careless clear fellings. Students attending these courses pay a fairly nominal fee for board, lodging and tuition.

The *Landeskammer* conducts works for its members as a non-profit-making concern but is very insistent that on every job the farmer and his family must provide the maximum of local labour and bullock or cow haulage; this being really an important part of further education. All the various subsidies, where payable, are based on a percentage of the cost of the job, but they take no account of the farmer's or his family's labour. Machinery is charged at an assessed cost to cover fuels and depreciation. The Styrian *Landeskammer* runs its own maintenance workshop and central supply store in Graz.

The main silvicultural work is in the improvement of degraded stands ruined by generations of grazing, which has prevented natural regeneration, and removal of the best trees (the two together being given the nice name of *Plunderwald*). This may necessitate artificial replanting, but often natural re-seeding can be secured by soil cultivation combined with phosphate or combined fertilisers.

Then there is the reafforestation of scrublands which had hitherto been maintained under the *Brandwirtschaft*, a very old extravagant system of periodic burning and rye cultivation.

The principles of thinning in the better stands are quite strange to most farmers, while Craib, Hiley and J. A. B. Macdonald are names as yet looked upon with gravest suspicion by the forest officers! Great stress is laid on the need to operate systems of selection felling, minutest of group fellings or "line fellings" for maintaining the forest free from wind-blow or soil erosion. The whole system of management being demonstrated to these farmers strikes one as being perhaps ultra-cautious but quite workable on the small individual acreages involved. The *Landeskammer* foresters are always available to give detailed day-to-day advice and to mark the thinnings and fellings.

With the development of a basic network of roads, timber merchants are

now buying modern road haulage vehicles and it is becoming customary to sell on roadside. The *Landeskammer* strongly discourages its members from selling standing or at stump, on the basis that the owner will look after his forest better if he does all operations himself. There is a lot in this! The trade prefers it because the extraction problems are difficult and (if the farmer costed his own labour properly) would be expensive.

It strikes one that the *Landeskammer* Working Plan specialists habitually underestimate the volume of the growing stock in a farmer's woods and even more grossly do they underestimate the rate of increment. With some reservation they agree that this is in fact the case. It is not only a safety factor to discourage the farmer from over-felling but it helps him with the inspector of taxes!

In brief, the *Landeskammer* may be likened to a joyous combination of what we hope to see in our T.G.O., of the advisory functions of the Forestry Commission, and of a large forestry contractor, together with their agricultural counterparts in the C.L.A., the N.F.U. and the N.A.A.S., added to which is a small fleet of charming women who advise the farmer's wife on how to modernise her kitchen, her dairy and her household generally. It obviously needs the highest degree of co-operation both by the *Landeskammer* staff and by groups of neighbouring farmers. The amazing thing is that it is so very obviously working and becoming a snowball. The success has depended on mutual confidence between farmers and the *Landeskammer*: there are no compulsions other than on (State) felling limitations.

The development of these hitherto very primitive and inaccessible hill farms and forests has been facilitated by the rapid post-war distribution of electricity. Over 80% of Styria's hill farms are on a main supply, while others have installed their own water-driven generators with loan help from the *Landeskammer*.

The construction of the *Gemeinde* roads has been quickly followed by the provision of a fair rural bus service which is, in most valleys, run in conjunction with postal delivery and collection by the Post Office. This service, on the rather poor standard roads and over bridges often built by foresters (not by civil engineers) provides quite exciting journeys to and from the market town. Fortunately public service drivers are not allowed to drink alcohol during duty hours!

Hunting

On all properties under about 300 acres the owner has no rights to "hunting" over his own land, this being reserved to the *Gemeinde* (Local Authority) which issues licences to qualified hunters. These licences specify the quantity by species which may be shot during the season.

The landowner may lodge a claim for compensation if his farm or forest suffers damage due to excessive deer or hare populations, but these claims are difficult to prove and seldom get paid. However, at the annual *Gemeinde* meeting, when the coming season's permissible bag is decided, the farmers are strongly represented and in practice the system works well.

By and large the deer population is considered to be excessive: damage to crops and young forest is moderate. The *Landeskammer* is pressing for harder control. In some regeneration areas it was seen that a lot of expense was being necessarily incurred in small group fence enclosures.

Deer are of course subject to very rigid close seasons.

By and large on typical mixed farm forest hill properties it is considered that 2½ head of Roe or 1 of Red deer per 100 acres is the absolute maximum which should be permitted.

The Public

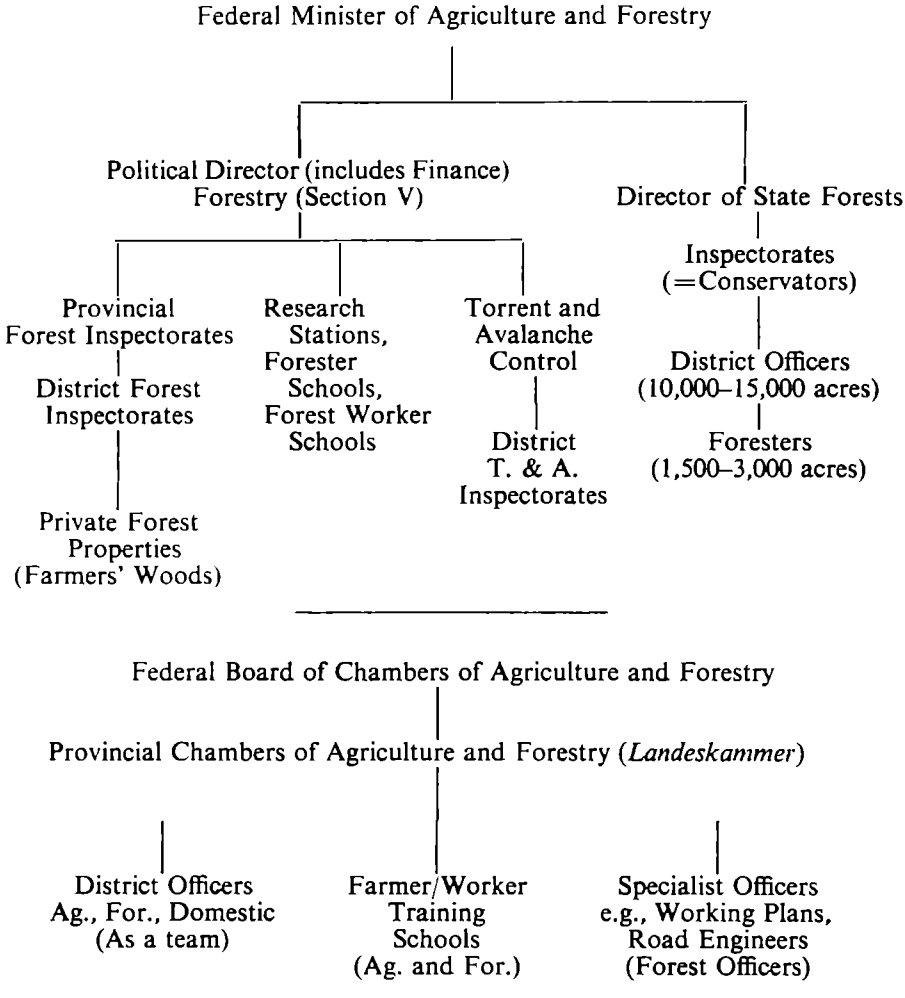
All forest land, whether belonging to State, Church, *Gemeinde* or individuals, is open for the public to wander in at will. When hunting is in progress notices may occasionally be posted up, but the public and the hunters are trained and trouble is almost unknown. In State forests a permanent notice is occasionally posted up saying "Welcome, but *without* automobiles". *There are no other notice boards.* (The highway authorities have a neat "leaping deer" notice board at road bends etc. where deer may be expected habitually to cross public roads).

Sawmilling

Hitherto every little farmer has been almost passionately devoted to his primitive water-powered, highly uneconomic and Heath Robinsonish frame sawmill, often located in an inaccessible valley bottom. These are dying out slowly as the trade demonstrates that it can cut better and more economically. The State has limited sawing-for-sale to certified sawmillers. Thus the farmer may only saw for his own purposes. By this means the standard has been improved.

APPENDIX I

The Forest Organisation in Austria



APPENDIX II

Diary and Sundry Notes

7th June, 1961

Grottenhof-Hart School of Agriculture and Forestry built since the war with demonstration farm land, range of buildings, laboratories and workshops. Also several good blocks of variegated woods ranging up to 100 years but with a predominance of pure spruce, middle-young ages.

250-acre Farm. 137-acre Forest.

Forest management and education is under charge of qualified Forest Officer. Most of the courses are in winter as farmers' sons are needed on farm in summer.

Forty students each session. Place accommodates up to 200. Average age 20 years. Very responsible types volunteer. Cost to students is limited to 8 schillings day, balance subsidised. Beautiful buildings and accommodation.

Forest work is 50% classroom and 50% in woods.

Visit to Franz Hinteregger at Kumberg. He is also *Burgomeister*. Farm of 45 acres plus 20 acres of forest has been in family for four generations. Now supports man, wife, three children in very obvious comfort (or luxury). House has been modernised recently. Only employs outside labour to the extent of 200 female days per annum. Timber sales paid for modernisation.

Forest is a capital reserve and part is overstocked with fully mature spruce, pine, larch, silver fir.

Little effort made to restock areas of poor coppice because hates idea of employing labour. Son is yet too young! (? 10 years old.)

When Hinteregger first joined the Chamber after the war he was advised to do improvement fellings and remove a lot of very poor timber at a time when it fetched absurdly high prices. His friends thought he was mad not also to sell good timber which later might become of less value. They threatened to displace him from the *Burgomeister*-ship if he was so silly! Now his same adherence to a W.P. compiled by the *Landeskammer* is being imitated by his neighbours.

8th June, 1961

Pichl Farm Forest School for training sons of farmers, etc., in the practical work on their farms. The school is a very old vaulted castle not really suitable for indoor instruction and accommodation but the whole estate was bought for a reasonable price and it includes a very typical mixture of farm land, good forest and poorer grade forest so that it is ideal for practical work.

Instruction in the use and maintenance of the right type of tool is very important (old-fashioned cross-cut saws still used for large timber). For felling of poles up to, say, 8 -inch diameter a very nice light curved saw not unlike our pruning saw was greatly favoured in preference to any fiddle or bow saw.

Nursery work (seedlings only) in the old kitchen garden was a poor show smothered in weeds.

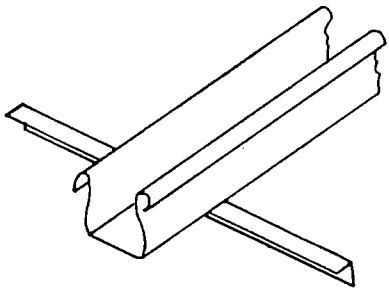


Fig. 1. Steel grip. Channel 4 × 4 inches. Angle-iron foundation cross-pieces welded at about 6 foot intervals. Channels about $\frac{1}{8}$ inch gauge. Heavily bitumen coated.

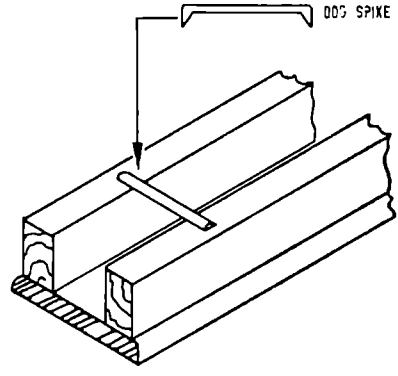


Fig. 2. Wooden grip. Channel 4 × 4 inches. Walls 4 × $2\frac{1}{2}$ inches reinforced by dog spikes at about 4 foot intervals.

Road construction and maintenance is simple. Maximum gradient 1 : 8 (possibly it is exceeded). Width is bare and passing places few. No upper side drain is made but grips are put in at intervals of 30 yards or less. Steel channel grips are preferred but sometimes sawn wood ones or even poles are used, as shown in Figures 1 and 2.

Steel grip generally keeps itself flushed clean. Wood grips collect silt and need constant attention. Untreated spruce lasts about four years. Larch is preferred and may last over seven years if traffic is not too heavy.

This is the general specification for all forest farm roads including many miles of the more remote publicly maintained roads.

Road costs are quoted at prices from 40 to 80 sch. per metre run (10–12 feet wide) but this figure is deceptive because the unpaid work put in by the farmer himself and his family is not included.

For rates of subsidy see 12th June, 1961, following.

Grabner Farm. Thirty-six acres farm and 80 acres forest supports owner, wife, two adult sons and granny in evident comfort.

About 2,000 H. ft. per annum are cut for revenue against a reputed increment of 4,400 H. ft. (55 H. ft./ac./ann.). There is probably far higher increment but age distribution is bad with an excess of older size. Mainly Norway spruce, Silver fir, Scots pine and some European larch.

Owner is planting-up more of his marginal land.

When present owner inherited the farm he had to fell 50,000 H. ft. for his other brothers and sisters to equalise the inheritance. Since then he has modernised and electrified (water generator) his house and buildings and has built addition to house, built a small sawmill and constructed over a mile of very good forest road: all paid for in timber.

Necessary to cut less than the increment in normal years because of such capital expenditure as above. Also at next death the inheriting son will have to pay out his brother.

Net revenue is about 2 : 1 ratio from forest and from farm but forest is barely 50% exploited, the rest going to capital reserve.

"Does this road wind uphill all the way?"

9th June, 1961

Tour to study the "conversion" (or rehabilitation) of remote mountain valleys and hills in the **Gasen-Heilbrunn** district which, prior to the post-war construction of valley roads was completely isolated and accessible only by rough pony cart tracks. Each hill farm had its little water mill in valley bottom (now these are all pathetic ruins).

Roading and electrification has made a new civilisation and has made the forest areas accessible to market.

Previous habit of grazing in the forest and lopping for litter is now largely stopped. Thus better forest and N.R. is now resulting.

Previously large areas of birch-alder scrub were cut and burned on about 12-year rotation to give a fertilised area for a 1–2 year crop of rye, then allowed to go to scrub again. This was only way to keep the steep hill plots fertilised. (*Brandwirtschaft.*)

Now artificials are used so that far less land is needed for stock. The small area of arable land needed is often so steep that it has to be ploughed by winch. The use of winches is increasing: they are also used for timber extraction.

Thirty-five to 40 per cent of the road construction cost of the bye roads

(i.e., giving access each to just one or two farms) was subsidised, but main valley roads were State or *Gemeinde* expense.

General trend of farmers is to expand forestry at the expense of farming. The system of *Brandwirtschaft* has been largely eliminated, these areas being regenerated naturally or artificially to spruce, etc.

Typical is **Höllbaur Farm** at 2,850 ft. above sea-level. Its owner maintains himself, wife, six small children and granny on 77 acres, being 33% farm and 66% forest. He has entirely abandoned grazing in the forest. However, as most of his forest is slightly immature, he has to cut carefully; mainly thinnings for many years ahead. He is about completing the conversion of his birch/alder *Brandwirtschaft* scrubland; most of it has been converted to Norway spruce by natural seeding but some enrichment was necessary. The birch is used as shelterwood, being systematically thinned out as needed, using a Jo-Bu brush cutter on loan by *Landeskammer.* This is said to be infinitely quicker and cheaper than bill-hook work.

10th June, 1961

Visit to lowland farm forest areas near Mureck not far from the Yugoslavian border. The economic problem here is quite different as the agricultural-market garden land is rich and the forests play a minor part in the farm finances. Nevertheless, there is need for improvement mainly to prevent systematic robbing of the forest by removal of litter.

Typical was **Schmied Farm** of 89 acres, of which 35 acres are woodland. It has been in hands of present owner's family for 210 years and now supports owner, wife, adult son and wife, and one grandson infant.

Only problem is to educate the son (who has been to courses at Pichl School; see 8th June, 1961) in thinning, restoration of some low-grade hardwood areas and need to stop ruining the forest by continued litter removal.

This little farm has provided enough cash since the war to enable the house to be completely rebuilt; the standard of living is high.

The local wine, ham and sausage is good but the cider is sour enough to "draw in all the holes in your socks".

12th June, 1961

Hartberg Forest District. Here the Agricultural, Forestry and Home Economy advisers met us at Walter in Weissenbach Farm to explain the vital need in these conversion areas for full mutual co-operation. It was very clear that the two former were both well acquainted with each other's jobs, and the Home Economy lady explained how the extremely primitive timber house, built in 1640 and very little changed since then, must be modernised from the revenue of the farm and the capital in the woods.

Farm contains 22-acre forest and same of agricultural land but forest has barely enough reserve to pay its share of the £2,300-odd needed to bring the place into order.

Road access has already been put in.

Road subsidy equalled 65% of cost on all blasting and ancillary work with 30% on all dozing operations, etc., all excluding the value of time put in by the owner and his family.

The farm of **Blas im Summersgut** near Wenigsell, of 95 acres has 46% under forest, the more remote half of which has been inaccessible to grazing or felling and thus contains big surplus stock of over-size timber. The more accessible part has been well managed and shows a good uneven-aged structure but even so with an excess of the over 14–16 inch B.H. diameter which the trade wants.

In this case the domestic and agricultural improvements have already been done out of farm profits and the whole forest is thus a capital reserve, with no desire on owner's part to fell. The largest sizes are locally developing butt rot.

Dreyfusia nusslinii has recently become epidemic on the Silver fir (*A. alba*) in this area. Seemingly good success has been obtained in killing it by use of smoke-bombs (Kerfex Nebel) used at rate of 4 per acre. Calm weather is necessary and in the seasons when there are many *Dreyfusia* nymphs, few eggs and before the nymphs have developed a wax coating. (Trade details obtained: it is reputed to be fatal to all crown-feeding soft insects and far cheaper than mechanical fogging.)

13th June, 1961

The Köflach District near to the Voitsberg coalfield. The study here was concentrated on the problems created by the old "Plunder-wald" system carried out by the farmers. Under this the best timber has been systematically creamed out for generations. The ground has been raked over for litter, together with roughly hacked-off branchwood.

Now use of imported artificials on the farms has much improved the pastures so that the cattle can be excluded from the forest. Improved arable land yields more straw so that there is no longer need to collect forest litter. In some cases the poorer grazings are being afforested and less stock is kept.

Steady education in silviculture is devoted largely to encouraging the removal of the very rough and resin-scarred trees ruined by lopping. But the grazed and plundered forest is generally very understocked and open canopy has led to development of thick mat of bilberry (*Vaccinium myrtillus*) and cranberry (*V. vitis-idea*). A useful little snow-plough type of dozer has been invented for rolling off mats of this turf to secure natural re-seeding on the exposed mineral soil.

The results are very good. Lime, phosphates, nitrogen salts and lupins are used, maybe with greater faith than anything else! Lime alone has been used in fantastic doses without benefit. On some sites the need for any artificials seemed doubtful.

Farmers get a 30% subsidy on the cost of approved turf scarifying. The dozer does about 7 acres a day in a very good patchwork.

Deer are here too abundant. An ingenious and highly effective method of preventing damage to young plants is to twist a little skein of raw hemp around the tip of the growing shoot. It must be repeated annually till out of reach.

PROTECTION FORESTS IN SWITZERLAND

By

H. L. EDLIN

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A brief holiday in the Bernese Oberland, in August, 1962, enabled me to make a first-hand assessment of the famous system of selection forestry practised by the Swiss. We have had conflicting reports of this—some enthusiasts asserting that it is the only method of forestry worth the name, whilst others report that the Swiss themselves consider it outmoded and are turning to other methods.

In the region that I visited it was the only system followed, for indeed any method involving the clear felling of woodland, even in small patches, would have been quite unthinkable. The lie of the land, the nature of the husbandry,

and the severity of the climate, made perpetual tree cover on the prevailing steep slopes absolutely essential.

The long valleys, hollowed out by vanished glaciers in days gone by, have a general level from 1,800 to 3,000 feet above sea-level. A few hold broad lakes. From their narrow, but fairly level, floors, the forested slopes run up surprisingly steeply to the tree-line, which may be as low as 4,500 feet or as high as 6,500 feet, depending on slope and exposure. Above the tree-line, but seldom rising over 7,000 feet, are found the Alpine pastures, and above them the wastes of rock and ice that culminate in the towering peaks of the Alps, over 14,000 feet high, still bearing living glaciers and snowfields.

Husbandry, which can have changed little down the centuries, is centred on maintaining herds of docile cattle, which have to be kept indoors throughout the long winter. Each cow wears a bell, so that it is easily traced by its owner. Meadows on the valley floor, and also on any fairly level piece of ground that can be found on the hill-slopes, are cropped for hay; this is stored in the upper storey of a combined barn-cowshed-and-cottage, in which the farmer and his beasts pass the long snowbound winter. In summer, many of the cattle are taken up to the high Alpine pastures, and some of the people go up with them to the summer chalets, while the rest harvest, mainly by hand labour—the two essential hay crops, one in June and another in late August. Both the meadows and the pastures are of native grasses and fodder plants. Dung from the cow-sheds is spread to maintain a rich lush growth on the meadows used for hay. Oats and lucerne are grown as supplementary feeds for livestock.

All the slopes are so steep that in the absence of forest cover the melting snows, in the spring, would cause erosion that would destroy the "hanging" meadows and pastures on the slopes. At the same time it would deposit stones and mud over the invaluable bottom lands. This does in fact happen locally, and the whole countryside is intensely avalanche-conscious. At intervals the slopes are marked by vertical gaps in the forest cover, where snowfields gather, melt and send torrents of water and stones downhill to the plains. At the foot of these shoots, broad channels are made, artificially, to carry the rushing waters harmlessly through the lower fields to the main river or lake.

For the rest, the forests act as a kind of giant "carpet" or "sponge" that traps the snow in winter and releases it gradually as the countryside warms up in late spring. Even so, the trees suffer severely from the downward movement of loose rocks, and are—as often as not—scarred on their upper sides by blows from falling stones. Natural regeneration is fortunately plentiful, and silviculture consists first, of thinning this young regeneration out, and secondly, of a combined thinning-and-felling selection of stems to be removed, wherever and whenever the crop becomes too dense. Extraction is largely by ropeway. The slopes are commonly so steep that all felling is done "downhill", so that the tree falls below the feller, and occasions least risk to him.

The soils of the slopes appear reasonably fertile, and annual rings showed a fair rate of growth. But the early rings were usually very narrow, revealing a history of close competition among young regeneration until the survivors—the present timber trees—were either freed or else suppressed their competitors. Fungal activity appears slower than with us, owing to lower temperatures and shorter summers. I found a spruce, at least 50 years old, growing on "prop roots" over the stump of another spruce; this 50-year-old stump was rotten and it disintegrated at a touch, but in Britain it would have decayed and disappeared within a few years of the felling that gave rise to it.

Curiously, there was no sign, in these hill forests, of either fire damage or protective measures against fire. Many factors work against the dangerous conditions found elsewhere, such as the long snowbound months, mountain

mists, and a high proportion of beech at the lower levels. The general structure of the selection woods, with trees of all sizes and ages in each stand, did not seem to favour the spread of fire, while the ground cover lacked those dry grasses, braeken, and heather that add so much to fire risk in Britain. Further, the scattered meadows, pastures, ravines and avalanche shoots break up the forest mass, lessening risk of fire spread. The railways are all electrified and the people both fire-conscious and fire-cautious. But it was quite a change to see so much woodland without a single "fire danger" notice.

Little wind damage could be seen; it is said that the irregular structure of selection stands lessens its incidence.

Tree Species

At the lower levels, up to about 3,000 feet, beech is the leading tree, with a fair amount of sycamore and some European silver fir, *Abies alba*, Norway maple and lime trees. Oak and ash are here lowland trees, found mainly on the valley floor.

On the higher ground, beech gives way to Norway spruce, which is really the dominant tree of the whole region. Towards the tree-line it thins out, being replaced by larch and mountain pine, *Pinus mugo*. Although the bushy form of mountain pine is common, the upright race is also found in abundance. Other constituents of the timber-line forests are willows, rowan, the bushy grey alder, *Alnus incana*, and the dwarf juniper, *Juniperus communis* var. *nana*.

At some points along the tree-line, every larch and mountain pine has been battered and bruised by avalanches or ice storms. The trees—no more than bushes—form an "elfin forest", but are said to be of surprisingly great age.

Except in cultivation, I did not see either the Austrian pine or the five-needled Cembran pine, *Pinus cembra*, though both are native to other parts of Switzerland. On the valley floors, the Swiss grow most of the exotic trees that we do; walnuts are widely planted, and there are some fine wellingtonias and Atlas cedars.

Utilisation

Each village has its sawmill, situated beside a stream. In the past, no doubt, they were driven by waterwheels; now they rely on the cheap hydro-electric power that is available everywhere in Switzerland. Vertical-frame gang saws reduce each log, in one pass, into a number of planks. These are then stacked, in the original tree pattern, with stickers between each plank to season in the open air.

These sawmills appear to be family concerns, associated with building or furniture-making firms. The whole industry has an air of strictly local enterprise, and much of the timber is apparently used within sight of the forests where it grew. No doubt the same man often buys the tree in the wood, saws it up, and, after seasoning, uses it in his carpentry trade. With the sea 500 miles away, competition from foreign imports must be slight, and no stacks of Scandinavian timber were to be seen.

Enormous quantities of wood go into the Swiss chalets, but it seems a good investment, as they are almost everlasting. One we saw was dated 1585 and still quite sound; several others had been built in the seventeenth century. It is customary for the builder to decorate the walls with his name, the date, and his favourite text in the local dialect of German, so the age of the more substantial buildings is easily determined. In old buildings the main logs are roughly squared, then built into walls with mortised corners on the log-cabin principle. Nowadays less timber is used per house—but wood holds its own in competition with concrete as a building material.

Despite the plentiful electricity, wood fuel is generally used, especially cleft blocks of beech. Faggots of brushwood are also burnt, and the stacks of these materials, set under the eaves and against the walls of every house, present what appears an alarming fire risk. But so many houses have survived for hundreds of years that the rate of real loss must be low.

The country sawyer-carpenters husband every piece of sawn wood. No matter how odd its shape, it is stored in a neat rack and only classed as firewood if it would never have any conceivable use anywhere. Slabs have now a real value for the paper pulp industry; I saw one mill where they were carefully baled, though the quantities likely to become available were so small that—to our way of thinking, the work was quite uneconomic.

Just as the Swiss farmers gather up every blade of grass, so do the foresters and sawmillers find a use for every piece of timber. Even the bark of spruce is carefully stacked for the tanneries.

Alpine Flowers

Having heard that the true Alpine flowers were only to be seen in May and June, and then only by climbing precipices, I was agreeably surprised to find a wealth of species in flower in August. These grew beside quite ordinary footpaths, and were seen and admired by thousands of Swiss visitors on their weekend excursions to the countryside. About twenty kinds enjoy special legal protection, but only a few of these are really rare, though all are attractive enough to tempt excessive collection.

The alpine flora as a whole is very rich, but closely adapted to particular habitats. The Swiss recognise a dozen common plant associations, but most of these can be found on one hill! Big changes in altitude, and quite small changes in bedrock, surface soil, slope, and inclination towards or away from the sunshine or prevailing wind, result in surprising differences in the kinds of plants encountered. Changes occur, within a few hundred yards, that one would expect to have to travel many miles to see.

Most British plants are represented, but often in situations that we should regard as odd. On the valley floors can be found the typical meadow grasses and clovers of the English Midlands. Ascend a limestone range to 6,000 feet, and you will find chalk downland plants which we meet with only 600 feet up in Kent or Sussex, such as marjoram, rock rose and stemless thistle.

Yet at the same height on a sandstone rock you will see a flora typical of the Scottish Highlands, with heaths, blaeberry, and mat grass, through true heather is rare.

Other unfamiliar plants are associated with these well-known kinds. On limestone summits we saw tiny rare blue gentians, rock pinks, dark blue and yellow monkshoods, the mountain avens (*Dryas octopetala*), and low bushes of *Daphne mezereum*. Foothill pastures sport taller gentians, with blue, yellow, or purple flowers, sturdy thistles or patches of autumn crocus, *Colchicum autumnale*. On sandstone rocks and screes grow many sorts of saxifrage and stonecrops, wild auriculas, and knee-high thickets of the alpine rose, *Rhododendron ferrugineum*.

On the limestone bluff called the Schynige Platte, above Interlaken, the Swiss have created an alpine garden at an altitude of 6,500 feet. This viewpoint had long been served by a rack railway, which ensures a constant supply of visitors. Two acres of broken ground were enclosed, in 1925, and paths laid. Many plants were already growing there in full harmony with their native surroundings. Others were introduced, along with supplies of peat and rock suited to their needs. So it became possible to display a great variety of "natural"

plant associations in a small stretch of ground. Although the plants are under snow until June, when the garden opens each year, they are accustomed to this and all we saw were thriving exceedingly, except for one miserable specimen of heather—out of its element so far up.

This garden is maintained by the Botanical Institute of Berne, and has beside it a small laboratory for research. An excellent scientific guide is published, in German, English, and French editions, describing each plant association and its component plants. All this is a bit above the heads of the average visitor, who expects to find a rockery with all the more showy alpines displayed *en masse;* but the flowers are so charming, and bloom so obligingly through the tourist season, that nobody is disappointed. Several hundred different kinds of plant are grown, and every one is a native of Switzerland.

Public Appreciation of the Forests

Many of the forests are owned by local communities (*Gemeinde*), and some by the larger units called cantons. Public ownership has, apparently, always meant public access, and this is nowadays actively encouraged. It is promoted by the *Schweizerische Vehrkehrszentrale* (Swiss National Tourist Bureau) as well as by the *Vehrkehrsvereine* or Tourist Boards of each town. The most apparent signs are the *Wanderwege* or ramblers' paths that range far over the hills, each marked by yellow signs giving distances—in hours, not kilometres—to the main points ahead.

There is also a public transport system, consisting of railways, mountain railways and aerial ropeways, lake steamers and autobus services, out of all proportion to the needs of the local people. With this go ample hotels, inns, and even temperance restaurants. This impressive machinery of tourism was first developed, and is still supported, by visitors from outside the country. But with increasing prosperity, it is now used to a surprising degree by the native Swiss from the cities in the north of the country. Living in a beautiful land, but a long way from the sea, they flock to its points of scenic grandeur at every opportunity in the warmth of high summer.

This wanderlust affects people of all ages, from organised gangs of schoolchildren and rugged alpinists armed with ice axes, to old folk who are tied to car, boat, or train. The woods are therefore a tremendous asset for recreation within the country, as well as an attraction to visitors from outside it.

Summing up, the protective and scenic values of these particular Swiss forests nowadays rival their worth as producers of timber. But the selection system on which they are managed enables a steady yield of wood to be harvested, in perpetuity, without endangering either their landscape beauty or the part they play in maintaining mountain farming.

A STUDY TOUR IN HOLLAND

By

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and

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To most people, Holland is a land of bulbfields and farmland, of windmills and waterways and museums, but hardly noted for its forests. It is true that only 7% of the land surface of the country is woodland, but as members of the 4th F.A.O. Study Tour were able to see, trees are a very conspicuous

feature of the Dutch countryside and forestry plays an important role in the life of the country.

The emphasis is on the multiple use of forests which, in Holland, is considered to be Timber Production, Nature Conservation, Landscape Planning and Recreation. Each of these uses seems to be given its full measure of consideration without any apparent signs of antagonism. This harmonious relationship is due, in no small measure, to the administrative organisation of the State Forest Service. Under the Director and Deputy Director are four divisions —State Forestry, Advisory Work to private owners, Nature Conservation, and Landscape Planning. The country is divided into ten forest districts and in every district there is a district officer representing each of the divisions. There is, as a result, a close integration of all interests.

The inclusion of Nature Conservation under the wing of the State Forest Service is an interesting arrangement and one which has been suggested for this country too in certain quarters. It is also remarkable that a country with such a dense population and so small a percentage of forest land should be prepared to set aside quite extensive areas of this for recreational purposes. Most of these lie in the sandy areas of low fertility where only crops of poor quality might be expected to grow, but nevertheless the recognition of recreational needs is noteworthy in these days when the emphasis is on increased production from the land. In addition, the Dutch are encouraged to explore their forests by the provision of picnic places and camping sites at suitable points, while the bicyclist receives very privileged treatment by the construction of special cycle tracks through the forest, an indication of the importance of this mode of travel in Holland.

One of the most striking sights to the visitor is the extent of the tree planting along roads of all sizes. Every road seemed to have its row or avenue of trees, and it was by no means uncommon to find main roads bordered on either side with a road reserved for cyclists, each of which had its own avenue of trees, i.e. four separate rows of trees. It was a delight continually to see roadside trees of all ages and not merely the very young and the very old. The trees are carefully tended and pruned to produce a beautifully straight, clean stem which is of obvious commercial value when the time comes for it to be felled. The disposal of branchwood is undoubtedly a problem since it cannot be left on the roadside to rot, as in the forest. One method demonstrated was the conversion of this material, both branches and leaves, into chips, using a Finnish machine worked off the power take-off of the tractor which tows it. Branchwood up to 6 inches diameter can be fed into the machine, and the chips are blown out into an attendant trailer with a rapidity and roar that have to be seen and heard to be believed. These roadside trees are computed to represent the equivalent of nearly 100,000 acres of normal plantations and yields approximately 4 million H.ft. per annum. Their management is the responsibility of the Landscape Planning division, and County Planning officers in this country might well profit from a study of its work.

Trees are also a common sight in towns and villages, where they help to break up the monotonous rows of buildings. The Dutch do not appear to find it necessary to lop such trees, leaving a hideously truncated object, but are content to allow them to grow to their natural height and achieve a balanced narrow crown by intensive pruning practised with almost the skill of a topiarist. The presence of several age classes in city squares (in one square in Utrecht there were no fewer than five separate age classes of about 10–15 year intervals) was in pleasing contrast to the even age groups in Britain, and was surely an indication of the overall control by a trained forest mind as achieved under the Dutch type administration. As might be expected in such a flat and windswept

country, the farmer knows the value of shelter, and almost every farmhouse has its enclosing belt of trees.

The total area of woodland in Holland is approximately 643,000 acres, of which about 20% is owned by the State, 58% privately owned and the remainder distributed in the ownership of Provinces, Municipalities and Societies of Nature Conservation. The average size of property for the State is 1,100 acres and 22 acres in the case of those in private ownership. Only 12% of the woodland area is considered as unproductive, and of the productive woodland 73% is conifer high forest, 16% broadleaved high forest and 11% coppice. Of the conifer high forest, Scots pine occupies 74% of the area, Japanese larch 11%, Douglas fir 8% and Norway spruce 7%. There are few woods over 70 years old and the great majority are in the 0–30 age classes. Estimated annual production from the woodlands is 11 million H.ft. of softwoods and 3 million H.ft. of hardwoods, while over 80% of the timber needs of the country have to be imported. The prospect of expansion is small, except in the poorer parts of the reclaimed polders and in roadside planting on these areas.

It is interesting to note that the Dutch count the age of a plantation from the year of sowing the seed in the nursery and not from the year of planting in the forest. This practice is also used in a number of other European countries. Close planting is favoured in Holland with 1 metre by 1 metre being the normal for even fast-growing species like Douglas fir. The Dutch are also great believers in the importance of a shrub layer and will often interplant the rows of a forest crop with a row of shrubs at the time of planting. They have treated red oak as a shrub in the past but have more recently found it seems to be doing harm to the forest crop and are busy getting rid of it by chemical spraying. The present shrubs in favour are *Prunus serotina* and *Alnus incana*. Examples were seen of their beneficial nursing effect on a newly-planted forest crop in exposed conditions (e.g. planting on the new polders) and the nursing of a more demanding species (Douglas fir) on a poor soil. In addition, shrubs are used to keep out unwanted ground vegetation in older crops. It was shown that a grass invasion under a larch crop reduced the current annual increment to 22 Hoppus feet per acre per annum, as compared to a C.A.I. of 89 H.ft. per acre where the grass was kept under control by the use of a shrub layer (in this particular case the shrub layer was oak). The Dutch are prepared to plant such species as oak, Douglas fir and Norway spruce on soils of a texture and apparent low fertility which normally would be reserved for pine in Britain.

The theme of the tour was thinning, and this subject is therefore dealt with in some detail in the official report on the tour. It should be stated here, however, that the practice in Holland in the past has been to keep a fairly dense stocking on the ground throughout the life of the crop, a practice due no doubt to German influence. Since 1950 there has been a trend towards a much heavier type of thinning aimed at producing rapid diameter growth on a selected number of trees. Coupled with this a method has been introduced to define quantitatively the degree of thinning of a crop. This work obviously owes much to the guidance of Professor Becking of Wageningen University. The degree of thinning (known as S%) is expressed by the percentage relationship existing between the mean distance between trees and the top height of a crop. The mean distance between the trees is based on an assumed triangular espacement as this gives the most economical use of ground. Tables have been prepared which give the mean distance between trees from the number of trees standing per hectare.

Thus:

$$\text{Thinning density degree (S\%)} = \frac{\text{Mean distance between the trees}}{\text{Top height of crop}} \times \frac{100}{1}$$

Tables have also been prepared which show for varying degrees of thinning (S% from 16 to 25) the number of stems that should be standing per hectare for a given top height. It would seem that past thinning practice in Holland has been of a degree of about 16 S%, present practice is about 19 S% and the trend is towards 22 S% (Douglas fir plots show no loss of C.A.I. at this degree of thinning). It is considered that oak, beech, spruce and pine need a gradually rising S% but with Douglas fir and poplar it is possible to maintain the S% at the same level for longer periods. It is considered that successive thinnings should take place when the S% has dropped back by about 1½. This method of defining quantitatively a degree of thinning would seem to be very good, particularly when dealing with young crops. It is simpler to operate in practice than the method using the basal area to top height relationship to which it is, of course, analogous. There is, however, one serious disadvantage in that only the number of trees per acre is used in the calculations, and no account is taken of increment. Consequently there may be a danger of unknowingly over- or under-thinning, particularly with older crops when both volume and height increment for a particular crop become more unpredictable.

Protective measures against fire appeared to be unusually scarce for such a densly populated country with a low rainfall and extensive areas of sandy pine-woods. Ploughed fire traces were seen only in the Crown properties near Apeldoorn, but fire towers were rather more numerous, and fire notices were displayed in many places. Some of the latter only conveyed the simple warning to beware of fire but others in poster form were more arresting, although these were designed more for use on noticeboards and in buildings than at the entrance to or within the forest. This type of notice might, however, be worth copying in this country to try to make people more conscious of the danger of fire to woodlands. The Dutch forest officers would not agree that their fellow countrymen were more attentive to such warnings than others, or particularly careful about throwing away matches and cigarette ends, but whatever the reason may be, the forests do not seem to suffer much damage by fire in spite of the large numbers of people that visit them every year. Even in the very dry summer of 1959, it was said that the largest fire was under 10 acres, and the total area burnt was less than 50 acres.

Much time is devoted to the study of working methods and conditions, under the general heading of Labour Rationalisation. This is due mainly to the urgent need for economy in working due to the rising cost of labour, but partly also to the somewhat uneasy relations which seem to exist between the Forest Service and its workers. Many of the tools used in the forest are similar to those introduced into Britain by the Work Study Section, for the Dutch like ourselves have gone out to pick what is best from other countries. They have even been to Britain, taken a forest planting machine which was apparently not too successful, suitably adapted it, and gave a most impressive demonstration of mechanical planting on a clear felled area with a liberal incidence of stumps. In addition the training of workers is actively pursued, and no doubt some of the ideas to be found in our own new Forest Workers' Training Scheme are derived from Holland as a result of visits paid to the training school by staff from Britain. The part played by the Netherlands Land Development and Reclamation Society (Nederlandsche Heidemaatschappij) in this field, as in other spheres, is notable. This society, which was founded towards the end of the last century for the purpose of improving waste lands, is now responsible for much advisory and executive work both in the Netherlands and overseas. The initial courses of practical training for forest workers were organised and largely financed by the Society, but since 1955 this work has been a joint enterprise of all parties concerned with forestry in the country.

No account of a visit to Holland would be complete without a reference to

the reclamation work which is now proceeding and which when completed will add over half a million acres to the land surface of the country, an invaluable contribution to the existing area of nearly 9 million acres. This is, of course, no new idea in Holland, for since 1200 some 345,000 acres have been drained, but by the enclosure of the Zuiderzee in 1932 by far the greatest reclamation operation known in the history of the Netherlands was made possible. As one member of the party remarked in a speech of thanks to one of our many hosts, it is a notable achievement in these days for a country to increase its territory *within* its own frontiers. The main use of the reclaimed land or polders is agriculture, but some of the less well drained areas are being planted with trees, and the roads across the new polders have their customary avenues of trees too. The drainage of the polders is a mammoth undertaking, but modern machinery makes light of this, and the team of three "D.6" tractors which were harnessed together with a heavy draining plough and raced across the ground leaving a three foot ditch, were the envy of those of us who are concerned with the draining of peatland.

The Netherlands State Forest Service are to be congratulated on their organisation of this tour. Much time and trouble had evidently been taken to provide a wealth of information about each item, even to the extent of having copies of all papers in English, French and German, while the officers themselves displayed a fine blend of efficiency and good humour which contributed greatly to the enjoyment of the participants. Finally, the hospitality of our Dutch hosts on numerous occasions and in various ways was most generous and much appreciated.

A VISIT TO DENMARK AND HOLLAND

By

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In the autumn of 1196, I made a short official visit to forests and research centres in Denmark and Holland, and my impressions are related, mainly in the form of a diary, below. A more detailed version of my report is being retained for reference at Alice Holt.

I. DENMARK

The main interest in Danish forestry and growth and yield studies is in the remarkable similarity of growth of most species in Denmark with those in Britain. In fact, it was only about fifteen years ago, before we had our own revised tables, that we were using the Danish oak, beech and Norway spruce yield tables as a guide to the probable rates of growth of these species in Britain. In spite of this similarity of growth generally, the pattern of volume increment is somewhat different, and where it is possible to compare species, the periodic annual increment does not fall off so fast in Denmark as in Britain. However, by merely looking at the various stands there was nothing in their outward appearance to suggest why this should be the case but it may be due to the fact that the climate is very windy—only 4% of the days are calm—and the speed of wind averages 6–8 metres per second (say 12 to 16 miles per hour). These

winds tend to check height growth and also affect the shape of trees considerably (Sabroe 1954).

I am indebted to Dr. H. A. Henriksen for arranging so comprehensive a programme for me and to Mr. Bryndum, sample plot officer, Professor C. M. Møller, Dr. Hermansen, Mr. Wedel-Heiner, and Mr. Erik Christiansen for sparing time to show me something of Danish forests. I was also privileged to give a short talk on British forestry to the Forestry School at Copenhagen.

The Danish Forest Research Institute is financed by the Government and is entirely separate from the State Forest Service. There is a certain element of amenity value attached to the Danish forests in a country which is predominantly agricultural, and which is fairly flat and featureless with no marked hills, while those that do occur are mostly of glacial origin. Forests thus play an important role as recreational centres for the large towns. The total area of forests is 916,000 acres or 8·6% of the total land area of the country. For over 150 years the forests have been subjected to quite stringent regulations and the revision in 1935 of these old forestry laws regarding the protection of forest has, if anything, made them more rigorous.

Monday, 13th November

The first day of my visit was spent in the Bregentved Forest District in Central Zeeland, where sample plots and thinning series in Red oak and beech were seen. The beech series comprises 11 plots containing 6 grades of thinning A–F. Whilst the F grade is heavier than any we have yet used in Britain, the impression of heaviness is lost due to the large amount of undergrowth present. Whilst height growth is unaffected by the intensity of thinning, total production *has* been affected, and the lighter thinning grades have an appreciably greater yield to date than the heavier grades. Moreover, fluting appeared to be more pronounced in the heavier grades.

The Red oak are from seed of Dutch origin and are in two blocks. The first was sown in 1924 and the second block was established with one-year seedlings taken from the first block. There are four thinning treatments in each block, A, B, C, and D. There is little difference in the height of the two blocks but the plots that were sown are slightly larger in diameter than those established with seedlings, and have a slightly greater total volume.

Tuesday, 14th November

The morning of the second day was spent with Dr. Hølmsgaard, Director of the Forest Experimental Station at Springforbi, with whom I was able to discuss climatic variations in ring width as they occur in treated stands. Unlike certain findings in Finland, where temperature during the growing season is of prime importance, rainfall during the growing season is found to be very important in Denmark, and may in fact be more important than temperature alone. On the poorer sites, and also on clay soils, a higher reaction percentage has been found due to changes in rainfall. Since growth generally in Denmark is similar to that in Britain, the same may also apply here. It seems, therefore, that we should attempt to establish some basic correlation between climate and ring width in Britain, as with these two conflicting evidences it does seem unlikely that the findings, certainly those in Finland, will be directly applicable in Britain.

With the situation in this country in mind, where there are no completely untreated old stands, Dr. Hølmsgaard thought we might be able to obtain some preliminary information from isolated trees, but thought that old, lightly thinned stands, or ones where past treatment was certainly known, would probably prove better since the effects of seeding in isolated trees can consider-

ably reduce annual ring widths. No long-term "climatic waves" have been established for treated coniferous stands in Denmark. To find the situation in Britain, it was suggested that we should need first to discover if there were any regional or country-wide long-term patterns of growth (as shown by annual ring widths) from the best available sources. Since most of our plantations are young, to then compare short-term trends with the long-term ones. However, any computations for short periods would only correct annual variations and these themselves, due to treatment effects, might mask any variations due to climate. However, it was felt that if we did find a correlation with any one climatic factor, or any combination of climatic factors, then predictions could probably be based upon climatic data alone.

The most important of Dr. Hølmsgaard's findings is the economy with which these basic studies can be made. For any one locality he has found that 6 to 8 cores from each of 6 to 8 stands of any one species are sufficient to obtain a basic series with which to compare and adjust radial growth in the strata in which increment borings are to be made.

In the afternoon of the second day sample plots were seen in North Zeeland with Mr. Bryndum the sample plot officer.

At Volbey Forest, a 46-year-old Norway spruce provenance experiment was seen comprising provenances from Finland, Russia, Norway, Germany and Denmark. *Fomes* was present in the area and there had been some"group dying": the Norwegian provenance appeared to be free of infection. The Danish and German provenances showed the best results.

From here we went to Earom district where a young oak thinning experiment was seen. The oak were sown in 1944 and had just been given its first thinning. The experiment is replicated three times and there are four treatments. The height is approximately 18 feet. Bore holes have been placed in each plot and water-level measurements are being taken throughout the year.

On the way to this experiment some 150-year-old European larch and beech were seen at Tinghus. This was a comparatively small stand but the larch were of exceptionally fine form. Close to this was a very nice block of *Thuja plicata*. Finally Douglas fir and larch race trials were seen in the Nødebo forest district.

Wednesday, 15th November

The day was spent at the University in Copenhagen where I saw something of research work being carried out and had discussions with Professor Carl Mar Møller. In the afternoon I gave a short talk to the students on forestry in Britain.

Thursday, 16th November

With Dr. Hermansen I visited the woods managed by the forestry school in North Zeeland. These form part of the second largest forest complex in Denmark which is approximately 15,500 acres in area; the southern part only is administered by the forest school.

Thinnings are light and are made frequently, at intervals of about two years. The woods are mixed in character, including pure beech, Norway spruce, beech/larch/spruce mixtures and rather poor oak, and as such provide ideal material for teaching purposes. The working plan for these woods is made by the state forest service, and in common with all such plans is revised at 10–15 year intervals. Compared with British working plans they tend to be rather less flexible and the prescriptions, especially with regard to regeneration, are fairly strictly adhered to even, as far as I could gather, if towards the end of the working plan period, conditions had somewhat changed from those obtaining when the plan was written. I found this particularly striking in regard to a

Norway spruce thinning experiment that I was shown, where the crop is due to be regenerated, and it seems doubtful if the sample plots can be retained, although they are now beginning to yield some quite interesting results. These plots were divided into two sections; 3 of them acting as controls had been given normal thinning treatment, the remaining 4 had received a form of selection thinning in which selected trees had been removed in thinnings to meet a highly lucrative market for poles of a certain size.

The problems of regenerating poor oak stands was discussed, whether to clear fell, or to heavily thin and underplant? Beech is mostly naturally regenerated on the group system. Norway spruce groups planted under beech were seen where the spruce were planted at one metre spacing. These were about 20 feet high and had just been line thinned, one row in four removed. The intention being to come back in 2 to 4 years' time and remove the intermediate row of the 3 rows remaining together, and then subsequent thinnings will be made in a normal manner. It was interesting to learn that this method of underplanting in small groups is not so much in favour as formerly, and it is considered preferable from the management point of view to regenerate in much larger blocks. Young pure beech stands appear to receive a thinning treatment similar to that practised in Britain.

Nearby, a 53-year-old oak stand of excellent form had been underplanted with beech; it had an average height of 60 feet, an average quarter girth of 7 inches and a standing volume of 1,350 hoppus feet per acre. The final stop was made in a very old mixed hardwood plantation which is being retained as such to observe what happens when a wood is left to itself and only nature intervenes.

Friday, 17th November

The final day in Denmark was spent in forests near Silkeborg in Jutland; the morning in the state forest district where some of the older stands of exotic conifers in Denmark were seen under the guidance of Mr. Wedel-Heinen; the afternoon on the private estate of Mr. Erik Christiansen.

The first stop in the morning was in a 69-year-old stand of *Abies nobilis*. The largest trees were 100 ft. tall and had a girth of 98 inches. Near to these magnificent trees were plots of Douglas fir and Sitka spruce of the same age. The Sitka spruce were 111 feet high, with a mean girth of 62 inches and a standing volume of 9,700 hoppus feet over-bark per acre; current increment was 314 hoppus feet per acre per annum. The Douglas fir were 116 feet high, with a mean girth of 79 inches and a standing volume per acre of 7,500 hoppus feet over-bark. Close to these older stands was a 20-year-old block of *Abies nobilis*, 30 feet top height, 14 inches average girth and a standing basal area of 90 sq. ft. q.g. In appearance, at this stage, similar to stands of this species in Britain with a somewhat uneven canopy structure.

In this part of the forest the ground was gently undulating and the soils were good. The final stop in the morning was on another part of the forest which was much flatter and the soils generally poorer. Here old Scots pine and lodgepole pine provenance trials were seen, and a recently established experiment of pine race trials, laid out in small replicated blocks.

In the afternoon Mr. Erik Christiansen conducted me around his extremely well-managed estate. Here old specimen trees of Sitka spruce, *Abies nobilis*, and Douglas fir were seen, the latter both of "French" and "British" origin, being some of the first introductions of these species into Denmark. The trees of "French" origin were of considerably better form than those which came from Britain which were very similar in form to those of the younger plot at Tortworth in Gloucestershire (i.e. coarse bark, persistent coarse branches), which

Mr. Matthews has suggested may be of Lobb's strain introduced into Britain in about 1850. From the best trees mainly of "French" origin, which are mostly of third generation, Mr. Christiansen has established small trial plots, each containing trees grown from the seed collected from one parent, the plots being separated from each other by a row of larch. An excellent stand of Hybrid larch first generation was seen which had been raised in mixture with Norway spruce, the latter being all removed as Christmas trees.

The intensive management and somewhat unconventional approach to forestry to meet certain seasonal demands on this estate was most impressive. At this time of the year there is a very good market for "Christmas greenery", most of which is exported to Germany. *Abies nobilis* is in great demand for this market and the more silvery the foliage the greater price paid. It is preferred to the somewhat sombre foliage of the Norway spruce both as foliage and Christmas trees. To meet these demands, specially silvery forms of *Abies nobilis* have been grafted, so that eventually there will be a "Christmas green" orchard of *A. nobilis* of more silvery foliage than is obtainable from young trees grown from seed. In order to supply this very lucrative market with Christmas treees, there was a small plantation in which a large number of the trees had been "topped" at about four feet, and the side branches, taking over the job of the main stem, will in a few years' time supply 4 to 6 Christmas trees per tree!

II. HOLLAND

I am indebted to Mr. M. Bol for arranging such a varied and interesting programme for me during my short visit to Holland, and to the various officers who kindly spared the time to show and discuss with me various aspects of forestry in Holland. Holland is the most densely populated country in Europe and, like Denmark, has a relatively featureless landscape; as is well known, large parts of the country have been reclaimed from the sea and are below sea-level. Whilst these areas are predominantly agricultural, large areas of the polders have been planted with poplars and other species, but the poplars are a typical feature of the landscape as roadside avenues. From an amenity and recreational point of view forestry is of even more importance than in Denmark; the Nature Conservation Society, which was formed in 1905, has as its objects the preservation and conservation of places of outstanding interest, and whilst most of the areas it owns are open to the public, only members have access to some, whilst others are reserved for scientific research.

Monday, 20th November

a.m. Visit to Research Institute. Mr. J. F. Wolterson, the Director of the Research Institute, briefly outlined its work. As in Denmark, the Research Institute is separate from the State Forest Service and is financed by a Government grant. The programme of work is decided by a committee and priority is given to that which will be most useful as an aid to the State Forest Service. For example, in the Mensuration section the current priority is the collection of data to enable volume tables for Corsican pine to be constructed. Most departments, I was told, tend to have less staff than is desirable for the amount of work on hand.

The morning's programme concluded with a visit to Mr. Zaat, who discussed statistical problems associated with forestry and described the bunch map techniques he has been using to solve certain problems in which several variables are of almost equal importance; but he was not entirely satisfied with this technique mainly because of the amount of time it takes to construct the necessary graphs.

In the afternoon a visit was paid to some plantations on heathland near

Wageningen with Mr. C. P. van Goor. Here fertilisation experiments were seen, with particular reference to Douglas fir; various levels and combinations of N.P. and K. had been applied. Response to N. shows in first years after application, but the effects of K. are more sustained, there had been little or no response at all to P.

Subsequently, the establishment of new crops of Douglas fir were seen, both under light sporadic cover of Scots pine and where the pine had been cleared in strips. The latter was much to be preferred, the Douglas fir got away better, and also this method facilitated both the preparation of the ground prior to planting by shallow ploughing, and subsequent control of weed growth by spraying with chemicals.

Tuesday, 21st November

The day was spent on the Isle of Texel, the largest of the strip of islands off the entrance to the Zuider Zee. Visits were paid to the dune plantations and sample plots of Austrian and Corsican pine were seen. The exposure is quite high and this is shown very markedly in the profiles of the plantations and shelter strips on the windward side; the maximum distance the plantations are from the sea is 3 miles.

The forest is almost entirely on the sand but a part is on more fertile soils. It is comprised mainly of Corsican and Austrian pine but some small blocks of Sitka spruce and Japanese larch were seen which were not looking at all happy and the latter were of very poor form: part of the area near the sea is being reserved as natural dunes.

The pine plantations that were seen were mostly 50 years of age or older, with heights ranging from about 60 feet to only 15 feet on the more exposed sites. Generally the Corsican pine was better than the Austrian, but in terms of height growth mostly equivalent to our third or fourth quality classes. The Austrian pine on the same site and of the same age was one quality class less than the Corsican pine. This was clearly seen in one area where alternate strips of these two species had been planted. However, although in many respects at a given height the main crop characteristics are similar to those in Britain, the volume increment is higher.

Most of the sample plots seen at Texel were of recent origin, having only had two measurements, but two of the plots had been established since 1925. The plots are thinned and measured on a 2–3 year cycle, and vary from 0·04 to 0·08 ha. in area. The shape of the plots varies, some are circular and some rectangular; no surround to the plots is demarcated but an area around each plot is thinned to the same intensity as that applied in the plot. With the smaller plots, the intention is to enlarge them when the number of trees is reduced. This allows for a certain economy in the time spent in measuring them when the numbers of trees per hectare is high. No numbers were painted on the trees but for each plot a plan was constructed showing the position of each tree. Thinning treatments are controlled by spacing percentage, and grades of 19%, 22%, 25% and 28% were seen. None of these thinning experiments were replicated, but for subsequent analysis the rectangular plots are subdivided into 0·01 ha. units. The use of these small subdivisions also facilitates the application of thinning treatments, the spacing percentage being applied to each unit to ensure that the correct number of trees remains after thinning. The units are also used as a basis for sampling in order to obtain the dominant height of the plot.

The Research Institute have about 230 permanent sample plots, whilst the forestry school at Wageningen have their own series of permanent plots which supplement those of the Research Institute. These latter plots are established

in the first instance for special studies, and at the moment the growth and development of Norway spruce is being investigated.

Wednesday, 22nd November

The day was spent with Dr. J. van Soest and Mr. M. Bol, the morning visiting sample plots on a private estate near Arnhem, the afternoon in the Nature Conservation Area between Arnhem and Apeldoorn.

In all plots the thinning intensity is controlled by spacing percentage assuming triangular spacing. The first stop was in a 49-year-old stand of Red oak thinned to progressively heavier spacing percentages. That obtaining after the last thinning was 29%. In appearance, and in standing crop chracteristics, this was very similar to one of our plots of Red oak, established at Herriard Park, Hants., the figures of which are given for comparison in the table overleaf.

Opposite this was a 49-year-old plot of Douglas fir established in mixture with beech and Norway spruce; the latter have now all been removed. The very high increment per cent of the beech is worth noting. The next two plots seen were of Douglas fir in mixture with Japanese larch, beech and oak planted on old arable land.

The final plot seen during the morning was a 51-year-old plot of Japanese larch in mixture with Douglas fir, Red oak and beech. Early thinnings had been neglected and the stand was not thinned until about 1948. The plot was established to test if the increment of Japanese larch does fall off and to study the effects of delayed thinning.

The Nature Reserve visited during the afternoon contained some of the best Scots pine I saw in Holland, and it is probably also one of the most extensive areas of this species in the country. The area consists broadly of two types of site. On the southern slopes the better soils occur; these are less sandy and good growth of most species can be obtained. To the north the soil is more sandy or gravelly; here the growth of the pine is poor or very poor of not very good form. The poorer pine is now being replaced with other species. In this area in particular there was much damage by fallow deer. The two areas are separated by very undulating open heath-land, similar to the area around Hindhead in Surrey, without the trees and not such steep slopes. Other parts of this reserve were in some ways reminiscent of the New Forest, in particular the older areas where there are mixed woods of pine, beech, oak, etc. One of these contained 120-year-old pine of French origin, with beech, Douglas fir, Japanese larch, Norway spruce and oak aged about 60 years.

The Nature Conservation Society was founded in 1905 to save a lake at Naadermeer near Amsterdam. It then continued to buy other properties of particular beauty or of special natural interest. Before the last war it was financed entirely by private subscriptions, and loans. Nowadays it receives grants from the Government of up to 50% for poor land of non- or low economic value. For better land it receives grants on a reduced scale.

Its properties are mostly open to the public, but to some only members have access whilst others are reserved for scientific research. It now owns about 42,000 acres, and I was told that the State Forest Service are also buying land with similar objects in view to those of the Nature Conservation Society.

Thursday, 23rd November

I was privileged to meet Professor Becking and to discuss mensurational problems with him. I was also shown, by Mr. P. G. de Vries, some of the Douglas fir provenance experiments in the vicinity of Garderen situated on sandy soil and at Sprielderbos on former forest soil. These plots and others, a total of 50 in all, represent 26 different North American provenances. Where

DETAILS OF SOME SAMPLE PLOTS NEAR ARNHEM, HOLLAND

Record of Standing Crop Measurements per Acre

Series	*Spacing* %	*Age of Crop (years)*	*Main Crop*					*Total Crop Yield to Date*	*Periodic Annual Increment*
			Number of Trees per acre	*Dominant Height (ft.)*	*Average b.h.q. (in.)*	*Basal Area per acre sq. ft.*	*Volume per acre (over bark) h. ft.*	*Volume (over bark) h. ft.*	*Volume (over bark) h. ft.*
Red oak, Holland . .	29	49	90	80	37	53	1,840	—	—
Red oak, Herriard Park, Hants, England . .	—	55	98	77	35	52	1,690	—	—
Douglas fir	25	49	86	94	48	—	3,400	—	45
Beech	—	49	57	—	—	—	775	—	30
Douglas fir	—	30	170	63	28½	59	1,570	2,000	80
J. larch/beech/oak . .	—	30	120	—	—	31	920	1,400	76
Douglas fir	25	31	173	69½	30	67	2,020	2,370	121
J. larch/beech/oak . .	—	31	82	—	—	21	680	1,520	48

possible thinning series were established in plots of the same provenance. In Holland, the provenances from the Pacific Coast, Chilliwack and Mid-Washington have proved best, and this was certainly borne out by the plots I saw. I was interested to notice also that in the few provenances I saw at these two sites that certain external characteristics could be used to distinguish between the various provenances, such as bark characteristics and branching habits. Whether these would be sufficiently strongly developed to serve as a useful guide to strain would be difficult to say as only six different provenances in all were seen; but of these that from Chilliwack was most outstanding.

Friday, 24th November

The final day in Holland was spent on two of the Polders; the newly-reclaimed Oostelijk Flevoland, where the northern part is completely drained and contains some newly-formed plantations of poplars and also of oak and various coniferous species; and the much older North-east Polder. My guides on this final day were Mr. H. A. van der Meiden of the Research Institute, and the local forest officer.

The first visit was to Oostelijk Flevoland, an area of 133,000 acres, the actual draining of which was only completed in July 1957. However, it will be at least 12 years (i.e. 1969) before the area is fully inhabited and cultivated; by this time the "endikement" of the next polder will have been finished. Already the broad plan of development is provisionally laid out, although only the north-eastern part is as yet being cultivated; but large areas have been sown from the air with reeds to help in the "drying up" process of the newly-reclaimed land.

The nursery produces some 100,000 poplars per year, and also contains some 400,000 one-year-old oak and 150,000 three-year-old oak transplants and produces all the plants needed to plant the polder. Prior to planting the poplars, alder is planted to provide and fix nitrogen in the soil. The poplars are usually introduced one or two years afterwards and the alder are "topped" if they show signs of competing with the poplars or other species that have been planted. The tremendous contrast in the growth of the poplars compared with that of other hardwoods and conifers was most striking. It is because the future woodlands will have a certain amenity value that poplar is not being planted entirely, in spite of its vastly superior growth.

In the nursery the plants are mostly lifted with a newly-developed machine which not only lifts the transplants but bundles them as well. This machine, developed in 1960, is supplied by H. Zijlstra and Sons, Plantex N.V., Veendom, and costs about £1,500. In a sandy nursery it can move at the rate of 4 to 6 km. per hour. The planting of the alder and other species is also mechanised, but the poplars are planted by hand. The planting machine I saw moves at a rate of 1–1½ km./hour. The cost of planting is approximately £3/ha., and 5 ha can be planted in one day. The machine was planting alder when I saw it in action and the plants were about 2 feet high. (One hectare, ha.=2½ acres.)

In the afternoon I saw some of the older poplar plantations and avenues on the North-east Polder, which is 119,000 acres in area and which was completely dry by September 1942. With such large areas of poplar plantations of different varieties seen in so short a time it would be impossible to do more than retain a general impression of the behaviour of those that are known to us in Britain and which are represented in our own trial plots. From a very brief inspection of the data for their growth in Holland it would seem that the very convenient relationships of the various crop characters with height that I found so useful in constructing the preliminary yield table for poplar, do not obtain in Holland.

The visit to the polders was a fitting climax to my short visit to Holland and the tremendous engineering feats that have led to the reclaiming of this land from the sea can now be more fully understood and appreciated.

REPORT ON RATIONALISATION COURSE IN ARNHEM, HOLLAND 1st-19th OCTOBER, 1962

By

J. SPEERS

Pomeroy Forestry School, Northern Ireland Forest Service

This rationalisation course for forest workers is completely different from the forestry course for workers offered in our own forestry school, and no amount of modification of the Dutch course can make it similar to our course. Where ours is largely theoretical and silvicultural the Dutch course is largely practical (either on tool maintenance or forestry operations) and any mention of silviculture is incidental. We have not the workshop facilities available to deal with tool maintenance to the extent they do and until we have these, the type of course offered in Northern Ireland cannot be much altered.

The course aims to teach workers already in forestry and those starting out in it correct working methods and better working techniques using the proper tools for the job. This means that they become skilled workers and through the acquired skills and the fact that piecework rates of pay are available they are able to earn a good wage and compare favourably with men in other industries. This is psychologically important for the training and the earnings available are such that the forest worker in Holland need not feel inferior to other workers. Holland is no longer the agricultural country of the school books for its industrial expansion is remarkable and in an expanding economy there is an increased demand for wood and forest products. Nevertheless the basic forestry wage is the lowest in the country (i.e. 80 guilders a week, approximately £8).

The need for labourers in industry and in the building trades is great and there are 100,000 vacancies. Therefore, without training and the resultant increased output in production and increase in earnings the forestry worker could not compete and would be drawn in many cases to the other jobs which (contrary to the situation in Northern Ireland) are available. Due to research and the application of work study to forestry in Holland and to the facts mentioned above, the education of forest workers became an obvious necessity, and over the last ten years the course organisers are convinced that they have revolutionised working techniques and working methods with the obvious benefits to the State and to the individual.

Such is the nature of the Dutch forestry workers' attitude to education that he is willing to come to Arnhem at his own expense, pay a fee for the course to the Netherlands Land Development Co. who run the course, and he also has to pay lodgings in the city. The courses have grown longer and larger over the years and what was originally a one-week course is now a three-week one and may soon take in five weeks. All through the three weeks there was an atmosphere of enthusiasm maintained by the excellent instructors and by the 30 students. The course was in no way handicapped by being held in the city of Arnhem for the city is almost surrounded by pine and hardwood forests and by the woodlands of the Veluwe National Park. Practical forestry operations upon which much time was spent were performed in these almost suburban woods which were within half-an-hour's car ride from the school.

While the older workers unquestionably benefit from rationalisation the organisers feel that young men starting out, who have not developed any prejudice against the new methods taught, would benefit most, and it is felt that to cater for these at least three training centres are needed in different parts of Holland. The Dutch forestry service, employing less than 1,000 men, is smaller than our own but perhaps through these courses it seems to have asserted itself strongly among other occupations in a country of 12,000,000 people and is not regarded as a last-resort job or in the nature of an unemployment scheme. The country is forestry conscious and many of the towns are surrounded for amenity purposes by "town woods" which provide recreational facilities for the inhabitants and also produce timber. In the new polder lands areas are reserved for forestry with great attention to types of soil and species selection, and around each polder town are the town woods, mostly in this case of fast-growing poplars. The planting of shelter belts is also essential on these flat polders with their hundreds of new farms, and this work is carried out by the State Forestry Service. The State Forestry Service has had no success in Holland in getting foresters and workers to live on isolated forests. They prefer to live in normal communities with modern amenities available and in the polder lands the farm workers also live in the villages and towns and, like their forestry colleagues, travel out to their work.

To get back to the actual course; it first of all placed great emphasis on the importance of using the correct tools to do a job and maintaining these tools properly. This, of course, has long been known in Britain and the Forestry Commission Work Study group has been able to make satisfactory changes along these lines in some conservancies. Taking the axe as an example, scientific study in Holland of the amount of energy consumed using various methods and weights of axes have allowed the Dutch to decide upon the right weight and quality of axe for the job in hand. Consequently we find that they use lighter axes than we do. They use a light snedding axe weighing 2 lb. with a $2\frac{1}{2}$ lb. one for heavier work, while for laying-in and felling a 4 lb. axe is used. No heavier axe than 4 lb. is used.

This study has been applied to peeling irons, of which eleven different types were available for use on the course, and members were urged to try out all types and make comparisons. Some of the peeling irons have detachable weights which can be attached if the bark of a tree is thick and tough to give additional weight to the "peeling stroke".

The proper maintenance of these and all tools was greatly emphasised and sharpening and setting to a fine degree of accuracy was done in the well-equipped school workshops. Here all the necesssary apparatus was electrically driven and good heating and lighting conditions were available for work which is often carried out here in most primitive conditions. Microscopes were used to point out the difference between a "ground edge" and a "honed edge" and at all times "safety" was the by-word in the school and all cutting edges were covered. The necessity for care was emphasised when a course member succeeded in cutting himself badly with a peeling spade and had to get hospital treatment.

Having taught the men the absolute necessity to use the correct tools and proper work technique, the course goes on to emphasise the proper use of the body and the use of the correct muscles in using of the tools.

The main idea behind this, and one which should appeal to workers on piecework rates, is to do more work and use less energy. That guidance along these lines is very essential was proved by the fact that among the members of the course various ways of holding and using tools, and, in standing at the job were evident. People can work their whole lives at a job misusing their bodies and their tools and in fact that is what most of them were doing. The instructors

taught the correct stance, the correct use of the body in doing all jobs and especially in debarking pine trees—their new method was a much easier and practical one than any that the course members were using. It was merely the use of the heavier muscles and the stronger to do a job that most of us were trying to do with our arms and wrists. After practising it for a time, all agreed that it was much less likely to lead to strained muscles on the arms and wrists.

The emphasis all through was on cutting out the muscle strains and strained backs which affect forestry workers and eventually shorten their working lives, and this use of the proper muscles brought about a relaxation on the job which enabled production to be increased without loss of energy on unnecessary work.

The use of the force of gravity in tool use, especially in axe usage, was advocated, usually by taking a longer grip on the axe and by a rhythmic swing so that as much as possible should be done with one stroke.

This was well illustrated by a first-class film showing a Swedish demonstrator at work felling, snedding and debarking a tree—and he made it look extremely easy. The work seemed to flow from the edge of his axe and peeling spade, and in technique and stance he used all the methods we were taught.

To adopt these new ideas and acquire the skills that go with them calls for a great deal of practice especially from those used to other ideas—but men who have been "brought up" on them swear by them. The older men would have to persevere in use of new muscles but as these became "toned up" to the work better work would be produced and there would be less bodily abuse.

Great importance is laid on the use of gymnastics and sport of a proper nature to bring the muscles into shape and keep them supple and ready for work, and this is essential in work like forestry where high physical effort is often required on the job. The reasoning in Holland is that proper, reasonable and well-planned exercise will help to keep a man fit for his work just as such exercise keeps the athlete or the footballer fit for his sport. A fit man is always able to endure physical effort much better than one who is unfit and in fact the unfit man is abusing his body and putting an undue strain on his heart by attempting really hard physical work such as lifting poles.

The course had now illustrated what tools to use and how to use them as far as muscular effort was concerned and it now went on to the approach to the operation, in other words to put forward correct working methods instead of the haphazard and badly planned methods often encountered. This involved a great deal of practical work, mainly felling, snedding and debarking in the woods around Arnhem and Appeldoorn and provided a further chance to employ the new working techniques earlier taught. Protective leather gloves were worn at all times, even when using the axe. Correct working methods entail the use of absolutely correct tools in good condition—no matter how simple the operation (i.e. in one-man felling work—the use of lifting tongs is insisted upon although the poles can easily be carried or pulled by one man). The actual carrying and placing of the tools as jobs change, by placing them in a safe and handy position ready for use, is insisted upon, and where a good many tools are used this leads to safety and to less losing of smaller tools.

Subsequent operations must also be thought about at this stage (e.g. if felling is being carried out the trees must be felled in the right direction to aid future extraction).

The rationalisation has been extended to finding the most effective size of the squad engaged in a given operation—which is most important from the correct working method point of view, and here we had reports on work done in Finland and in the Scandinavian countries.

There were many other incidental lectures, on diets for workers, on the

application of time study and the consequent setting of piecework rates, which broadened the scope of the course without adding anything to the skilled part of the work.

To sum up—the course was a very specific one and great attention was paid to simple tasks and to small details in the effort to rationalise them. The Dutch have over 10 years' experience in this form of training while we are only making a start—but one cannot but feel that this is the proper type of course for the worker with perhaps a little more silvicultural training thrown in. Future training plans should incorporate as much of the course as is possible, but this would mean the provision, first and foremost, of better facilities.

ROYAL SCOTTISH FORESTRY SOCIETY 65th ANNUAL EXCURSION TO PERTHSHIRE 1962

By

W. A. EVANS, *Head Forester, South Wales*

and

T. W. B. BOLAM, *Forester, North-east England*

This is a joint account of the excursion to private estates in mid-Scotland, held from 7th to 11th May, 1962, with headquarters at Perth.

Invertrossachs Estate

Tuesday, 8th May, 1962, we visited the Invertrossachs Estate, which is situated on the south shore of Loch Vennachar. We started the tour by looking at a long, narrow belt of about 100 acres of mixed scrub and bare ground which is to be developed as permanent woodlands. The intention is to plant some of the rarer species. The Research Branch of the Forestry Commission will be advising a suitable species to try. The next area to be visited was Coronation Wood, which had been planted in staggered groups of Norway spruce, Japanese larch and Scots pine in 1937 and the rest in 1953. A problem had been created here because the thinnings from the older plantations would have to be tushed out through some of the younger groups. This had not been borne in mind at the time of planting.

Our next stopping point was at Crow Wood which consisted of P.53 Japanese larch which had just been thinned. Some windblow had occurred during the gales of early spring. I noticed that the ground conditions were very moist, and am of the opinion that adequate draining would have saved some of the windblows. I was also informed by the Forester that all planting was done by making a slit with an ordinary garden spade. Mansfield spades would have done a far better job.

We went next to Upper Strachan Wood which was planted with P.53 Japanese larch in furrows, the planting being done on top of the furrow. Most of the trunks were badly curved due to this type of planting. It was suggested that much better results would have been had, if they had been planted in the trench, but the general opinion was that this type of planting would have resulted in windblow.

We were also shown a recently constructed forest road necessary for the extraction of timber from the upper slopes and for the importation of artificial manures for hill pasture reclamation. The gradient was below the standard of 1 in 10 as set by the Forestry Commission and was in fact over 1 in 8 in places. This was to shorten the road thereby reducing expenditure, and up till now this road had proved adequate.

We were shown a recently slagged field of 10 acres also sown with seed cleanings, all materials for which had been imported *via* the new road, as had also hay for the hill stock. Already thinnings had been extracted from the hillside plantations *via* the new road.

We were to have seen a fire pump demonstration but unfortunately the pump had broken down. We did, however, see a hill pasture reclaimed from bracken by persistent mechanical flailing in the early stages of growth. The success of the operation could be judged by comparison with the heavy bracken on the surrounding untreated areas. Experiments are now being continued with chemical sprays on difficult ground unsuitable for flailing. It is too early yet to judge results.

We ended our visit here with lunch alongside the shore of Loch Vennachar.

Cambusmore Estate

In the afternoon we went to the Cambusmore Estate near Callander (Capt. J. N. B. Baillie-Hamilton). The first stop was at Black Park Wood, which consisted of birch scrub due for clearing and replanting in 1964. A road was under construction through this block, the soil was peat, deep in places, with clay below. This had been dozed and was in a rather bad condition. Stoning was to be carried out at a later date. Our suggestion that the stoning should have been done on top of the vegetation was agreed by most of the company. But now that the dozing had already been done it was agreed that the best method now would be to cut the scrub and lay it across the road before stoning.

The next block was the continuation of the above wood which was cleared and replanted in 1961 mainly with Sitka spruce, with some Scots pine on the drier ground. Most of the area was ploughed and had been well-drained. The Sitka spruce was doing very well. The Scots pine had been severely damaged by blackgame.

Our next stop was at Bog Myrtle, a 10-acre block which had been cleared of scrub and some fairly good Scots pine and replanted in 1959 with Norway spruce, Sitka spruce and Hybrid larch. This was one of the least successful plantations on the estate. Extensive frost damage had occurred, particularly to the Sitka spruce. The general opinion was that they would recover eventually. We could not help thinking that some of the scrub birch should have been left for cover.

Of botanical interest, Captain Baillie-Hamilton pointed out to us a plant very rare in this country growing wild in this compartment, and called Labrador Tea. On looking this up I find it is a North American plant, either *Ledum latifolium* or *Ledum palustre*, which have leaves that have been used for tea.

Whilst observing this plant, the Royal Scottish Forestry Society President, Mr. John McEwen, noticed another rare plant growing nearby, namely *Linnaea borealis*. This is "The Little Northern Plant, long overlooked, depressed, abject, and flowering early" which Linnaeus himself selected to transmit his name to posterity. The textbook tells me that it grows mainly in pine woods in Scotland and in one English pine wood in the parish of Hartburn, Northumberland.

Our visit ended with tea at Cambusmore before returning to the hotel.

Scone Estate

Wednesday, 9th May, 1962. Scone Estate. (The Rt. Hon. The Earl of Mansfield.) This was an open day for the Society and we all met at the Scone Palace cricket ground.

The first plantation we visited was an oak and Japanese larch mixture planted in 1953. The oak were planted in groups of 13 with Japanese larch 6 ft. apart in rows spaced at 9 ft. Along the outside edges the oak were keeping

pace with the Japanese larch, but as one moved further into the plantation the Japanese larch were double the height of the oak. Something would have to be done immediately to save the oak. A slower-growing nurse species would have been better.

A picnic lunch was had at the Scone Palace cricket ground. After lunch was held the annual business meeting of the Royal Scottish Forestry Society on the cricket field.

The meeting was addressed by the Earl of Mansfield, who stressed the importance of much more publicity of the fact that increased afforestation was in the national interest. He forecast that within two or three generations forestry and its products would form the greatest single industry in the country, employing more people than either coal or agriculture. He said that only forestry would repopulate the Highlands, providing employment for ten to twenty times as many people as sheep did, particularly on bad sheep ground, of which there is a tremendous amount in Scotland.

The meeting was also addressed by Sir Henry Beresford-Peirse, Director General of the Forestry Commission. He forecast a great future for the forestry industry.

From his observations whilst he was abroad, he said that he was convinced of a mounting demand for timber, not fully realised, and even surpassing production in terms of present-day standards.

"Timber-exporting countries," he said, "like Finland and North America, forecast that within ten to fifteen years they would be unable to meet their own demands for raw material and would be unable to continue as large exporters of wood."

"Europe," he said, "was likely to run into serious timber deficiencies within the next fifteen years, but that did not apply to foodstuffs".

"Where," he said, "a country finds it no longer sound to use all the land for food production, then forestry offers an attractive alternative, producing a raw material for which there will be a steadily rising demand".

After the meeting we inspected specimen trees in the policies and a large collection of rare conifers in the pinetum. The following trees are noteworthy of mention:

	Age	*Height*	*Girth at 5 ft.*
1. European larch	105 years	109 ft.	13 ft. 3 in.
2. Douglas fir	128 years	108 ft.	13 ft. 3 in.
3. Sequoia gigantea	109 years	93 ft.	24 ft. 7 in.
4. Tsuga heterophylla	109 years	84 ft.	16 ft. 6 in.
5. Noble fir	109 years	84 ft.	12 ft. 1 in.
6. Sitka spruce	109 years	106 ft.	17 ft. 1 in.
7. Cedrus atlantica	102 years	81 ft.	10 ft. 10 in.

The Douglas fir is of special interest in that it is a tree grown from the first seed brought to this country by David Douglas of Scone in 1827, and planted here in 1834.

The Sitka spruce, too, is of interest in that three much younger trees have been produced by natural layerage and are still connected to the parent tree, although the layered branches are now dead and unfortunately the offsprings are now semi-suppressed by the parent tree.

We now had tea in the marquee before returning to Perth. Up till now it had been a beautiful sunny day but about this time storm clouds gathered around and it began to rain.

Argaty and the King's Lundies and Kilbryde Moor Estate, 10th May

On this day all the foresters were guests of Captain D. S. Bowser, a Forestry Commissioner, at his Argaty and Kilbryde estates, situated to the north of Doune.

Argaty and Kilbryde consist of 5,469 acres of which 496 acres are dedicated to forestry as follows:

	Argaty	*Kilbryde*
Dedicated and planted . .	199 acres	149 acres
Dedicated but unplanted . .	19 acres	126 acres
Unproductive	3 acres	—
	221 acres	275 acres

The underlying rock on the joint estates is Lower Old Red Sandstone with a narrow dyke of basalt running north-west to south-east. The soil varies from sand at the south end of Argaty to deep peat at the north end of Kilbryde Moor and most of the ground is stony.

The land rises from 178 feet to 1,691 feet in a distance of six miles and many of the lower slopes are steep with varying aspects mainly to the south, the woods being exposed to all winds but somewhat sheltered from the north.

On arrival at our meeting point at Dalbrack Farm we were welcomed by Captain Bowser and then we proceeded to Stand 1.

Stand 1—*Compartments K*7, *K*8, *K*9

When Kilbryde Moor was purchased in 1953, a hill farming scheme was undertaken including the planting of three shelter belts each of three acres K7, K8, K9. As K7 has reasonable access it was decided to increase the planting area to 11 acres with approval from the farm tenant, making 17 acres in all.

Planting was carried out in 1959, and under the hill farming scheme 50% of the cost of 9 acres was met by grants. The remaining 8 acres was dedicated and planting grant received. Two years later the other 9 acres were dedicated and maintenance grant received.

The elevation of the planted area is around 700 feet, the vegetation is *Molinia* and the method of planting was S.S. on ploughed turfs. The growth is reasonable but some bud damage has been caused by blackgame and there is evidence of browsing by deer, the belts being surrounded by rabbit netting.

Average costs per acre for the 17 acres are as follows:

	Per acre
Ploughing	£10
Fencing	£34
Drainage	£7
Planting	£8
Cost of plants	£18
Maintenance to date	£6
Total cost to date	£83
Grants received	£39
Net cost to date	£44

Before moving on we stopped to admire the view. Looking south we saw Stirling Castle and the Wallace Memorial. To the west we saw Ben Ledi and, in the far distance, the peak of Ben Lomond.

Stand 2

The party was conducted round the farm to see the new sheep pens and dipping installations, and also the newly-remodelled farm buildings, all done

with the aid of a hill farming grant. It is a very efficient layout and quite impressive to see.

Stand 3—*Compartment K*1, 40 *acres*

This was the first plantation to be established on the Kilbryde Estate. It covers 40 acres and was planted in 1955 and 1956 with Hybrid larch, Scots pine, Norway spruce, a few Sitka spruce and a few poplars. We only made a brief stop here. The plantation is ably managed and growing well. Some of the Norway spruce have been thinned out for Christmas trees.

The party now proceeded to the Argaty Estate and Lerrocks Farm where a brief tour of the steading, laid out for milk production, was made. We then proceeded to Stand 4.

Stand 4—*Lerrocks Strip: Compartment* 4(*a*), 4 *acres*

This area was cleared in 1950 and replanted in 1952 with oak/Norway spruce mixture at 5 ft. spacing with 10 ft. in between rows. The pattern was 1 oak and 2 Norway spruce. After 5 years the Norway spruce was removed for Christmas trees and replanted. Another row of Norway spruce and *Tsuga* was introduced between the existing rows. The mixture is now growing well with promise of a final crop of oak.

We were then invited to the Mansion House and provided with lunch, after which we proceeded to Stand 5.

Stand 5—*Compartment* 8, 8 *acres*

This area was planted in 1931 with European larch and oak. The larch was badly cankered and in 1952 the estate wished to remove it but the Forestry Commission advised heavy thinning and underplanting, which was done in 1954, the species used being Hybrid larch, Norway spruce and *Tsuga*. Roe deer damaged the larch and *Tsuga* but the Norway spruce and original oak are growing well. The original European larch is very poor and will be taken out in subsequent thinnings.

Stand 6—*Compartment* 9, 10 *acres*

This compartment was planted in 1933 and in subsequent treatment more consideration has deliberately been given to game and amenity than to forestry considerations. The planting was very mixed with European larch, Scots pine and hardwoods. Most of the European larch has gone and half of the plantation is now almost pure oak whilst the remaining half is a mixture of Scots pine and oak. It is intended now to favour the oak for the final crop.

Stand 7—*Compartment* 10(*a*), 4 *acres*

This compartment was planted in 1922 with Japanese larch, Scots pine and *Abies nobilis*. There are some good *Abies* on the lower slope but the Japanese larch has suffered badly from windblow and is badly underthinned where it has not blown.

The larch will be felled as required for use in the sawmill.

Stand 8—*Compartment* 10(*c*), 4 *acres*, *Whinny Knowe*

Planted in 1935 with Scots pine and Japanese larch, the Japanese larch has since dominated the Scots pine, which has disappeared completely, leaving vigorous Japanese larch which is in urgent need of thinning.

Stand 9—*Glack: Compartment* 10(*d*), 1·6 *acres*

This part of the plantation was blown by the gales of 1952 and was replanted with Hybrid larch and Norway spruce the following year. Some of the Norway spruce have already been removed for Christmas trees and the proceeds from sales have almost equalled the planting expenditure.

Stand 10—*Compartment* 10(*b*), 5 *acres*

This plantation was planted in 1923 and has suffered from under-thinning during the war years. It has been overcrowded and the crowns are very small. It has since been thinned and shows some response.

Estate sawmill

The party was finally conducted round the estate sawmill, which was very well laid out and included a Stenner bandsaw, McConnell swinging table portable saw, routing machine, Remington power saw and a "hot and cold" creosote tank.

It has been a most pleasant and interesting day but as we were preparing for the return journey to Perth heavy rain began to fall.

Dupplin Estate

The Dupplin Estate, visited on 11th May, is owned by the Rt. Hon. Lord Forteviot of Dupplin, M.B.E., J.P. It extends to 11,000 acres and is situated 1 to 8 miles south-west of Perth in the River Earn Valley and the surrounding high ground to the north. The woodland elevation is from 50 feet to 500 feet and reasonably flat. The rainfall is 30 inches and the underlying rock is Old Red Sandstone.

In 1956, out of 2,300 acres of woodland, 1,970 acres were included under the "Approved Woodland Scheme", the remainder being excluded for sport and amenity. There are 1,600 acres of productive woodland of which 300 acres have been planted within the last six years. Eight hundred and sixty acres of mainly Scots pine were planted after the First World War, providing a continuous five years thinning cycle. One hundred and seventy acres of older conifers provide material for the estate sawmill and the remaining 270 acres consist of mature and over-mature woods which will be felled and replanted over the next twelve years.

Once planting arrears are made good the replanting rate will be steadied at 25–30 acres per year, giving even age groups and a sustained regular income. Seven and a half miles of new roads have been constructed in the last six years, resulting in better prices for thinnings.

The chief species used in planting are Scots pine and European larch with some beech and Norway spruce for Christmas trees. More Norway spruce and Sitka spruce are to be planted where conditions are suitable.

There are few rabbits but roe deer and hares make necessary 6½-foot fencing. The summer fire hazard is considerable and precautions include roadside-fire-resistant species, warning notices, fire beaters, fire dams, patrols and a mobile 500-gallon tanker and pump.

All young plantations up to 30 years old are insured at a basic cost of planting of £30 per acre plus 5% compound interest.

All thinnings and fellings are handled by Scottish Woodland Owners' Association and the main block conifers thinnings are practically all sold to the National Coal Board in the round.

The monthly thinning programme is approximately 6,000 H. ft. Over and above this 3,843 tons of mainly conifer fellings have been sold over the last six years for £17,779 gross (£9,146 net) and 2,965 tons of low-quality timber have been sold to the National Coal Board at 30/- to 45/- per ton over the same period.

On arrival at Dupplin we were welcomed by Lord Forteviot before commencing our tour on foot around the stands previously selected.

1. *Garden Bank—Compartment* 88 (49 *acres*)

This is an area of over-mature oak and beech with a wide range of conifers intermixed as single trees or in small groups with a large amount of yew in the under-storey and some natural regeneration of sycamore up to 30 years old in the windblown openings.

The conifers include European larch, Norway spruce, cypress, *Sequoia sempervirens* and *S. gigantea*, *Tsuga* and *Abies nobilis* of varying heights up to 120 ft., and volume 150 Hoppus feet to 450 Hoppus feet. After seeing these trees, the R.S.F.S. President, Mr. McEwen, remarked that he was extremely impressed by some of the very fine specimens of conifers, and was sorry to see that no effort had been made to clear up the area to show these trees to the best advantage, as well as introducing young stock of similar species to perpetuate the stand, which he considered was worth coming some distance to see. In reply Lord Forteviot said that these remarks had stirred him into considering some action along the lines suggested.

We then moved on to Stand 2 and on the way Lord Forteviot showed us some yew trees where he had actually seen roe deer browsing.

2. *East Munday Muir* (*Compartment* 48) 19 *acres*

Before entering this stand we had a fine view to the south-east across the valley into Fife where we could see the "Caps of Fife" in the Lomond Hills.

The compartment was planted in 1934 with mainly Scots pine and some European larch in close groups of thirteen trees with 15 to 18 feet centres between groups. The planting density was approximately the same as normal 5 ft. spacing. There has been a heavy invasion of birch between groups and no systematic thinning was carried out until last year. The trees in the middle of the groups are suppressed and the perimeter trees are coarse and tend to lean outwards. It was generally felt by the party that early felling and replanting was the solution here.

3. *West Munday Muir* (*Compartment* 50) 69 *acres*

This area consists of variable birch scrub mainly 10 to 15 feet high and fairly dense. On application to the Forestry Commission in 1961 for a scrub clearance grant, it was suggested that killing by chemical spraying would cost well below the minimum qualification for a grant. The chemical spraying company quoted an all-in figure of £7 per acre for a complete kill.

As an experiment, 10 acres were sprayed along the west side by helicopter on 26th August, 1961, with 4 pints of 2-4-5-T ester per acre (12 gallons gross dilution per acre). The helicopter flew at just above tree height spraying in 30 ft. wide strips. The whole operation took half an hour.

The birch leaves died off earlier in the autumn on the sprayed area than on the untreated area. Now, in May 1962, the tops of these trees seem quite dead but the middle and lower branches are starting to flush. The representative of the chemical spraying company states that this is just as he expected but the leaves will die off in mid-summer and the trees will then die. Present appearances are not conducive to optimism but may be misleading.

4. *Compartment* 59—21 *acres*

This is a typical area of old scrub oak and beech with some Scots pine of poor quality. It has no silvicultural future and will be felled for replanting.

5. *Pinetum*

Our tour was completed by a visit to the pinetum where we saw various species of *Cupressus*, *Abies*, *Pinus*, *Picea*, *Tsuga* and *Cryptomeria*, etc.

We then had lunch and, after saying our various farewells, the party broke up.

THE ROYAL FORESTRY SOCIETY OF ENGLAND, WALES AND NORTHERN IRELAND: SUMMER MEETING AT CARDIFF, 7th to 11th MAY, 1962

By

D. H. BUTTON

Head Forester, East England

and

S. W. R. STEWART

Forester, East Scotland

As a preliminary to the week's activities the Annual General Meeting of the Society was held on Monday evening, 7th May, at the Angel Hotel, Cardiff, when the retiring President, Mr. H. W. D. Pollock, was succeeded by a very popular choice in Mr. N. D. G. James.

The Cardiff Parks

The week's proceedings commenced on Tuesday morning with a visit to Roath Park, by kind permission of the Cardiff Corporation.

One was immediately impressed by the area of open spaces, parks, gardens and woodland said to amount to 2,500 acres, of which 620 acres are ornamental parks and gardens, and 490 acres are woodlands, leaving approximately 1,400 acres of playingfields and children's playgrounds.

Roath is the city's oldest park; it was presented to the town by the Marquess of Bute and opened to the public in 1894; it covers an area of 102 acres and comprises recreation ground, botanical gardens, lake and wild gardens.

Due to the prolonged cold spring many of the flowering shrubs were unusually late and much of the colour and beauty was unfortunately missed, but there was still a great deal of interest in the great variety of plants, trees and shrubs—all labelled for the interest of visitors. Of particular interest were the variety of eucalyptus trees planted over a period of years, some of which have survived recent winters and are now regarded as reasonably hardy.

There were also some useful specimens of *Ginkgo biloba* (the Maidenhair tree), *Liriodendron tulipifera*, *Metasequoia* and a rather grotesque specimen of *Sequoia gigantea pendula*. From Roath Park we moved on to Parc Cefn On, a property in the city's green belt between Cardiff and Caerphilly.

It comprises a farm, a golf course and a woodland dell, which was the object of our visit; the soil here is acid, and apart from more interesting conifers the main source of interest was the great variety of rhododendrons, azaleas and heathers, and although it was a little too early to see the blooms at their best, it was still a colourful and pleasant experience.

Being somewhat behind schedule, the visit to the Municipal Tree and Shrub Nursery at Llanishen was all too brief, but a wander through the greenhouses revealed a wonderful array of plants in bloom, all ready for planting out in the public gardens and traffic islands.

Particularly interesting were the clean-stemmed standard trees for highway planting, and it was explained that side branches were pruned to a height of eight feet to minimise damage by children, a sure sign of the modern era when humans are accepted as just another tree pest, and methods of protection are an accepted necessity.

The time factor reduced the visit to Bute Park to a ten-minute stroll along the banks of the River Taff, which runs through the centre of this ornamental park which extends to some 350 acres.

A particular point of interest here is the establishment of a variety of ornamental trees of such species as *Acer, Sorbus, Malus, Prunus, Ulmus,* upon what is virtually coal dust washed down from the Rhondda and Merthyr Valleys. After enjoying the hospitality of a civic luncheon presided over by the Deputy Lord Mayor at Cardiff Castle, we journeyed by bus to Dyffryn Gardens, an area of some 90 acres administered by the Glamorgan County Council. Here again ornamental trees of great variety, dwarf conifers, magnolias, Tulip trees, Golden-berried yew, a fine collection of maples and a host of other trees, shrubs and rockery plants, and so to Dyffryn House for tea and the end of the first day's programme.

A most enjoyable day with a particular attraction for the horticultural and arboricultural experts, who enjoyed the opportunity to impress with their ability to reel off countless botanical names with effortless ease.

Wednesday, 9th May: Ebbw Forest

A journey by bus up the Ebbw Valley with a very interesting running commentary of places of passing interest ably conducted by the Forestry Commission Divisional Officer, Mr. Legard, and on to the Ebbw Forest.

This is part of the Forestry Commission efforts to establish forests in the industrial areas of South Wales and the Llanover section of this forest is one of the first established forests in Wales where planting commenced in 1921.

Early plantings were of Scots pine, European larch and spruce, with failures in European larch eventually being replaced by the more vigorous Hybrid and Japanese larch.

Japanese larch and Scots pine have proved to be the most successful species over a fair elevation range and current practice has settled down to planting Scots pine on the dry, stony slopes between 800 and 1,000 feet, and above this it is replaced by Lodgepole pine.

On the middle slopes Japanese and Hybrid are still the main species, with Sitka spruce now limited to *Molinia* areas, while *Tsuga heterophylla* and Douglas fir have been used on selected sites but only on a scale still small enough to be classified as experimental. Corsican pine has only been partially successful and this at the lower levels below 800 feet.

Corsican pine on a small scale at around 1,200 feet shows very definite signs of dieback. No definite symptoms are apparent for this failing and it must therefore be accepted, until a more obvious reason is found, that, at this altitude with its exposure, the shallow soil with rapid draining and drying-out, is just not favourable to the growth of Corsican.

A discussion developed regarding the wisdom of planting such large areas of Japanese larch; it was felt by some members that its future as a saw timber was not very attractive and that Scots pine, which it was readily agreed gave comparable returns, would have been a better commercial proposition.

It was explained by the Director for Wales that in view of the high fire danger on these steep slopes and the damage by straying sheep it has been essential to use species that would establish themselves early, and Japanese larch, with its rapid early growth and ability to suppress the vegetation, had been particularly adaptable for this purpose.

It was also pointed out that there is a ready pitwood demand for Japanese larch thinnings in the local coalfield; at present not more than 40% of South

Wales pitwood demands are being supplied from home forests, and at the present rate of expansion it may be 15 to 20 years before saturation point is reached and the problem of finding other markets for surplus material is likely to arise.

Regarding the future of Japanese larch as a saw timber, very little of this size had so far reached the market, and it was felt that the sawmillers' objections were probably prejudice through lack of knowledge, and as larger quantities became available, experience may prove much of the prejudice to be unfounded. Despite this it was stated by those responsible for producing the future working plans for this region that serious consideration had been given to the pros and cons of Japanese larch and Scots pine, and the findings appeared to be in favour of Scots pine, in which case it would be included in greater quantities in future plantings at the expense of Japanese larch.

It would be unfair to leave the Ebbw Forest without some mention of the roads; it was indeed a pleasant change to hear the much-maligned road engineers for once in a while receiving a word of praise.

There was unanimous appreciation of the roads over which we travelled by lorry—roads carved out of mountain sides as sheer as 1 in 3, a task, it was agreed, that must have presented many complex problems, and the verdict was full marks for a difficult job well done.

General

The formation of these forests in the industrial areas of South Wales is a real achievement. As well as climatic and geographic difficulties to be overcome there is the sociological or rather anti-sociological one, which seems to be more pronounced in this part of the country.

Ebbw Vale forest has just been re-fenced against sheep, which do a great deal of damage and which can still be seen all over the place even after this extensive fencing programme. However, as the Forestry Commission cannot effectively fight this they are going to join it by charging the graziers rent.

Fire is also a very serious problem and from February until May, 1962, 100 acres were lost in this forest and some 500 in South Wales as a whole.

As a general rule the management's aim is eventually to clear-fell blocks of not less than 100 acres and replant, but at present the natural regeneration of small sections is being tried. Netting these areas to protect them from sheep is essential, and when fencing these areas about 2 chains per acre is sought and 5 chains per acre is never exceeded.

We were struck by the amount of brashing carried out on all species. Even in pine the brashing was 100%.

National Museum of Wales

In mid afternoon we returned to Cardiff and a visit to the National Museum of Wales for a tour of the botany section, after tea very kindly provided by the Museum authorities.

The Department of Botany houses a most comprehensive range of native flora and forest botany has received special attention.

The forestry section provides exhibits of the life histories of most of the important broadleaved and coniferous trees grown in Wales, but with the limited time available main interest was centred in:

(1) The extremely fine collection of more than 150 specimens of commercial timbers in large plank, mostly grown in Wales.

(2) The set of four dioramas illustrating forestry in Wales, one depicting Lake Vyrnwy as a large-scale area of reafforestation, and a second of a

coniferous thinning operation in progress have been completed, while a third, of a forestry nursery with seed sowing and lining-out in progress, was nearing completion.

These are extremely fine specimens of workmanship, perfect in almost every detail, and they were of great interest to all members of the party.

(3) The herbarium, which houses some 200,000 documented specimens of Welsh plants, also a most extensive collection of pressed specimens of tree foliage and, in an extension to the herbarium, a fine collection of tree seeds and cones.

Ffrwdgrech

A meeting at Ffrwdgrech, Brecon, by kind invitation of the owner, Mr. W. D. D. Evans, was held on 10th May.

This is an estate of 1,200 acres, south of Brecon on the lower slopes of the Brecon Beacons, and varying in altitude from 450 to 1,100 feet, with a deep red sandstone loam soil over Old Red Sandstone with some Boulder Clay and an average rainfall of 44 inches.

Systematic management of the woodlands began in 1908 by the late owner, J. D. D. Evans, and despite extensive fellings in both the 1914–18 and 1939–45 war, replanting and good management has proceeded over the years and the estate now has dedicated woodland of 241 acres, of which 210 are now productive.

The day's programme commenced with a visit to the forest garden, an interesting group of mixed conifers planted about 35 years ago for the purpose of ascertaining the most suitable species for the local conditions.

In Held Wood we saw a mixture of trees planted in 1952—*Thuja*, *Tsuga* and Lawson cypress, and natural regenerated ash interplanted with Japanese larch. In Compartment F group fellings of Scots pine ½ to 1 acre in extent have been replanted with *Thuja plicata*/European larch, *Thuja plicata*/Corsican pine, pure *Thuja* and pure *Tsuga*, at five-year intervals since 1916; the wood now consists of small blocks of all species of all ages, and although growth generally is excellent, it now presents an extremely difficult problem of management.

In Compartment E we saw a small area planted with pure *Thuja plicata* in 1918, and beaten up with European larch planted in 1919, the larch now standing at some 15 stems per acre with the *Thuja* worked into a 2-storied high forest and acting as a very useful cleaning agent, a system, by the way, which has proved quite successful and may be repeated.

In Compartments C and D a crop of ash and European larch groups divided by strips of beech, and *Thuja* planted in 1915, the results of under-thinning covering a long period were clearly evident, as also were the unfortunate results of opening up such a crop too heavily; the ash and European larch have suffered from canker and heavy bramble has quickly developed. The owner here requested proposals for future treatment and it was generally agreed that the cankered larch and ash should be cleared and underplanted with *Thuja*, which grows really well here.

After a sandwich lunch at Ffrwdgrech we moved on to Waterfalls plantation, a most interesting stand of Douglas fir planted in 1910 at 4 ft. spacing, that has been given particular attention by way of frequent light thinnings and high pruning; it has a top height of 104 ft. and is still showing rapid growth. The financial returns are also worth recording, excluding the value of the standing crop. Thinnings up to 1954 has produced an average annual income

of £5 4s. 0d. per acre since it was planted, and since 1954 the income is even greater.

In Fern Bank, an area of approximately 6 acres originally planted with European larch with beech strips and groups of *Thuja*, was underthinned until 1942. It then received the somewhat unorthodox and drastic treatment of a very heavy thinning including removal of most of the dominant trees, with further normal thinnings in 1948 and 1954. Although crown response has not been as rapid as expected after the last thinning, it is still recognised as one of the best stands of its kind in Wales.

Conditions existing here must surely be the envy of every forester—no rabbit, deer or sheep problems, protective rabbit fences have not been used since 1932, no sporting interests to interfere with silvicultural operations, the only pest being the grey squirrel and even this does no severe damage. Indeed, a soil and climate, a rate of growth and a lack of all the usual hazards that add up to silvicultural Utopia.

Rainfall we were informed is often up to 60 inches a year, and after getting thoroughly soaked during a day of continuous downpour we had no reason to disbelieve it, but despite the rain it was a thoroughly enjoyable and interesting day, and tea and cakes provided by the owner, before the party's return to Cardiff, were most welcome and greatly appreciated.

Llanarth

On 11th May, 1962, we paid a visit to the Llanarth Estate, by kind permission of the trustees.

The estate extends to some 4,000 acres but only 177 acres are woodland, laid out in small blocks.

A brief history shows the woods to have been mainly ash coppice and standards prior to some replanting between 1935 and 1939 and after 1946, and these plantations of Japanese larch and Norway spruce with hardwoods are now showing a useful return from thinnings, for which there is a ready outlet in the nearby coalfield and industrial areas.

Our first visit was to Clawdd Wood, stocked with pure Corsican pine planted in 1913 and sadly underthinned for the first 35 years, after which it was taken in hand and given frequent light thinnings in an effort to restore the crop to reasonable stability.

The height growth is still very much out of proportion to the girth and the crowns are small, but the crop is at a difficult stage—too large for pitwood and too small for economic sawmill conversion—and the only obvious treatment it was agreed would be to continue the present treatment of light thinnings and market the crop at the first available opportunity.

Next, on to Court Robert, a plantation of regenerated oak under-planted with European larch in 1917. The larch were gradually removed in thinnings and the crop is now almost pure oak. It was last thinned in 1960 and is now a quite attractive stand of growing trees.

Finally, back to the Llanarth village hall for lunch after which the party dispersed around 2 a.m.

To summarise, one can say that all tastes were effectively catered for, whether they be specialists in botany, arboriculture or just down-to-earth foresters. The arrangements worked smoothly and reflect much credit to the organisers. The weather was generally kind and the accommodation excellent. Altogether an interesting and enjoyable meeting and I was indeed grateful to be given the opportunity to attend.

PROBLEMS OF SOIL EROSION AND STABILISATION IN COASTAL AREAS

By

E. W. B. GALE, N.D.H., F.Inst.P.A.

Parks Superintendent, Poole Borough Council

Two papers of considerable interest to parksmen were given at the November Public Works and Municipal Services Congress. These papers were "Some Problems Connected with Soil Erosion and Stabilisation in Coastal Areas" and "The Training of Staff for the Municipal Parks Service". The first of these papers, read by Mr. E. W. B. Gale, N.D.H., President of the Institute of Park Administration, follows:

The problem of soil erosion and stabilisation in urban coastal areas is an important part of the responsibility of the parks officer—working in conjunction with the civil engineer. In some instances the responsible parks officer may also be approached to advise upon suitable planting schemes for cliff protection or other types of stabilisation, when technical advice is not available in the immediate locality.

Some of my observations are based upon my experiences at Poole. Poole has a population of 90,000 and enjoys a sea frontage to Poole Bay which is shared geographically with Bournemouth and Christchurch. A distinctive feature of the coastline are the Chines, which are ravines or small gorges formed in the cliffs and winding steeply inland. The slopes are covered mainly with pines, gorse and heather. On the Poole coastline Branksome Dene is the most easterly chine, and is followed westwards by Branksome, Canford Cliffs, Flagstaff, and Chaddesley Glen, with the sand hills of Sandbanks completing the main Poole frontage to the bay. In addition to this coastline, Poole has also a considerable area of practically land-locked tidal water to form the second largest natural harbour in the world. A considerable part of the harbour frontage lying within the borough has been developed either commercially or for high-class residential development.

Strong south-westerly gales, together with heavy seas, mean that at various times of the year some damage is done to the various protective works such as sea walls, stabilised cliffs, and mudlands.

Erosion can be caused by:

(*a*) *Destructive wave action*, consequently resulting in a loss of beach material and the erosion of the adjacent cliff face. This may also result in shifting sands encroaching upon the natural shore vegetation or vegetation which has been planted to secure stabilisation.

Through the action of heavy waves and wind, sand is deposited in large quantities inland and is swept into dunes. The dunes will in time envelop the lower growing vegetation and the medium height trees and shrubs. Tidal scour and the general configuration of the coastline will affect materially the movement of beach material, and whilst groyning may be indispensable in maintaining a beach, some additional form of protection is sometimes useful to combat the combing of a beach.

(*b*) *Cliff erosion* where there is a rapid run-off of rainwater particularly after a heavy storm, or in instances where the subsoil water meets an impervious layer of clay or rock-stone, gullies are formed which gradually become deeper and wider. In time this will result in sections of the cliff being dislodged with a consequent loss of vegetation, not only within the dislodged section but also on the lower cliff slopes where the vegeta-

tion may be completely buried. The indiscriminate climbing of cliffs is also a further source of damage.

(*c*) *The depredations of man* who in his quest for recreation and pleasure will remove growing plants, take material for fires and hold beach barbecues. The thoughtless use of oil stoves for tea-making and cooking can do irreparable damage by firing ground cover shrubs and trees. The considerable increase in popularity of camping and picknicking has brought with it many problems, and it appears that more provision must be made where picknicking and camping can be enjoyed without damage to the local amenities. It is, of course, not unusual to find pines and other coniferous trees removed for use as Christmas trees or planting in a garden. Even when notices are erected drawing attention to damage to vegetation, it is not unknown for the post and board to be used as fuel.

The tree lupin (*Lupinus arboreus*) is a very useful plant for assisting in arresting the movement of sand, but I have been forced to reduce the amount of planting of this shrubby flowering plant, due to the damage done to cliffs by persons climbing to pluck the flowers.

The thoughtless removal of sand and shingle by contractors, without supervision, and the indiscriminate parking of motor vehicles on shingle beaches can also result in the loss of the natural vegetation, thereby exposing the surface to wind action. To control coastal erosion and maintain the natural vegetation means constant vigilance, especially after heavy rains or heavy seas. Major reclamation and repair work are obviously the responsibility of the civil engineer, but minor breaches, cliff falls, etc., will in some instances require immediate attention from the parks department and be a combined operation.

It is important to always have an adequate supply of fire brooms in the danger areas. In addition it may be possible to cut out fire-breaks in the larger woodlands, or areas with a ground cover of heather, gorse and bracken which carry a high potential fire risk. Fire-breaks should be very informal and it is very useful if the area is grassed down.

It is generally thought, and rightly so, that the moderating influence that the sea has upon temperature, coupled with the increase in atmospheric humidity, is naturally on the whole favourable to vegetation. The first problem is, however, to find trees, shrubs and other vegetation that will withstand the full blast from the sea, carrying with it salt-laden atmosphere.

The problems fall into the following headings:

(*a*) Permanent shelter belts.
(*b*) Cliff stabilisation.
(*c*) Shingle and sand.
(*d*) Mud flats or salt marsh.

Permanent Shelter Belts

Where it is necessary to plant naked ground to produce a shelter belt and in some instances give some form of stabilisation to the area, it is most important that artificial protection be given to the new planting. The stronger and more effective the protective measures taken, the more successful the initial plantings will be.

For this reason I often welcome the introduction of buildings such as beach huts, conveniences and shelters, which give protection to new plantings. Wattle hurdles or pale fencing to a height of 3 feet are very useful and should be fixed with stout posts about 4 inches in diameter and 6 feet in length. These may be pressure creosoted or in some instances stout posts from willow or poplar may be available and it is not unknown for these to root and form a part of the

initial windbreak. Any form of protective fence must allow the wind to filtrate through the interstices in the wattle or pales and the supporting posts must be about 3 feet centres.

Behind the protective fence the first plantings will be made and it is essential that the planting area is well prepared by the introduction of loam and certainly by some humus such as well-composted leaves and grass mowings, or sewage sludge.

It is essential that only small plants be used, planted closely together to give mutual protection. By close planting, in time a shelter belt is formed which may gradually slope upwards from the shore to make the first defence line. Depth of the shelter belt is very important, but this must depend upon the configuration of the site. To be successful in a fully exposed area a considerable depth is essential before adequate protection is secured to enable ornamental plantings inside the belt.

Amongst the most suitable trees is the Maritime pine (*P. pinaster*) and the sycamore (*Acer pseudoplatanus*), and these should be interplanted at about 3 ft. centres. The Scots pine (*P. sylvestris*) is also an excellent tree but is apt to suffer more discoloration from salt spray than the Maritime pine. The latter has been considerably overplanted in coastal areas, particularly in the West Hampshire and East Dorset districts. Once the initial windbreak has been obtained I would certainly recommend the indigenous Scots pine, which is more shapely and gives fine winter contrasts with the reddish-brown bark and dark green foliage. Other pines are the Black pine (*P. thunbergii*), a valued Japanese forest tree succeeding in poor sandy soil, and Monterey pine (*P. radiata*), which is a very rapid grower and has been used for afforestation in New Zealand. It is only suitable for the milder localities. The Corsican pine (*P. nigra calabrica*) and the Austrian pine (*P. nigra*) are excellent shelter-belt trees and will succeed in the colder districts and on chalk soil. The Corsican pine is a notoriously bad transplanter, and I would recommend using only pot-grown plants. Also worth considering are the Bishop pine (*P. muricata*), which is hardier than *P. radiata* and will withstand a great deal of exposure, and the Aleppo pine (*P. halepensis*), which is a drought-resisting pine and will succeed to a certain degree over thin limestone. Another conifer which has been widely planted in the south and south-west is the Monterey cypress (*C. macrocarpa*), and this tree makes an excellent windbreak. It will thrive in a variety of soils and may be seen growing in clay, heavy loam or chalk. It is a very difficult tree to transplant and should be grown in pots.

I have already stressed the use of small plants and in some instances the necessity of growing the young stock in pots to avoid undue root disturbance at planting time. This applies particularly to all the pines which have been recommended, and where only small quantities are being raised the seed can be sown in pots or boxes placed in a shaded cold frame. The young seedlings must be potted at an early stage in their development and the pots plunged in ash, being shaded from the full sun. Pines are very coarse-rooted and care must be taken to see that the young trees do not root too deeply into the ash bed, which can result in serious damage to the root system before planting. Some consideration might also be given when purchasing conifer seeds, to its origin, for instance, seeds of the Scots pine ripened in Scotland are more suitable for use in the British Isles than European matured seeds.

Other suitable trees for inclusion in the initial shelter belt plantation are: the Evergreen oak (*Quercus ilex*), which is readily raised from acorns and the young plants grown on in pots for planting, the Common holly (*Ilex aquifolium*), especially some of the broad-leaved forms, are very useful and will withstand a certain amount of salt spray. For evergreens the time of planting is important,

although when the stock has been grown in pots this is not quite such a problem. Whilst in inland districts I would recommend autumn planting, in exposed coastal districts I would recommend planting in late March or April, the young trees having a full spring and summer for growth.

Amongst deciduous trees for the outer "ramparts" the sycamore is a splendid subject for intermixing with the evergreens, and although it will be well "battered" it will certainly stand its ground. The Wych elm (*Ulmus glabra*) and the Smooth-leaved elm (*U. carpinifolia*) are also excellent trees to include in the initial windbreaks, as are also some of the willows—the White or Huntingdon willow (*Salix alba*) and its variety *S. alba argentea*, with the Palm willow (*S. caprea*). With these trees some of the poplars may be planted, particularly the Abele poplar (*P. alba*). This will, in suitable conditions, make a fairly large tree, but I have found it most useful because of its "suckering" habit and have been able to establish it almost on the shore. To complete a defence in depth, a number of other trees will be found to withstand a certain amount of wind and salt spray, including the Wild pear (*P. communis*), Mountain ash (*S. aucuparia*), Whitebeam (*S. aria*), hawthorn (*Crataegus monogyna*), Common ash (*Fraxinus excelsior*), Hornbeam (*Carpinus betulus*) and the Blackthorn or Sloe (*Prunus spinosa*).

In the formation of a shelter belt it must be expected that the vegetation taking the full brunt of the wind and salt spray will not present a very ornamental appearance, but with the density of planting combined with some initial protection to the newly-planted vegetation, together with defence in depth, stabilisation and an adequate shelter belt will be secured.

Shrubs Suitable for Permanent Shelter Belts and Cliff Stabilisation

There are a number of evergreen and deciduous shrubs which are exceedingly useful in providing a "front line" defence to the young trees in a future shelter belt, are also very useful for the planting of cliffs to affect stabilisation, and in some instances assist in landscaping the sea front. Again it must be expected that shrubs forming the first defence system must become disfigured and for this reason in some instances I prefer to use deciduous shrubs. One of the best is the tamarisks, of which there are several species. *Tamarix pentandra* is a valuable late-flowering shrub and its variety *T. pentandra rubra* is very attractive. *Tamarix tetrandra* is a May-flowering species, and the two other species are *T. gallica* and *T. anglica*, the latter growing successfully on the Suffolk coast. Even after heavy seas have completely saturated the ground they will continue to flourish. On the cliff face I would recommend the less ornamental *T. gallica* and *T. anglica*. *Myricaria germanica*, a close ally of the tamarisks, is also a useful shrub for coastal planting. On some heavy soils the Common elder (*Sambucus nigra*) will help to stabilise the upper parts of the cliff and may be interplanted with Blackthorn or some of the rose species. These will tend to make impenetrable hedges. The Wild rose (*Rosa canina*), Sweet briar (*Rosa rubiginosa*), Scotch rose (*R. spinosissima*), and the native *Rosa hibernica* are all worthy of a trial. In some instances hybrids from *Rosa wichuriana* are useful, providing proper preparation of the site is made when planting. On exposed cliffs the Goat willow may be planted, particularly where there is a certain amount of subsoil water, and other willows worth considering are the Dwarf willow (*Salix herbacea*), *S. repens*, *S. myrtilloides* and the North American Shining willow (*S. lucida*). The name Sea buckthorn (*Hippophae rhamnoides*) is self-explanatory, but make sure that you plant in groups with both sexes, otherwise you will fail to secure the brilliant orange berries in the autumn. The Red Osier dogwood (*Cornus stolonifera*) and the Siberian dogwood (*C. alba*) are useful shrubs, particularly as they are both capable of throwing "suckers".

For windbreaks the bamboo is suitable and in some instances will establish itself on the cliff face. One of the best is *Pseudosasa japonica* (*Arundinaria japonica*) which will grow to a height of 12 ft. *Arundinaria vagans* will make a good ground-cover plant further inside the shelter belt and *A. palmata* is a very rampant species for moist situations. *Griselinia littoralis* is an excellent evergreen to form a hedge on the sea front, or to include in the shelter belt, growing sometimes to a height of 10–15 ft. *Griselina lucida* is not so hardy but is a very useful shrub on the sea front. The Sea purslane (*Atriplex halimus*) and the Tree groundsel (*Baccharis halimifolia*) are shrubs which will withstand saline conditions, the latter not standing the strong winds so well and is more suited to the south and south-west counties. The evergreen *Euonymus japonicus*, which has a number of coloured foliage forms, is a very useful shrub for providing shelter and for cliff planting, being probably one of the most widely used in coastal localities. The oleasters, particularly *Eleagnus ebbingii*, which is a hybrid between *E. glabra* and *E. pungens*, will succeed right on the coastline and may be associated with some of the escallonias, one of the best being *Escallonia macrantha*, which will make a sound protective hedge on the sea front. The Common privet (*Ligustrum vulgare*) and the Oval-leaved privet (*L. ovalifolium*) make very useful shelter-belt subjects, and they will also establish themselves reasonably on the cliffs, being most successful if planted close together in groups, with possibly some of the Common bramble as an associate shrub. Other shrubs which I have used with success are *Aucuba japonica*, *Berberis stenophylla*, *B. darwinii*, *Pittosporum tenuifolium* which will form a small tree in the right locality, *Olearia haastii*, *Lycium chinense*, *Bupleurum fruticosum* and, of course, gorse. This is a useful shrub for maritime planting, using the Common gorse (*Ulex europoeaus*), or its double form. The latter is easily propagated under mist. Other gorse types are the native *Ulex nanus* and *U. gallii* which is not quite such a robust grower. It is important that gorse should be properly maintained by regular cutting every two to three years, as it has a very high potential fire risk. Associated with gorse are our native heathers, such as the Dorset heath (*Erica ciliaris*), the Cornish heath (*E. cinerea*), *Erica carnea* and the common ling (*Calluna vulgaris*). As with gorse, it must be cut regularly to reduce the fire risk. Another shrub is the Spanish gorse (*Genista hispanica*) but this will suffer a certain amount of damage from salt spray.

Cliff Stabilisation

Although I have already drawn attention to a number of shrubs which will be found useful in stabilising cliff slopes and dry banks, there are also a number of points which require emphasis and elaboration before planting is undertaken. To affect the stabilisation of the cliff face satisfactorily, the angle of repose is a very important factor and should not exceed one foot in three to provide a reasonable slope on which vegetation can be established. Needless to say, the importation of soil and humus for planting can be an expensive project, depending naturally upon the accessibility of the site. It is very important, therefore, for all suitable top soil to be saved during the reconstruction. Drainage of the cliff area is very important with a substantial catch-water drain at the top of the earthworks or cliff and a further drain at the base. In addition, the cliff face must be drained by means of land drains laid on the herring-bone system to pick up not only subsoil water where it meets the impervious rock-stone or clay strata, but also the surface water draining off the cliff face. The drains should not be less than 4 inches in diameter and given a fall somewhere in the region of 1–50 to 1–75 ft. to secure a fairly rapid run-off and prevent silting as far as possible. The depth of the drains will depend upon local conditions, but it is important that the drain at the top of the earthworks is not less than 3–4 ft. in width, and deep enough to pick up as much subsoil water

as possible. It should be shaped slightly concave at the top to catch surface water which runs off rapidly from the adjoining land after heavy rains, and the pipes covered with brushwood, or large stones (rejects), or similar material. All drainage works should be completed in the same manner. At certain key junctions it will be an advantage to have substantial silt pits.

In some instances local conditions make any reshaping of the cliffs very difficult, and artificial protective measures must be taken to prevent serious cliff falls. This can sometimes take the form of small rocks securely concreted in position. At the rear of the rocks, stonework drains are laid with outlets in the rock face. Pockets can be left in certain sections of the rock face for the establishment of suitable rock plants or small shrubs. The expense in construction is more than offset by the time saved in having to clear material eroded from the cliff face on to paths and promenades.

Another effective form of stabilising a cliff face or steep bank is by covering the whole area with heather clots. It is appreciated that this is only possible in certain districts. The heather "clots" are cut 9 inches square with a depth of 5–6 inches of peaty soil attached and are laid closely on the prepared face. It will be necessary to securely peg certain sections to prevent any possible slipping, using pegs of willow or poplar, which I previously mentioned may root. Needless to say, work should commence at the base of the cliff, and the heather clots top-dressed with screened soil to fill in the interstices. In some instances it is possible to leave small pockets for planting shrubs, such as *Senecio rotundifolius*, *S. monroi*, gorse or shrubs which have been previously recommended. In some instances where there is a certain amount of sand movement, one can attempt to stabilise the sand by using Marram grass (*Ammophila arenaria*) or Red fescue (*Festuca rubra*) and its variety *F. rubra arenaria*. These must be planted in clumps and it must be stated that the conditions which make for success in growing these grasses should really be avoided, that is, a fairly good supply of sand in which to root upwards. Other useful shrubs which are worth a trial are the Common ivy (*Hedera helix*), and in the south and westwards, the Hottentot fig (*Mesembryanthemum edule*). This plant in the Poole and Bournemouth areas has survived many years, but is severely damaged by frosts on occasion. Just a little further inland, two shrubs which are worth planting on steep sloping banks are the Rose of Sharon (*Hypericum calycinum*) and *Gaultheria shallon*. The latter requires a neutral soil.

A further method of soil stabilisation must be mentioned, namely the use of bitumen emulsion in conjunction with sand, covering a seedbed of grass seed sown in the usual manner. This procedure has been used extensively on roadside embankments and can in some instances be applied to cliff protection or similar works. To ensure success as far as possible, the face of the slope must be soiled and consolidated before seeding. The choice of seed is also important and I would recommend grasses such as *Agrostis stolonifera* (Creeping bent) and its varieties where seed is available, *Agrotis canina* (Velvet bent) and the *Agrostis* hybrid between *A. stolonifera* and *A. tenuis*. Red fescue (*Festuca rubra*) has already been mentioned, and S.59 with extensively creeping underground stems; and the Smooth-stalked meadowgrass (*Poa pratensis*, or Kentucky blue grass) is a very useful grass in dry, sandy situations because of its creeping underground stems. When the grass area is growing satisfactorily it is important to give the surface some aeration by forking, and on occasion a light distribution of wayside grass cuttings over the cliff face may also assist in rehabilitating the slopes.

Shingle and Sand

It is exceedingly difficult to establish any form of vegetation on shingle due

to its constant movement and lack of humus. The most one can aim for is to encourage as much as possible a carpet of indigenous flora such as *Lathyrus maritima* (Sea-side Everlasting Pea) which can be seen on the pebbly beaches in the South, Lincolnshire and Suffolk, *Silene maritima* (See Bladder Campion), *Geranium robertianum* (Herb Robert), *Sedum acre* (Wall Pepper), *Salsola kali* (Saltwort), *Crambe maritima* (Seakale), *Suaeda maritima* and *S. fruticosa* (Sea Blite) and *Lavatera arborea* (Sea Tree Mallow).

Sand presents an entirely different problem by reason of its susceptibility to the effect of wind, and one of the first essentials in attempting to stabilise it, is to arrest the force of the prevailing winds by the erection of some form of barrier. Any barrier must allow for a certain amount of wind penetration, otherwise the wind will travel over the top of a solid barrier and down the leeward side, severely damaging the new plantings. Other points to remember are: do not commence any movement of sand until you have completed the initial protective works; never attempt too much. Willow brushwood is ideal for forming a wind-barrier and should be sloped at an angle from the prevailing wind with parallel supporting wire fixed to stout stakes. Where the works cover a considerable length along the foreshore, access must be provided to the beach by means of stiles. The brushwood fence may be progressively raised as the sand builds up and in due course the artificial dune is planted with Sea Lyme grass (*Elymus arenarius*), Marram grass, and Sea Couch grass (*Agropyrum junceum*). The grasses should be planted in small clumps of 3–5 shoots, 2 feet apart each way. Further reinforcement can be made with gorse, Tree lupin and possibly *Salix repens*, also *Tamarix* species. Galvanised wire freshly sprayed with tar will also form a useful windbreak and protective shield for young, newly-planted shrubs. Where it is intended to carry out a fairly extensive planting of shrubs to reduce sand movement, it is again most essential that a good depth of garden soil enriched with humus is provided. As with shingle, the local flora should be encouraged to naturalise itself as far as possible, or in some instances turf can be established with the grasses mentioned in the paragraph on soil stabilisation. Once a sound turf mat has been established it is possible to move most of the sand which has invaded the grass area during heavy winds, by mechanical means.

Mud

The naturalisation or stabilisation of salt marshes or mudlands in the inner harbour areas may on occasion have to be considered. The most important plant for use in stabilising tidal mudland is *Spartina townsendii*, large areas existing in Southampton Water and Poole Harbour. When this grass is established it is very difficult to keep under control. Another alternative to the *Spartina* is the Sea aster (*Aster trifolium*), which can make a very colourful sight in the early autumn. A useful maritime grass for land which is only occasionally subject to tidal flooding is *Glyceria maritima*, and this will make quite fair pasturage.

There are a number of other indigenous plants which can be encouraged to give coverage to mudland and salt marshes, such as the Glasswort or Marsh Samphire (*Salicornia herbacea*), Club-Rush (*Scirpus nanus*), Arrow Grass (*Triglochin maritimum*) and the Glass-Wrack (*Zostera marina*). The latter is a very favourite food for wildfowl. In considering the use of the native flora for stabilisation, a sound knowledge of plant ecology is essential and where additional technical advice is desirable, the Nature Conservancy officers will be only too pleased to give every possible assistance.

FORESTRY AND LANDSCAPE

Contributed by
C. A. CONNELL, O.B.E.
Conservator, South-west England

Fig. 3. Forestry Commission plantations, by conforming with contours and by mixing the types of tree, are no longer as disruptive as they have been in the past.

"In a small concentrated country like Britain, it is unsound to have various interests—many of them Government bodies—bidding against each other for the exclusive use of land." This was the main conclusion to come from the Institute of Landscape Architects' annual conference for 1962.

The observation was not generated by the long-standing conflict between land for housing and agricultural needs, but referred to hillsides, "marginal" farming land, elevated moorland, and particularly to those few hill-tops which this country can call its mountains. This land is often claimed for uses said to be in the public or national interest, such as field crops, sheep and cattle grazing, forestry, water catchment, training areas for the services, nature reserves, radio and television masts, relay stations, and the recreational activities of climbing, walking, camping, or visual amenity.

Obviously, it was reasoned, we could not in a country of this modest size, afford to allow each of these interests exclusive use of all the land that they claimed. The conference, held in the agreeable surroundings of Wills Hall, Bristol University, from 20th to 24th September, had as its primary theme "Forestry as an element in landscape design", and the conclusion arose from discussions on the means of reconciling the demands of economic forestry with the principles of good landscape design.

C. A. Connell, Forestry Commission Conservator, South-west region, gave a very encouraging paper on the attitude of the Commission to amenity considerations in forestry. With 1·3 million acres of land under timber crop, and another million acres in its care, the Forestry Commission was the largest landowner in the country. But the area of land under forest and woodland was still only 7⅓%—less than almost every other country in Europe. We still imported

90% of our timber consumption, all but 6% of which was softwoods.

Although the desperate urgency of planting for defence and possible blockade was no longer present, the Commission was still charged with producing timber as an essential national asset at an economic cost. It was, however, very conscious of the need to strike a balance between economic or scientific requirements and the demands of amenity and good landscape design. (See Fig. 3.)

The meeting was reminded that the Forestry Commission had established National Forest Parks very many years before the National Parks Commission was formed, and that, under a policy of good rural integration, it believed in the multiple use of State forests.

Some of the other uses it was possible to combine with forestry were sporting rights, water conservation, forest workers' holdings, and agriculture.

Inevitably the question of forestry in National Parks came under discussion. The feeling of the delegates was that forestry was not wholly incompatible with National Parks character, but that it should be limited in extent and subject to careful design policy. The present method of voluntary control by joint committee procedure (both Forestry Commission and private owners and developers being included) was described. Papers were also given by Dr. J. D. Ovington of the Nature Conservancy, and by Rolf Gardiner, a Dorset landowner. Dr. Ovington spoke on the effect of afforestation on the conservation of fauna, flora and water, supporting his remarks with research statistics. Mr. Gardiner, who has had experience of large-scale land improvement by tree planting in Nyasaland, Dorset, and Finland, made a strong plea for the retention of regional landscape character in the face of increased agricultural mechanisation and specialisation. He also gave evidence of improved water conservation with protection from erosion and fluctuating supply, by the afforestation of bare hillsides.

The remaining two speakers, F. W. Shepherd, deputy regional director, east Midland region of the National Agriculture Advisory Service, and P. R. H. S. Holbourn, A.R.I.B.A., M.T.P.I., county planning officer, Brecon, both gave stimulating papers on practical aspects of the problem. Their points may be briefly summarised.

The removal of hedges, hedgerow trees and tree belts was not only breaking up the traditional small-scale pattern of the English countryside, but in the long view was definitely detrimental to land and crops. Meteorologists and agriculturalists had studied the problem and could show proof that sheltered plots produced better crops. There was still need to experiment to produce figures to justify the cost of providing shelter in economic terms.

Forest planting could be made more acceptable in the landscape by the adoption of non-geometric plots; by the planting of mixed species, with dividing lines sympathetic to the contours; by irregular boundaries and by rides set obliquely up a hillside, following a curved line; by the total avoidance of blanket planting over subtle contours near the tops of hills and over a skyline.

There was no doubt that much sensitive appreciation of landscape design by the foresters on one hand, and much useful guidance which could be given by amenity societies on the other, was obscured by blindly prolonging the old controversy over conifers versus hardwoods, as if this were the only issue. Even if it were economically desirable, substituting native hardwoods for conifers, or ringing each forest compartment with a belt of deciduous trees would not, in itself, make an attractive landscape. It might even underline other defects.

The conference expressed a hope that the co-operation of interested bodies

could be enlisted to consider the publication of a jointly-prepared booklet giving advice on the landscape-design aspect of forestry, and seek support for a survey of Britain's natural resources from which might arise regional land planning and multiple-use development programmes.

FORESTRY AT THE JOHN COLET SECONDARY SCHOOL, WENDOVER, BUCKS.

By

JAMES W. CRICK, M.A., F.R.G.S.

Headmaster of the School

All school work must be real, and to attain this as much use as possible should be made of the environment. Our forestry course is not just a "flash in the pan" where, as a means of escape and of using up excess energy, boys are turned into the woods to chop down trees and play hide and seek! Neither is it necessarily a vocational course, aimed at producing recruits for the Forestry Commission, though some lads may, if they wish, proceed into the industry on leaving school.

It is a serious attempt to use the woodland as a medium for the advancement of knowledge, and includes the practical aspects of forestry itself; it embraces quite a considerable amount of geography and history; it makes botany and zoology really alive and interesting; it encourages the creative urge in arts and crafts, and it affords useful practice in the application of English and mathematics. The various aspects are not merely correlated. Each forms an integral part of the comprehensive study of forestry.

In general it may be said that the objects of the course are both educational and social. Apart from providing a new stimulus and opening up new vistas of activity, it also helps the pupils to appreciate trees and woodland life generally, and acts as a very strong deterrent to vandalism, especially to young trees. Although one's own woodland is to be preferred, quite a number of the activities could be carried out in a local park or copse, indeed along a wayside hedgerow. I am astounded, indeed quite aghast, at the way much of our "natural heritage" is neglected by schools in their studies of rural science. Untold fields of research are waiting to be explored and yet to many, many schools, rural science means just one word—"gardening"—and allotment gardening at that! Gardening *is* important, but to my mind rural science should be based on at least four aspects —gardening, forestry, farming, and the keeping of animals at school. Maurice Foulger and I have introduced all these at our school, and the forestry is studied in association with farming by the fourth-year boys.

After several years' negotiation with the Forestry Commission we were able to select our four-acre woodland site, about 1¼ miles from school, and indemnity forms were duly signed by the Local Education Authority and Forestry Commission. We wanted an area easily accessible, even in wet weather, within fairly easy reach of school, large enough to offer a variety of activity—physical and mental!—and one which would present immediate natural interest by possessing "contrast", for example some open areas, various types of plant life and so on. Tuesday afternoon was selected as the most convenient session, both for ourselves and for our local forester, Gordon Axten, who was authorised by the Forestry Commission to help us.

My own childhood was spent on my family's farm and we had several areas

of woodland which we maintained. I found this experience invaluable when we took over our school site in September, 1960. We immediately began to fence it in and to erect bird boxes which we had made in the woodwork room. Incidentally, we now have forty of these in position, all carefully numbered and plotted, including two large owl residences.

A survey of the area was carefully carried out, using such things as a measuring chain, magnetic compass, and plane table equipment, and at the same time a start was made on plotting the flora and the tracks and homes of fauna within the woodland. We quickly realised that we would need some form of permanent shelter. We selected a secluded spot well away from the public eye, and planned and began to build a fairly large log cabin, as yet not completed. Our forestry practice has included "round the calendar" activities, such as nursery work, planting young trees, cleaning, brashing, and thinning, forest protection against fire and pests, felling and extraction of timber, the recognition of all sorts of trees and plants, and visits to nurseries, sawmills and furniture showrooms. We have also witnessed the felling of large trees and have started a forestry nursery plot on the school premises.

Timber-measuring interests the boys very much. We measure the heights of usable timber in our trees with various types of home-made hypsometers. Then, with quarter-girth tape and Hoppus tables, we find the volume of the timber in each tree. This volume measurement obviously also incorporates the different uses to which the wood from various trees is put, and tree recognition once more enters the picture. Bark rubbings, tree shapes, bud, twig and leaf collections are carried out by all the boys in pairs and diaries kept up-to-date.

It will be apparent that the amount of natural history studied is practically unlimited, depending on the time found to be available, weather conditions and the season of the year; but such obvious things as line and quadrant surveys and plant succession find their place. The collection and analysis of disused birds' nests and their contents is quite exciting.

At regular intervals we spend the Tuesday afternoon at school. As well as attending to our nursery plot and diaries, we examine the part played by trees in our modern economy, and we peep into the past to trace the history of forests and timber in Britain through the ages, leading to the evolution of the Forestry Commission. Compositions, both oral and written, sometimes accompanied by illustrations, are readily forthcoming when based on the woodland work. Last year, the collection of an anthology of poems and prose on trees and forest life was made, and these were read amidst the woodland itself, the effect being quite extraordinary and very worthwhile. The boys sometimes paint in and around the John Colet Woodland, and have done some simple sculpturing from unearthed chalk. Plaster casts of animal spoors in the snow have also been made.

Back at school we also show films and filmstrips and have collected an ever-growing library of books, poster-diagrams, photographic records, and specimens. The boys have also spent, both in 1960 and 1961, a week with us at Shortenills Camp School, specialising in the study of trees. Here my old college friend, Horace Hinton, an absolute fount of wisdom in botany, has more or less carried us along, and the camp warden has been immensely helpful. The trees at Wisley Royal Horticultural Society (Headquarters) have also been studied by both groups of boys.

It has become obvious to me during the first two years of this course that enthusiasm on the part of the teacher is as important, indeed, probably more important, than a highly specialised knowledge of every facet of the work. The latter will come with experience, and, in the meantime, one should always

call upon the services of experts in various fields of study to help out where necessary. Maurice Foulger and I cannot speak too highly of the help given us by Arthur Christie, the Forestry Officer for the Chilterns, and by his forester. They have helped us, not only by their knowledge and advice, but by lending us tools and equipment. We are gradually purchasing our own equipment, and are allowing a small sum in each year's financial estimates. Forestry now has a firm place in our rural studies curriculum, and, judging by the enthusiasm of the boys and the obvious benefits they derive from it, there is no reason why it should not remain so.

OPENING OF HENDRE DDU LOG CABIN FOR THE OUTWARD BOUND SEA SCHOOL, ABERDOVEY, 11th MAY, 1962

By

J. HAMPSON

Divisional Officer, North Wales

The Outward Bound Sea School at Aberdovey was founded in 1941 as the first of five Outward Bound Schools in Britain, the others being at Burghead, in Morayshire, at Eskdale, and Ullswater, and in Devon. It was originally started on the advice of Kurt Hahn (of Salem and Gordonstoun associations) as a course of training in survival for merchant seamen of the 1939–45 war.

The schools are now intended to give boys from all walks of life an opportunity for training through the sea, mountains and other natural elements: as a means of discovering and developing their own capacity to face hazards, difficulties, hardships and emergencies of all kinds under adventurous conditions. Such conditions demand self-discipline and teamwork and the training is carried out under discipline of picked instructors. Though aiming to train average boys to become good citizens, there are opportunities for the development of leadership and other qualities which some are able to discover in themselves for the first time.

The courses are residential, last for 26 days and are open for boys of normal physique, aged 15½–19 years, of a diversity of occupations and nationalities. The schools are based on a Christian foundation but without sectarian or political bias. They are sponsored by over 600 business firms and by local education authorities, youth and religious organisations, public and grammar schools, and by the parents themselves. The present setting-up on an increasing scale of similar "adventure training" centres by schools and local authorities may be regarded as an indication of the value and success of the original Outward Bound School idea.

The Aberdovey School is well situated in the south-west corner of the Snowdonia National Park for the main activities of seamanship, athletics and expeditions. There are also arrangements for co-operation with the Merionethshire County Fire Service, and, since 1956, with the Forestry Commission at Dovey Forest—where the District Officer at the time, Mr. E. J. M. Davies (now Divisional Officer, West Scotland), was a prime mover in getting the scheme started.

Each course normally spends four days on trek throughout the year in all weathers in the Dovey Forest area, and undertakes any work which offers suitable opportunities for self-discipline, teamwork and adventure under instruction by Outward Bound and Forestry Commission staff. Such work has included the construction of dams for fire protection water, high-pruning of trees, and the felling and extraction of timber. The school provides a mobile forest fire-fighting team on call day-and-night and the Forestry Commission give a

general talk on forestry to each course once a month. In these ways the Forestry Commission will help to instil into some of the youth of the country (many of them from urban and industrial areas), a forest sense and understanding of rural life and values in the wilder parts of Wales. To date 18,000 boys have passed through the Aberdovey School and the courses have undertaken some 5,000 "boy days" of training work in Dovey Forest since 1956, when the association began.

The log cabins are used as bases for expeditions and training work in the forest area. Much was learnt about constructional and aesthetical details from the first two and as a result it was decided that the third and latest, which has been opened at Hendre Ddu, would be a genuine log cabin constructed of round logs with traditional notched corner joints and caulked seams. The Outward Bound Trust and supporters supplied manufactured materials such as the windows, linings and Canadian Western red cedar shingles for the roof. The Forestry Commission provided all the other timber from Dovey Forest, including the logs, which came from a stand of Western red cedar (*Thuja plicata*) planted in 1930. This timber was chosen because it has a natural resistance to decay similar to that of oak, larch and teak.

The design and supervision of the work was done by the Forestry Commission estate Clerk of Works for the area (Mr. W. E. Griffiths) in close consultation with the Outward Bound School Warden (Capt. J. F. Fuller) and the Forestry Commission District Officer (Mr. R. C. Stern). The walls were assembled at a wet-weather work shed in Dovey Forest, numbered, dismantled and re-erected on site. The actual work of construction was done as a part-time job by Forest Worker B. Breeze, assisted by Outward Bound boys when available. The result is a truly joint effort by the Outward Bound School and Forestry Commission.

THE NEW SHEPHERDS

By

EUROS JONES

District Officer, South Wales

The mountain road from Tregaron to Abergwesyn is narrow, tortuous and hilly, but takes the traveller through some of the most magnificently compelling mountain scenery in Wales. The mountains, bleak and forbidding, are sparsely populated today, but full of history and romance. The one good road through the area was until very recently a dirt and mud track in many places, and extremely dangerous to any modern vehicle as several unwary motorists found to their costs, but very much a part of this history.

Some 200 years ago this very road was regularly used by the Welsh drovers as their main link from the collecting area in the Cardiganshire plains, and was the start of the long walk for cattle, sheep and men to the markets of England, oftentimes going as far afield as the Smithfield itself.

Then, as now, the last resting place before taking to the tortuous hills was Cwm Berwyn—its large accommodating house and rich green fields providing the final comfort and replenishment for man and beast before the long journey. A focal point, therefore, in one of the country's major industries of the day.

But the last drover closed the Cwm Berwyn mountain gate behind him nearly 100 years ago. Since then the old house has stood a lonely vigil, guarding the only entry into the hills beyond, and, apologetically almost, developing into

one of the biggest sheep farms of the locality. Like so many other farms in the area, however, the owner lived some considerable distance away, relying on a hired shepherd to tend the flocks and who, as part of his wages, was allowed to occupy the house and to keep a cow and a few hens for his own and his family's use.

In 1954 Cwm Berwyn was purchased by the Forestry Commission, and in 1959 when the land was being resumed for planting, Jenkin Davies (universally known as "Shanco") was over 60 years old and had been the shepherd at Cwm Berwyn for exactly 30 years. In a rather chequered earlier career, after serving an early apprenticeship as a shepherd, Shanco had spent several years at the coal face in one of the Neath Valley pits, until the call of the mountains became too strong and back he came to marry and settle down as the shepherd of Cwm Berwyn. The sheep and the mountains were his whole life throughout this period and his own contentment and industry were the cornerstone of a large and happy family.

It was indeed a major upheaval for Shanco when the Forestry Commission took over Cwm Berwyn for planting. What did the future hold for him now that his traditional way of life, to which he had given so much, was to be replaced by a strange new one; when his beloved sheep were to be replaced by serried ranks of Sitka spruce, and the bleating of his flocks would give way to the raucous din of the tractors ploughing the slopes where he had done his lonely shepherding so well and so faithfully for so long?

Some months before the final take-over I spoke to Shanco to see what his plans were, if any. His employer for 30 years had no further use for him. At 60 years of age did he wish to remain a shepherd, but in another post? Did he wish to retire altogether? Or would he like to stay at Cwm Berwyn and throw in his lot with the new regime.

The chance to stay at Cwm Berwyn was all that Shanco wanted. I think we both may have had some misgivings at first as to whether he would be able to adapt himself and become a fully-fledged forest worker and in every sense one of a gang. But there was no turning back now, his name was added to the list of over forty workers already at Towy Forest and one fateful Monday morning he joined the gang that had already started to fence the Cwm Berwyn mountain.

That was nearly three years ago. What of Shanco the old shepherd today? His love of the mountains is unabated, his knowledge of sheep and his skill in the saddle of his wiry mountain pony are quite undimmed, and he is still in constant demand at the local sheep gatherings, particularly, of course, on shearing days.

But he is, also, the proudest, most fiercely loyal of all the proud and loyal men that work at Towy Forest. His pride ranges from the fact that for the first time in his life he is a rightful tenant in his own right, with 36 fine acres to call his own, to the magnificent Sitka spruce now growing in a hallowed spot on the Cwm Berwyn mountain—the first tree planted on Cwm Berwyn, the first tree planted by Shanco.

His house, solid but almost unchanged over the centuries, has been extensively renovated for the first time in its long history, and the luxury of a bathroom will be added later this year.

His knowledge of the mountains has been invaluable to his forester and as he was once a pillar among the local shepherds, so is he now a tower of strength in the local forest structure. Indeed one of the cornerstones around which the Cwm Berwyn plantations of Towy Forest have been formed.

GAME FAIR, 1962

By

J. D. CAMERON

District Officer, South-west England

For the past five years, a game fair has been organised by the Country Landowners' Association as an annual event on some private estate. As the Commission is participating each year, it may be of interest to describe what it is and why.

In this functional age, the Game Fair is one of those rare things that sets out, not to make money or do good, but just to give pleasure—not to promote trade or a crusade, but to provide an opportunity for people with a common interest to meet together in a congenial setting. Here the common interest is in field sports, particularly shooting, fishing and falconry.

The fair, which lasts for two days, consists of demonstrations, competitions and exhibits. The demonstrations include the working of falcons and dogs; the competitions include clay pigeon and small-bore rifle shooting, fly casting and gun dog trials. There are trade exhibits, but these are confined to firms closely connected with sport, and there is the feeling that they are there to entertain the visitors rather than to promote sales. Apart from a line of booths offering such things as fishing tackle or sporting books or clothing, the greatest part is given over to rearing equipment, or to the Gun-makers Row. Non-trade exhibits are staged by organisations such as the Council for Nature, the Wildfowl Trust and the St. Hubert's Club. I.C.I. Game Research Station (Fordingbridge) have a major stand, and finally the Ministry of Agriculture is represented jointly with the Commission.

In 1962 the fair was held on the last Friday and Saturday in July, in the Marquess of Bath's park at Longleat, near Warminster in Wiltshire. The park forms a long valley, flanked by beech and oak woodland, with a line of artificial lakes down the centre, near which is the mansion. The fair was spread out in this fine setting, with none of the congestion of an agricultural show. Here the promoters were anxious only to cover costs, as they apparently did without difficulty, and to avoid swamping the competitions and catering by attracting too large a crowd. The atmosphere was rather that of a country point-to-point—not Epsom Downs on Derby Day.

The responsibility for organising the Commission's contribution this time fell on the South-west Conservancy, with much help and advice from the New Forest. The preparation of the exhibits was largely in the hands of the Game Warden, and further help came from the nearby Wiltshire and Dorset forests. While the Ministry of Agriculture were concerning themselves with pigeons and rabbits, the Commission's side was deer and squirrels—fallow had been the theme in 1961 in the Midlands, and on the Wiltshire/Dorset borders, roe was the obvious choice.

A description of the exhibit may be of interest to future organisers. One end of the main (70 ft. by 30 ft.) tent was reserved for the Ministry (30 ft. by 30 ft.). A lined 30 ft. by 30 ft. was set up behind as a cinema which was operated by the Ministry; the squirrel film seemed to be the "main attraction". Outside, there was about 100 ft. square available, and the space overall proved very suitable.

One side of the tent was devoted to squirrels, presided over by Mr. Legg. The rest dealt with deer in three sections: introduction, biology and control. All material was mounted on peg-board, with plastic letters for the main notice, the boards being 4 ft. by 4 ft., by 6 ft., or by 8 ft.

With the introductory notice was a board carrying heads of red, sika, fallow, roe, muntjac and Chinese water deer. The four main species were illustrated by reproductions of Mr. C. Tunnicliffe's drawings, three of which were made for the recent revision of the New Forest guide, and a fourth, most courteously, to make up the set for this display.

Biology was dealt with in an illustrated diagram of the life-cycle, and boards showing (*a*) antler, skull and teeth variation with age, and (*b*) annual antler development.

Control included advice on how and what to shoot, followed by some sad specimens from injured fallow deer of the results of unsuitable weapons (from Cannock Chase) or of snaring (from the New Forest). The last two boards carried (*a*) unusual heads—freaks or injury/disease effects, and (*b*) a selection of handsome roe heads from Commission forests.

Two other boards were devoted to photographs, and a third to introducing the outside section. It was hoped that this, and a staff of guides, would obviate the need for many outside notices, but as the public prefers to enter at exits or climb over fences, this proved to be a mistake.

A mock plantation was used for types of damage, varying susceptibility of tree species and the idea of leaving favoured or suitable fraying stocks when cleaning. Deer-fencing and high-seats completed the area. Particularly commended was a small plot of carefully prepared and labelled sand, on which were shown slots and fewmets of the main species of deer—clearly the result of much patient stalking in a deer park near Poorstock, armed with a bucket and spade.

Several members of the staff engaged on deer control came to Longleat, and while helping with the stand, found it a useful opportunity to exchange information. But there were also a number of other Commission visitors to the fair, including a party of workers from Savernake, and all seemed to enjoy it—a commendation to all with an interest in country pursuits to visit the fair if the opportunity occurs in future years.

VISITORS AND VISITING: A FORESTER'S OTHER DUTIES

By

T. L. JENKINS

Forester, Delamere Forest, North-west England

Since our forests are being used more and more by members of the public for recreational and educational purposes, perhaps some record of how this increasing traffic affects our man in "so-and-so" might not be out of place.

The first category of visitors may be classed as "well-informed", and are groups of university students, with or without tutors, or perhaps societies, many with a scientific bent. These are usually sympathetically inclined because they realise the scope of the subject, and how many questions the poor chap leading them around is quite unable to answer. One suspects that in their own chosen profession a similar state exists, and a bond of sympathy is forged. If the party is working to a fairly tight schedule and has no time to waste on the niceties, the doyen of the party will usually ask one searching, ruthless question which serves as a marker for further interrogation. This is useful because you both know where you stand.

On the next and slightly more difficult level are training colleges and gram-

mar schools where the budding specialist, be he sociologist, botanist or economist, has no inhibitions concerning the comfort of the speaker. He is lashed mercilessly with questions from Petersburg Standards to pH . . . or, alternatively, listened to in dead silence, which is even worse because it gives him a sort of trapped feeling when he realises that his intonation, diction and approach to subject are all being closely analysed, and the conclusion reached that he does not measure up to approved teaching standard.

But the most difficult of all parties is that party of primary school nine-year-olds who have been compiling questions for the previous month in preparation for the eagerly-awaited tour, and are going to have to write "a composition" when they return. No pulling punches here. They want to know what *makes* annual rings, and in terms that little Mary, who has few annual rings herself, can understand. On a bad day you are soon rumbled, and the party degenerates into a cone-gathering expedition, and you admit defeat. If you get away to a good start, answer some tricky questions and produce a test tube of very small seeds at the right moment, the day is crowned with glory and you sit by your fire at night a rewarded and satisfied man.

Then, of course, there is the casual visitor who, complete with car and picnic equipment, seeks quiet enjoyment under the most unsilvicultural tree possible. He is rarely any trouble, and the occasional offender constitutes such a small percentage of the total as to emphasise the good behaviour of the many thousands of people who walk and sit and eat their sandwiches, throughout the year, winter and summer, among the trees of this forest situated on the edge of a great industrial area.

An important part of the work, however, consists in taking forestry to the people, as it were, and much of this involves speaking at local institutes, guilds, and societies of various sorts. One is usually asked beforehand to give the talk a suitable descriptive title that can be announced to the audience, and I have been able, to date, to restrict this to the indubitably respectable "Forestry in Britain". "Tea and Forestry" would ring the changes and would probably be more accurate, but it has unfortunate associations. The talk is usually aided by coloured slides and tree and cone specimens, and there are now, I hope, housewives in this county who are at least as well-informed on brashing as I am on jam-making and flower arranging.

On looking back over what I have written, I feel that the subject perhaps calls for more serious treatment than I have given it. To make some amends for this I would like to end on a less flippant note, and say that over the past few years I have talked forestry to a good cross-section of the community, and almost without exception they have been enthusiastic about our work and interested to know more.

REFLECTIONS OF AN AUDITOR

By

W. E. REYNOLDS

Clerical Officer, H.Q.

I studied the fresh notice on the board carefully. "Applications are invited . . . . from male staff . . . . for vacancies in H.Q. Finance Branch travelling Audit Teams." I had been in my present job long enough and, much as I liked it, I realised that the time was overdue for making a change. I prided myself that I knew a little about most other branches of the Commission but finance was something of a mystery to me, in fact I knew woefully little about

it. However, I had ten good fingers so I knew that I could add and that I could subtract. Besides, the prospect of travelling around and actually seeing something of the various conservancies rather appealed to me; also I knew that at least one of the vacancies had arisen because a previous auditor had been promoted.

I decided to find out more about the job. "What is it like being an auditor?" I asked, button-holing a member of the audit staff a few days later. "Oh, it's alright if you like travelling around," he answered, "for instance, I am off to the Northern Conservancy next week and they sell the finest bitter I've ever tasted up there." So far, so good. "Do you think I would like being an auditor?" I asked another member later in the day. "Well *I* think it's a grand job," he replied, "and I am sure you would like it too, Tubby. I am going to the Southern Conservancy next week and do you know that in their luncheon club you can get the best dish of rice pudding in the whole country." Well, I had heard nothing to put me off so far. "What do you actually *do* on audit?" I asked yet a third member of the staff the next day. He was a young man and looked at me in mild surprise. "Why we check the ledgers of course," he answered. "I am looking forward to my trip west next week; they have a gorgeous blonde cashier down there, phew what a beauty!" And he proceeded to illustrate by outlining with his hands what I could only imagine to be 44–26–38. Well, I guessed the job had something to do with figures anyway and my informant's remarks had finally convinced me that this was the kind of work I was looking for.

That evening, I took home a bunch of flowers and began softening-up my wife. I explained that in order to gain more experience and perhaps further my career, I ought really to seek a change of duties. She listened intently whilst I explained about the vacancy that had arisen in the Audit Section, and I was doing rather well until I came to the part about being away from home. At first, her answer was emphatically negative. Eventually, however, after I had explained that I would not be away every week and that during those weeks I was out, it would only be from Monday morning till Friday evening, she relented a little. I warmed to my task. After all, the children were fairly grown-up I coaxed, certainly of an age to be company for her; I would be well looked after whilst I was away I assured her, telling her about the beer and the rice pudding. I saw no point in mentioning the cashier—after all, that young lady might have had a change of duties before I travelled west and then I would have been made to look a liar! Finally, after I had somehow been inveigled into promising to buy a new television set, my wife gave her blessing and I duly put in my application.

I was pleased to learn that I had been accepted and was given a reporting date. In the interim, I looked in on the auditors as often as possible. "It seems a very friendly section," I remarked to my colleague after one of my visits. But he was a cynic. "They have to be friendly amongst themselves. You don't imagine an auditor has friends except other auditors, do you?" Nevertheless, the audit section seemed just as chummy as ever when I reported for duty on the Monday appointed. "Welcome to audit," greeted the H.E.O., "let me see, I will give you a nice easy conservancy to start with; go and sit in with Ernie, he will show you what to do". I took my place next to the officer indicated. "I'm glad you are with us this week," he said briskly, "we are auditing one of the heaviest conservancies of the lot and can do with some help." I let this difference of opinion pass without comment for now Ernie was pointing to a formidable pile of documents. "As you can see we will be checking the A.117's, the A.118's, A.39's, A.136's, A.125's, A. 109's, A.177's and the A.36's." "Eh, what?" I asked, my mind in a whirl, but Ernie, misunderstanding my lack

of comprehension, had asked me to pass him the A.121's. I looked at all the documents with something akin to despair and hopefully passed him a bundle of papers consisting of about eight pages of closely-typed foolscap. "No, not those, they are our instructions," explained Ernie patiently, "I want the papers there with the green lines on 'em."

That first week, the time sped past like clockwork. There was plenty to do on, what to me, was a bewildering array of documents. Check this. Cast that. Verify, ensure, ascertain, enquire, agree. By Friday I was in a complete daze. How *anyone* could ever get the hang of it all, I failed to see. During that week I had thought of nothing but audit and at night I had dreamed of nothing but audit. I found myself casting columns of figures on buses and trains, and began to develop a little blue tick in my right eye.

I learned that auditors work as a team consisting as a rule of one E.O. and one C.O., and although the E.O. is naturally in charge of the team, there is no hard and fast division of duties; each officer is expected to be capable of performing all the duties required as there is precious little that is "purely mechanical" about audit. "Of course, the real work starts in the conservancy," said Ernie, cheerful as ever, "so don't miss the train on Monday".

That week-end I dug my garden to rhythm, debits on the left, credits on the right; debits are in black and credits are in red; fences new, a/c one, one, two; and when my wife called lunch I checked my garden equipment carefully ensuring that all the tools were there before going indoors.

Determined not to be late on the Monday, I arrived at Paddington with threequarters of an hour to spare, then five minutes before the train was due to pull out the other two members of the team arrived and we were on our way. I listened to their conversation in the train, my eyes shining with admiration as they spoke easily and confidently about "debtors", "suspense", "capital", "account numbers", etc. We arrived at the conservancy just before lunch and I was introduced to the accounts section staff. Somewhat to my surprise, they greeted us cheerfully enough and seemed genuinely pleased to see us. I could detect no trace of anxiety or apprehension amongst the staff, just a certain amount of good-natured leg-pulling and affectionate enquiries concerning the health of "old Charles", the erstwhile travelling auditor who had decided to spend the remainder of his time before retirement, in London. After lunch, when we had been made as comfortable as possible in the conservancy waiting room, we were off again. "Get me the revenue ledger please," said Ernie. I walked boldly into accounts and made my request. "Yes, certainly," said the clerk obligingly, "do you want Rev. 1, Rev. 2, Rev. 3, Rev. 4 or Rev. 5?" I could have wept. Instead I went back and meekly enquired which of the revenue ledgers we wanted. "Oh yes I should have told you," laughed Ernie, "Rev. 3 we want". I managed to secure the right ledger at last then we checked, cast, verified, and proved the entries as per instructions. "Now get the capital ledger," said Ernie when we had finished. "Which one?" I shot at him quickly. Ernie raised his eyebrows in surprise, "there *is* only one of course," he answered plaintively. "Of course," I agreed and hurried away on my errand. I thought that the first week had gone quickly, but the week we were out, the time absolutely flew past. We checked the cash book, the other revenue ledgers, the petty cash, the valuables book, the bank statement, the receipt sheets, the rent debtors, the oustanding invoices, the control accounts, the totals account, the A.100's, the suspense ledger, the debtors' ledger. Our queries seemed to necessitate visits to all sections of the conservancy. I learned that in the cash book debits became credits and credits became debits. I learned that financial accounts related to the trading account and that Parliamentary accounts were proper to the appropriation account, that the financial year ended in September

but the Parliamentary year ended in March. I learned what account numbers were and that standard heads had nothing whatever to do with the Navy—in short, I worked, and worked hard. When I staggered into bed on *that* Friday, safely home once more, I was sound asleep almost before I had calculated my subsistence rates!

All this seems a long while ago now and I am practically a veteran in the Audit Section today. I regret to say that I have never yet met a blonde cashier but my knowledge of the Commission and its workings has increased immeasurably in the past couple of years. Audit work is not confined solely to the Accounts Section. The range covers every aspect of Commission business. I have been on rent audits, Establishment Section, progress report, P.V. and M., Produce Section, Stores Section, Private Woodlands Section and balance sheet audits. I have visited various estate workshops. I have been to Brandon produce depot. I have checked sub-accountants' cash accounts out in the "field". I have audited the stores held at divers repair depots—Haldon, Lightmoor, Castlemain, Lyndhurst, Santon Downham. I have carried out conservancy bank reconciliations. I have checked items I had never really thought about before such as telephone bills, meal vouchers, pension payments, etc. The work is varied and interesting at all times because the duties of an auditor are so wide that the job itself cannot possibly become dull. It is fascinating work, demanding yet at the same time rewarding. There is a wonderful feeling of freedom about the job insofar as supervision is at the minimum, all officers have a job to do and are kept so busy that teamwork becomes natural.

Personally I have made many friends in the conservancies—well I think I have—and in some offices I am referred to (affectionately I hope!) as the Chubby Checker. Work apart, I have enjoyed many a pleasant evening out with members of the staff. I have been boating on the Wye, on the Severn, on the Cam, on the Dee; spent wonderful times in the glorious Wye Valley; toured the countryside around Thetford; visited Torquay, Rhyl, Brighton and Bournemouth after working hours; I have explored the city and walked through the college grounds at Cambridge. I have strolled through the fascinating Shambles at York, marvelled at the terrific sense of height one gets from the Clifton bridge, gazed in awe at Epstein's Christ in Majesty in Llandaff Cathedral, seen the splendour of Lake Vyrnwy, and bought cigarettes in Shrewsbury from a shop bearing the delightfully improbable name of Pelican Snelson. I have stayed in lodgings ranging from the supreme (ask any auditor about Cambridge) to the downright seedy. I have tramped through the slush in winter and rambled through the forest in summer.

I am not trying to justify the job to myself, neither do I get a shilling for each new recruit—I have simply related life on audit as experienced by me. To any officer contemplating joining the staff I would advise him to be prepared to work like a steam engine and not to insist too much on "conditioned hours" at the distant office. He must be ambassador for the Controller of Finance, diplomat, advisor, and sometimes even act as an arbiter, always bearing in mind the fact that staff in the conservancy know far more about their job than the visitor. He must be quite sure of his facts and put his queries very carefully. I well remember the time in my early days when I discovered that the Produce Section had undercharged an invoice by a shilling or so. I was jubilant (quite the wrong attitude, as I realise now). I marched happily into the section and asked the clerk if he agreed that there had been an undercharge. He checked, frowned, and re-checked the figures, and finally, to my delight, he admitted that he should in fact have charged a few pence more. "Well, what do you want me to do about it?" he questioned drily. The invoice in question was nearly four months old and I was completely deflated. *I* did not know what he was supposed to do about it; I just did not know enough about my own job, much

less his. I went away crestfallen but I had learned my lesson. The auditor must learn facts for himself and because time is all-important he will receive the minimum amount of training. For the first twelve months he will be learning the job; after that he will still be learning. Being an auditor is more than just a job, it is a challenge!

The complement of the audit staff does change, of course. Thus it was that recently, when a newcomer joined the section, I was instructed to show him the ropes. "Right," I said, "now here are all the "A" forms which we check," and as I named them "A" this, "A" that, "A" the other, I pointed to each pile in turn. "Now just pass me the A.177's and we will get started," I said briskly. "The 'A' what?" asked my pupil blankly.

The wheel had turned full circle.

CHANGING TIMES

By

R. J. JENNINGS

Head Forester, Dean Forest

The huge oak shook perceptibly with each blow of the woodman's metal sledge. Then, as the steel wedges were driven still further into the dark brown heartwood, dead twigs and thin strips of dry bark rattled through the branches. A final stroke of the sledge with its ringing crack . . . and the great tree shivered and fell, a long creaking groan as of protest coming from the mouth of the saw cut which opened wide as the tree crashed to the ground; a sudden draught caused by the massive crown as it whipped into the undergrowth flicked up dead leaves from the forest floor. Once more the woods were silent save for the harsh cry of a jay, and the whisper of a flock of long-tailed tits working their way through the tree-tops searching for food.

The woodman put down the sledge and took a watch from his pocket. "Good going," he said to his mate, "four minutes flat". Then, pointing to a chain saw at the foot of another tree, he turned to me. "Wonderful machines these chain saws, boss. Make no mistake, they're here to stay. There's close on three hundred cube in that stick . . . that butt is over four foot through. A couple of years ago would have seen the four of us pulling our guts out on our knees for an hour or more with a cross-cut to fell a tree that size. And spurring in and taking out the sink on a butt like that would have taken up half the morning. Thank the Lord timber-felling isn't the hard graft it used to be. Mind you," he continued, as though to correct any wrong impression he may have given, "it's all a matter of skill, like it always was. Felling timber like we handle is no mug's game. That saw weighs nigh on thirty pounds and kicks up a tidy chirp as you'll hear in a minute when my mate starts it up. It's no joke when that thing's rattling in your ear all day. Of course," he went on, "we take it in turn on the saw . . . we fell four or five trees and then go on trimming out the tops with our axes and ranking up the cordwood while the man on the saw takes off the big limbs. A bit different to the old days when you were a lad and we all used seven-pound axes, isn't it? Times are changing!"

I had worked with these men as a youth and recalled the methods and tools of nearly thirty years ago when the seven-pound axe was the order of the day and compared it with the axe he was using now—a small, light English felling axe weighing four pounds. The design of the tool was the same, but here he was using an axe that he would have despised as a child's toy several years ago. The woodman saw me looking and must have known what I was thinking.

"Never use anything heavier nowadays," he said. "The chain-saw does all the hard work. Of course we had to use seven-pounders to spur in some of the old oak and beech we used to cut . . . with spurs and roots three or four feet high you had to have a bit of weight to get around them. All the same, I shouldn't want to go back to all axe work now . . . 'twould kill me."

Some weeks before, a photographer had visited us in connection with a film that was being made for television. He insisted on having the tree felled with an axe and cross-cut saw. "If anyone asks why you are doing it this way," the photographer had said, "tell them that your saw ran out of petrol". "Hurry up and get your photographs," said the woodman, "or I shall be telling you as I'm running out of breath!"

"Of course," said one of the cutters, "the locals don't like the chain-saws. Reckon they make too much noise. We got into trouble the other week when we were working near Whitecroft. Chap worked at the Princess Royal colliery who was on nightshift. His missus complained that he couldn't sleep when the saw was running. It isn't that really though that they don't like. What really bothers them is that the power saw leaves no chips. When we used axes for laying-in we'd cut off chips as big as dinner plates. All the old women would be here with their prams, sacks and push-carts like a lot of ants . . . they'd be backwards and forwards all day. Mind you," he said, "we used to get a fair drop or two of cider from them. No cider, no chips we used to tell them! Course some of it you couldn't drink. There was a chap from Pillowell used to make a drop of good cider . . . Stunnem they call it round here. His missus brought a bottle one day and asked us what we thought of it. 'Well,' said Frankie, 'I suppose it's just about right for us'. 'What do you mean, right for you?' she said. 'Well,' said Frankie, 'it if had been any better we shouldn't have got it, and if it had been any worse we couldn't have drunk it!' But you know it doesn't do to drink much of that kind of stuff on this job—it's pretty strong . . . it doesn't bother your head—it's your legs that go first!"

The woodman was quite right about the chips. There are no chips to be collected after the chain-saw: some of the spurs that are cut off weigh a half-hundredweight and are far too large to be handled by old-age pensioners.

Suddenly, with an ear-splitting whine, the chain-saw sprang into life as the cutters began trimming-out the oak. Each limb had a cut several inches deep put into the lower side, then with great skill and speed the chain was pressed down into the wood until the severed limb dropped to the ground. White strips of wood, for all the world like a shower of macaroni, flew from the cutting edge of the chain as the metal tore into the wood. "A bit different to the old way when we cut up our cordwood by hand," said the woodman as we moved away from the din of the engine.

A bit different . . . yes—but aren't most things a bit different in the woods these days? And isn't it just as well? Before the tractor was employed a team of struggling, sweating horses would have dragged the log out to the ride to be loaded on to a carriage. Up to their bellies in mud, the creatures would have jerked, snatched and heaved until they could hardly stand, kept active by a man with a whip; straining at their collars in unison until the timber carriage was at the sawmill was a killing job for a horse. Nowadays, with little ado, a skilled driver with a crane can extract his logs without tearing up the rides, and he has no need to shout at the tractor. Swearing at it is quite sufficient.

I measured the logs and looked at my watch, it was five o'clock. The cutters packed up their tools and, bidding me good day, walked to the road. In a moment or two they were on their way home in a modern saloon car.

I stood for a while admiring the sunset and recalled the timber-cutters I had

Plate 1. A last look at the Newland Oak, Forest of Dean. Once the stoutest tree in all Britain, at 47 feet 6 inches round, this mighty tree collapsed in 1956.

Plate 2. Old days in the Dean. Charcoal burners on Tidenham Hill, in 1928.

Plate 3. In the days before Work Study. A Scottish tree-planting gang in the 1920's. Planting bags have not yet been thought of, so the Foreman brings up the trees on a hand barrow.

Plate 4. Part of the Forestry Commission's exhibit at the Game Fair, Longleat Park, July, 1962.

Plate 5. A Dean Craftsman, about 1925. He made hurdles, chair legs, and barrel hoops. His round hut, built of poles and thatched with wood shavings, is built on a plan unchanged since Neolithic times.

Plate 6. The Hendre Ddu Log Cabin in Dovey Forest, North Wales.

Plate 7. Planting trees to mark the opening of the log cabin by Sir Geoffrey Miles, K.C.B., K.C.S.I. 11th May, 1962.

Plate 8. Coypu on land.

Plate 9. Coypu swimming.

Plate 10. Coypu and dog walking on submerged ice, after thaw.

Plate 11. Coypu, showing frostbite on webbed feet and tail.

Plate 12 Forester shows how to catch coypu alive.

Plate 13. Ernie Muller, warrener, who killed 110 coypu in six weeks.

Plate 14. Forester's children baiting raft with wheat and washed carrots, using saucepan on stick.

Plate 15. Lassie with three hour's work!

Plate 16. Coypu trap. Measuring 10 10 48 inches, simple in design and operation.

Plate 17. John Crassel, a Forest Trainee, with coypu in every trap.

Plate 18. Freezing permits entry into *Phragmites* reed-beds, normally too deep for thigh boots, with black oozy mud too shallow for boats.

Plate 19. Starved coypu, which refused to leave *Phragmites* beds, found huddled together and dead; each weighed about seven pounds.

Plate 20. The Ledmore lining-out plough at work.

known as a youth. Year in, year out, fair weather or foul, they had walked to their work along the many miles of grassy paths and rides of the Dean Forest.

As I climbed over the stile the roar of a car engine faded in the distance. As the woodman had said, times are changing.

Fig. 4. "Gnawing was good enough in grandpa's day, but not now!" (By courtesy of "American Forests").

WORK STUDY WEEK AT SOUTH STROME FOREST

Contributed by Work Study Staff

An "open week" held at South Strome Forest, Ross-shire, by the Forestry Commission's Work Study Section in autumn, 1962, provided a useful opportunity for woodland owners, timber merchants, contractors, hauliers and others —comprising about 100 visitors in all—to see something of the Commission's progress in this field. The Commission is now investigating the best methods of felling, extraction, loading and transport of thinnings for the new pulp mill which will be built at Fort William.

The operations were: felling with chain-saw, cross-cutting at stump; piling for extraction purposes; extraction by horse, with "V.S.A." and "M.S.A." sledges; extraction by Isaachsen double-drum winch; and loading 9–12 feet

pulpwood by "Hiab" Elefant and grab. All were seen as normal forest work, except that the lorry was unloaded nearby to keep it available. The whole demonstration was arranged in adjacent compartments within a radius of about a quarter of a mile.

Considerable interest was shown by the visitors and discussion indicated general approval of the lines of development. Use of the double-drum winch was regarded as representing a considerable advance. Details of equipment tested follow; manufacturers, agents and approximate prices of equipment are given, including freight, customs, etc., for imported articles.

I. Felling

Job: Fell, creosote stumps, cross-cut into logs and pulpwood, stack pulp along racks ready for extraction by double-drum winch.

Team: Two men.

Equipment: Chain-saw. Jo-Bu Junior, super model.
Plastic wedge. Bushman No. 309.
Wm. A. Meyer, 9–11 Gleneldon Road, London, S.W.16.
Plastic creosote bottle.
Halloway Containers Ltd., Bessemer Road, Welwyn Garden City, Herts.
Canthook.
Wm. Clark, Parkgate, Dumfries.
Felling tongs.
Wm. Clark, Parkgate, Dumfries.
Breaking bar/canthook, No. 1022.
Skogsdon A.B., Narravagen 3, Stockholm.
Slimline axes. Elwell No. 5405, 2 lb. and 2½ lb., 24 in. or 27 in. shaft.

Stand E: N.S. 7·1 H.ft. average tree. 580 H.ft. per acre approximately.
Previously worked:

		Average tree (H.ft.)	*Trees/man-day*	*H.ft./man-day*
Stand F:	N.S./S.S.	3·1	36	110
,, *A:*	N.S./S.S.	4·3	33	142
,, *C:*	S.S. mainly	5·0	30*	150*
,, *B:*	S.S.	5·4	21	115

*Very approximate estimate

II. Horse Extraction

Job: Extract along racks and stack at roadside using sledges.

Team: Horse and men.

Equipment: M.S.A. tracked sledge. £130.
M.S.A., Nyangsvägen 21, Bromma, Sweden
V.S.A. sledge with shafts. £60.
V.S.A., Filipstad, Sweden
} Both fitted with Swedish harness
V.S.A. hand tongs.
V.S.A., Filipstad, Sweden.

Stand B: N.S./S.S. 5·4 H.ft. average tree. 550 H.ft./acre.
Previously worked:

	Average haul	*Average tree (H.ft.)*	*H.ft./acre*	*H.ft./day*
Stand F	60 yards	3·1	360	180
,, *C*	100 yards	5·0	600	180*

III. Double-drum Winch Extraction

Job: Extract pulpwood and logs, stack separately at roadside.

Team: Winch operator and choker man.

Equipment: Isaachsen winch No. 3, with 5/16 in. diameter wire rope, ½ in. diameter wire for anchors, strops, etc., blocks, shackles, etc. £420.
Ludvik Isaachsen, Larvik, Norway.
Sappie.
Wm. Clark, Parkgate, Dumfries.
Tongs.
V.S.A., Filipstad, Sweden.

Stand G: N.S./S.S. 6·2 H.ft. average tree. 540 H.ft./acre.

Previously worked:

	Average haul	*Average tree H.ft.*	*H.ft./acre*	*H.ft./day*
Stand D	35 yards	7·1	650	390
,, *A*	60 yards	4·3	670	220*
	70 yards	2·0	300	

*Operators under training

IV. Loading

Job: Load pulpwood on articulated wagon with hoist.

Team: Lorry driver alone.

Equipment: HIAB 176 hydraulic hoist with grab. £1,000.
Manufacturer: Hydrauliska Industri AB., Hudiksvall, Sweden.
Agent: Geo. Cohen Sons & Co. Ltd., 600 Wood Lane, London, W.12.
Laxa bolsters. £100.
Laxa Mek Verksted, Laxa, Sweden.
Ranea bolsters. £70.
Broderna Vikstrom, Ranea, Sweden.
Tongs, chains, dwangs, etc.
Ladder.

Performance: During time studies of the operation the following actual times have been recorded. The potential times are thought to be possible as experience is gained.

	Minutes	
	Actual	*Potential*
1. Loading itself (12 tons)	50	45
Adjustment of the load	10	5
2. Bolsters, pins, chains and adjust hoist .	45	30
Move between stacks.	8	5
Total for 12-ton load:	113	85

MAINTENANCE OF POWER SAW CHAINS

By

D. T. PATTERSON

Forester, East England Conservancy

Sandvik chipper chains have been in use on Forestry Commission machines in my area for some two or three years. To achieve good results with small, one-man machines, the chain must be kept in first-class condition or it will impose excessive strain on the engine, sprocket and guide bar (and also, to some extent on the operator). Nothing is more frustrating or time-consuming than a faulty machine. Approximately one horse power of engine output is consumed in simply moving the chain round the guide bar, therefore there is little reserve power, in machines developing only three to five h.p., to cope with a blunt or faulty chain. A badly sharpened chain, which causes the operator to use force to make the machine cut, can lead to a broken big-end bearing and a £20–25 repair bill, apart from numerous lesser evils.

The treatment received by a chain in the first few minutes of its working life does much to determine its length of life and usefulness. There are four main points to observe if good working is to be achieved.

(1) The chain must be carefully *run-in.*
(2) It must always have adequate *lubrication.*
(3) It must be run at the *correct tension.*
(4) It must be correctly *filed.*

Running-in

Each rivet in the chain is in effect a small shaft running in a bearing. The stresses to which the chain is subject in working are borne mainly by the rivets and their bearings, i.e. the holes in the drive links through which the rivets pass. Any stiffness and irregularity left from the manufacturing processes should be smoothed away by a short period of running-in. If the chain is used at full power immediately, heavy initial wear can result.

The parts of the chain which bear on the guide bar are also subject to considerable friction and wear, and may also have small burrs left from the manufacturing processes. If the new chain is run at full speed immediately, very high temperatures can be induced in these burrs leading to friction hardening with associated cracks on the bottom surface of the links. Such cracks, microscopic at first, later enlarge and can cause endless trouble when link after link of an otherwise sound chain breaks for no obvious reason. The chain, or even the manufacturer may be blamed for this!

The running-in procedure should be as follows.

(1) When installing the chain on the machine, check the tension by ensuring that the chain can be pulled by hand round the entire length of the guide bar. Meanwhile feed plenty of oil into the chain, by means of an oil-can if necessary.

(2) Start the engine and run the chain slowly for about five minutes so that it is thoroughly warmed up, again giving it plenty of oil.

(3) Stop the machine and allow guide bar and chain to become cold; then check tension and adjust if necessary.

(4) Start the engine and make some light, easy cuts in soft timber, using very light pressure on the saw.

(5) After about five minutes of easy cutting stop, allow the guide bar and chain to become cold and then check tension.

The time required for running-in a chain is about fifteen or twenty minutes.

During the first hour of running, give the chain plenty of oil and check the tension at the end of this period. Take care never to adjust tension while the chain and guide are warm. They will contract slightly on cooling, and damage to the chain and sprocket could ensue.

Points where friction hardening is likely to take place, and where lubrication is particularly important, are shown in Fig. 5.

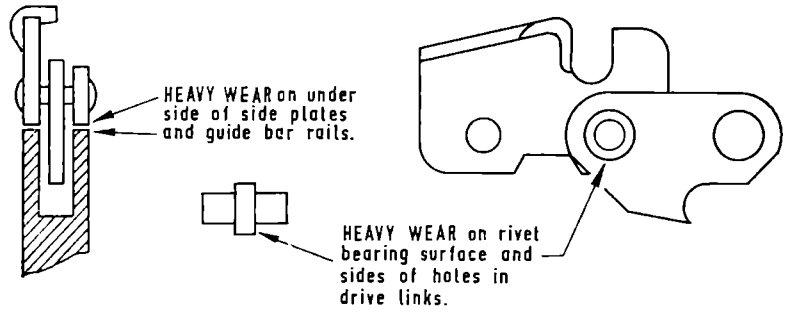


Fig. 5.

Lubrication

The chain must always be well supplied with oil, and the wisest course is to use the type and grade specified by the chain or saw manufacturers. The addition of diesel fuel to the chain lubricant is a practice of limited value. While it helps to keep the chain free of gum when working in resinous timber, dilution of the chain oil with diesel fuel may lower the lubricating qualities of the oil. To avoid this over-dilution of the chain lubricant, the quantity of diesel fuel added should never exceed 25%, and even this amount should only be used when it is unavoidable.

Old sump oil drained from vehicles is sometimes used as a chain lubricant. Such oil is removed from the vehicle because it has lost much of its viscosity and contains impurities. Despite this fact, it is mistakenly thought to be suitable for oiling those parts of a chain-saw which have the greatest need of adequate lubrication, the chain and guide bar. These parts are subject to great stress in working and should be lubricated with clean new oil if they are to give good service.

Chain Tension

This is extremely important. Run too tightly, the chain will quickly wear out due to heavy strain on the rivets and drive links. Excessive wear on sprocket and guide bar are also likely to occur. A chain that runs too loosely will whip about, damaging itself, the sprocket and the guide bar at the point where the chain is fed into it from the sprocket. A loose chain is also likely to run off the guide bar and distort in cutting, especially if there is also some error in the sharpening.

A bad tension fault is that of intermittent tightness and slackness as the chain travels round, owing to uneven wear of the chain, sprocket and guide bar. It will be found that the chain, correctly tensioned at one point, becomes very tight when pulled round a little way by hand, then slackens off again as it is pulled farther round. This development of "tight" spots on worn parts must be taken into account when tension is adjusted as, if the chain is subjected to sudden intermittent over-tightening as it runs it will soon break and can also damage the sprocket.

It will be obvious from this that lifting the chain from the guide bar at a given point is not a complete check of tension. The most satisfactory method is to pull the chain round by hand, at the same time adjusting the tension screw until the tension is felt to be correct.

Sharpening

It is best to remove the chain from the guide bar for sharpening. However, this is not always practicable as the chain, depending on the amount and type of work done, may require frequent attention in the wood. When sharpening must be done on the saw, first take up the tension so that the chain can just be moved round the guide bar by hand. This reduces the tendency for the chain to vibrate under the file. Support the tip of the guide bar against a log or stump so that it cannot move when the chain is filed, thus leaving both hands free for filing. After filing, remove the chain from the guide bar, brush or wipe off filings and remove burrs from both chain and guide bar before oiling the chain and refitting it to the saw.

Examine the chain carefully before starting to file it. If any teeth, drive links or side plates are found to be cracked or faulty they should be removed and new parts riveted in before sharpening commences. If a chipper tooth has been badly damaged it may be necessary to fit a new one. This should then be filed back to the same height as the remainder of the teeth on the chain. Also, and most important, the lower bearing surfaces of a new link should be carefully filed down to the same level as those on the remainder of the chain. Damage to the chain and sprocket can result from neglecting to do this. The effect of a new, unfiled tooth inserted in an old chain is shown in Fig. 6b.

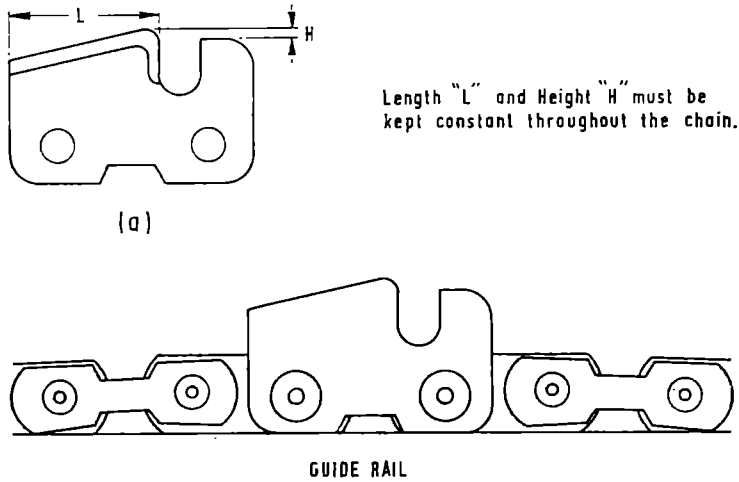


Fig. 6.

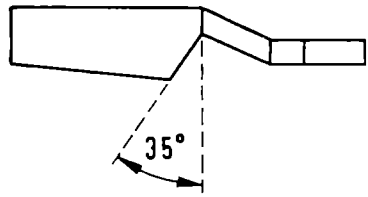
Sharpening should commence on the tooth which requires most filing to bring it into sharp condition and, after this tooth has been treated, the remaining teeth should be filed back to the same length, measured from front to rear as indicated at L in Fig. 6a. The length L and height H shown in Fig. 6a must be kept constant throughout the chain. A tooth which is longer than the others will also be higher and will set up vibration and stress in the chain.

Filing Angles

(1) The Top Angle

This is the angle of the upper cutting edge across the chain. It should be 35 degrees, as indicated in Fig. 7. If the angle is smaller (filed more straight across) the chain may not cut a full-width kerf and have a tendency to bind in the cut. Reducing this angle also leads to increased vibration, which is bad for all parts of the saw and uncomfortable for the operator.

If this angle is increased above 35 degrees there is a tendency for kerf width to increase as the teeth are pressed outwards in cutting, with consequent added strain on the rivet heads.



Top of Chipper Tooth.

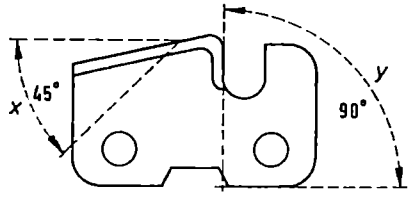
Fig. 7

(2) The Cutting Edge Angle, x in Figs. 8 and 9

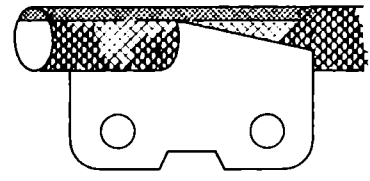
This angle is important because, if the cutting edge is made too thin it will not stand up to wear and will become blunt rapidly, while if it is too thick it will not cut. If the file is used correctly in filing the top and side angles of the tooth, the cutting edge angle will automatically be correct at 45 degrees, as shown.

(3) The Side Angle, y in Figs. 8 and 9

This angle should be 90 degrees and it follow automatically on correct positioning of the file in relation to the tooth and use of the correct diameter of file for the chain pitch. For example, chain of $\frac{1}{2}$ in. pitch requires a file of $\frac{1}{4}$ in. diameter. When filing, one-fifth of the file diameter should be kept above the height of the chipper tooth, as shown in Fig. 8b. When this angle is correct, the chain will feed itself into the cut without undue pressure being required from the operator.



(x) Cutting Edge Angle 45 degrees.
(y) Side Angle 90 degrees.



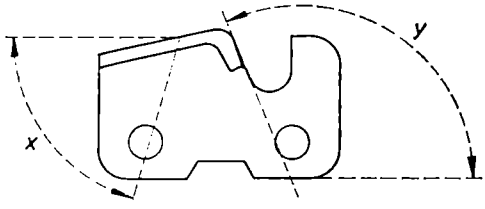
These angles are correctly maintained by using the correct diameter file and keeping 1/5 th of its diameter above the tooth as shown above.

Fig. 8.

If, by keeping the file too high, as in Fig. 9b, the angle is increased above 90 degrees, the cutting edge angle becomes too thick and blunt, as in Fig. 9a,

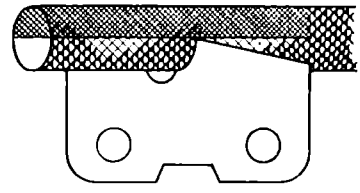
and pressure is needed to make the saw cut, causing excessive wear on the bearing surfaces illustrated in Fig. 5.

The opposite effect, caused by keeping the file too low in the tooth, gives a hooked shape to the side angle, reducing it to less than 90 degrees and giving a weak, thin cutting edge angle as in Fig. 9c and 9d. Such a tooth may cut well initially, but the thin unsupported cutting edge will soon turn over and become blunt.



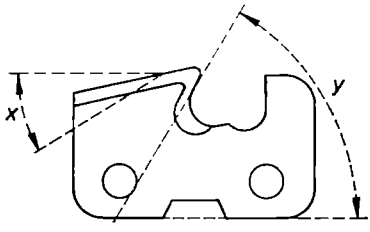
(x) Cutting Edge Angle too blunt.
(y) Side Angle greater than 90 degrees.

(a)



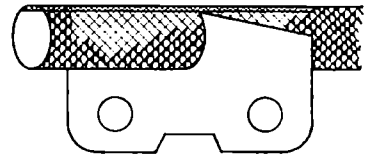
Caused by allowing the file to work too high in relation to the top of the teeth.

(b)



(x) Cutting Edge Angle thin and weak.
(y) Side Angle less than 90 degrees.

(c)



Caused by allowing the file to work too low in relation to the top of the tooth.

(d)

Fig. 9.

Depth Regulator Adjustment

The depth regulator determines the depth of cut which can be made by the chipper tooth. It is illustrated in Fig. 6a in front of the chipper, and lower than it by the height difference H. The chipper tooth can penetrate the timber only to the extent allowed by the depth regulator, as shown in Fig. 10. Depth of cut will vary with the power and strength of the chain, and a figure for depth regulator clearance is specified by the chain manufacturer. This clearance should be maintained carefully throughout the life of the chain.

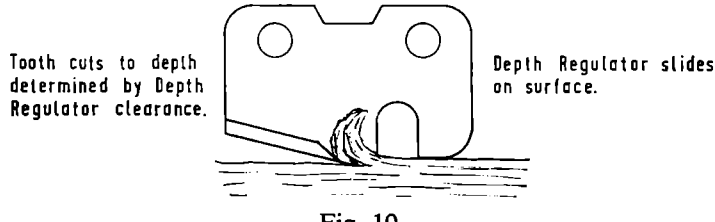


Fig. 10.

Several manufacturers produce gauges for this purpose which are made in a variety of measurements to suit the particular chain in use.

Particular care should be taken to avoid too little depth regulator clearance. This leads to the operator using increased pressure to make the saw cut faster, and a consequent tendency to rapid wear on the bearing surface of the link at the heel of the chipper tooth. In an advanced state, this fault eliminates depth regulator clearance entirely, as shown in Fig. 11, and a satisfactory cut can never be obtained from a chain in this condition.

In use, the gauge should be placed squarely over the chipper tooth, and the depth regulator filed down flush with the projecting end of the gauge using a flat 6 in. chain-saw file. After adjustment, the leading end of the regulator should be filed to a smooth, rounded curve which will slide over the timber without dragging. Take care that in doing this the height of the depth regulator is not further reduced.

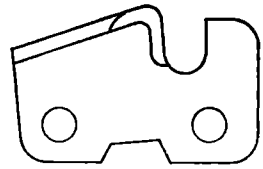


Fig. 11

General Maintenance

It is inadvisable to use a chain-saw with only one chain in action, purchasing another when the first is worn out. If this is done, a new chain is being fitted to a guide bar and sprocket which have already seen considerable wear, with consequent ill-effects on the new chain. It is more economical to run three chains, each being used for a short spell before being removed for maintenance. Wear is then consistent, and the three chains and their driving sprocket will all require renewal at the same time. A far higher standard of chain maintenance can also be achieved by working in this way.

Chains which have been cleaned, repaired and sharpened can be immersed in an oil bath until required, giving the oil plenty of opportunity to seep right through the chain.

Tools

A good range of tools to assist in keeping chains in order is available. Those which I have used and found to be useful to operators who are not particularly handy with a file alone, are the Sandvik No. 141 file holder, 147 angle gauge and 140 repair kit. The file holder guides the operator in relation to side and top angles, and also establishes the correct file height in relation to the chipper tooth. An accurate check on top and side angles is obtained from the 147 angle gauge. For chain repairs, the 140 repair kit, consisting of a riveting block and two punches, provides an inexpensive and portable "workshop". The entire set of equipment, consisting of file holder, angle gauge, depth regulator gauge and repair kit, can be carried in a jacket pocket.

For workshop use, the Nygrans File–N–Joint is a sound filing jig for use in conjunction with the guide bar, for sharpening chains, and for correcting chains which have been "touched up", perhaps rather inexpertly, in the wood. The chain can quickly be reconditioned to a good standard with this tool. The File–N–Vice is a similar tool, but in this case it can be used on the chain after it has been removed from the guide bar, as the File–N–Vice incorporates

a chain vice with the filing jig. Both of these filing jigs give something close to foolproof working, and are at their best in the sharpening of the chipper teeth. Although they are also capable of adjusting the depth regulator height, I believe that better results are achieved in this part of the work with the Sandvik No. 145 gauge.

Chain sharpening is best carried out frequently, so that little has to be taken off the chain at each sharpening. The chain is thus sharp all the time, and the damage to both it and the guide bar which could result from using a blunt chain are avoided.

A METHOD OF TOOL STORAGE

By

R. A. LANCASTER

Assistant Forester, North-east England

Storage of tools is surely an important consideration. To date I have visited many tool stores and in most cases the space is not used to the best advantage. An untidy tool store does not encourage workers to look after the tools they take from, or return to, it.

Tool maintenance does not end with the sharpening of a saw or the shafting of an axe; what happens to the axe in the period between a new shaft being fitted and the axe being used is important.

The usual way to store spades, shovels, forks, etc., is to arrange two pieces of wood, parallel to one another about three inches apart. The handle of the tool is thrust through from below, turned at right angles and the tool left suspended by the handle. When tools are close together one cannot be taken from the middle of the row without moving the others. Having seen one near-accident when three digging forks slipped and fell when being moved, I have spent some time seeking a method of holding tools which:

(*a*) is adequately secure,
(*b*) permits of quick, easy removal and replacement of tools,
(*c*) is inexpensive;
(*d*) is easily arranged and/or altered;
(*e*) is space-saving.

Terry's spring clips (Fig. 12) are perhaps part of the answer. These clips are by no means new but their application to forest tool stores may be a novel idea to some people. The retail price, inclusive of fixing screws, ranges from 1d. for the smallest size (80/1) to 5d. for the biggest (80/5). The cost of the clips would therefore be 1% to 2% of the cost of the tools they hold. There is a much heavier type on sale suitable for really heavy tools such as crowbars, etc.

Part of the Forestry Commission's exhibit at the Great Yorkshire Show in 1962 consisted of a display of tools in general use in our forests. These tools were presented on racks and had to be held firmly enough to prevent the public knocking them out and yet they had to be removed easily so that their use could be demonstrated. Three accident-free days under these conditions bear witness to the suitability of the clips.

The diagrams I hope are almost self-explanatory. Brackets to hold the battens and supporting boards are fitted as necessary to wooden uprights or "rawlplugged" to stone or brick walls. The supporting board must be strong enough to support the weight of the tools, with sufficient space beneath to allow a sweeping brush (Fig. 13). The size of the batten to which the clips are

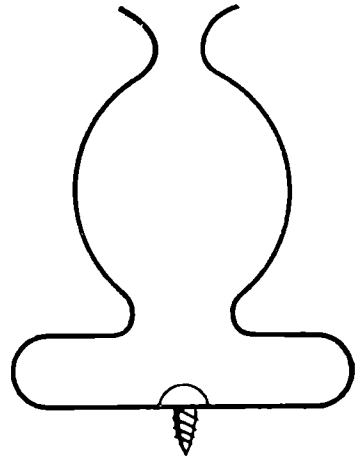


Fig. 12. Terry Clip.

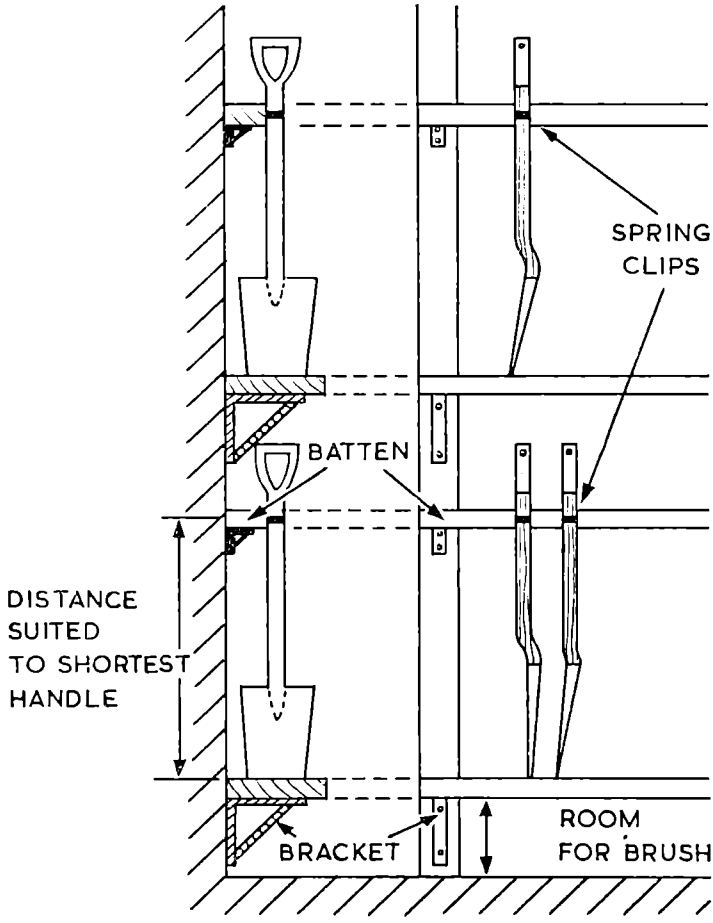


Fig. 13. Front and Side Views of Spades held by Clips.

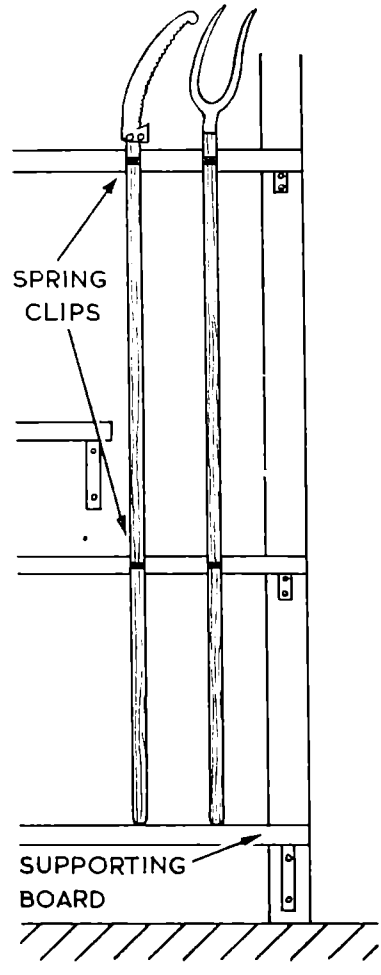


Fig. 14. Brashing Saw and Pitch fork. Held by Clips.

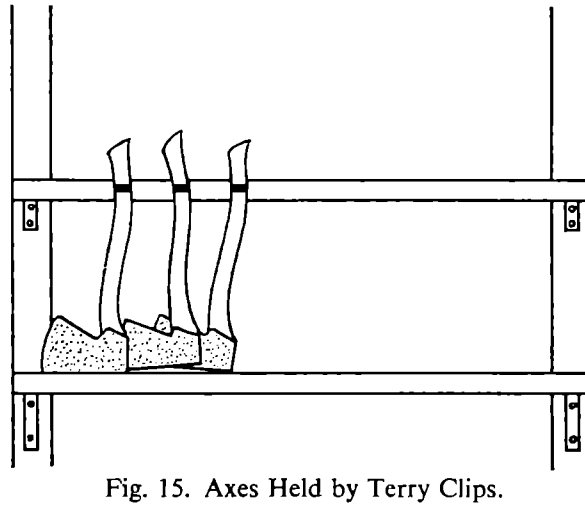


Fig. 15. Axes Held by Terry Clips.

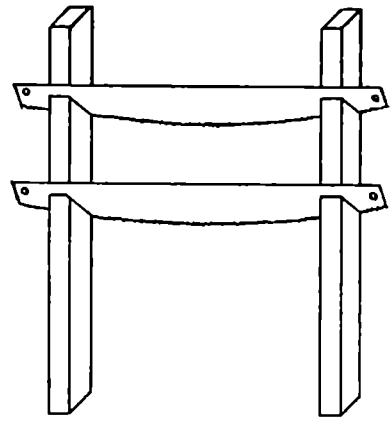


Fig. 16. Cross-cut Saws held in Slots.

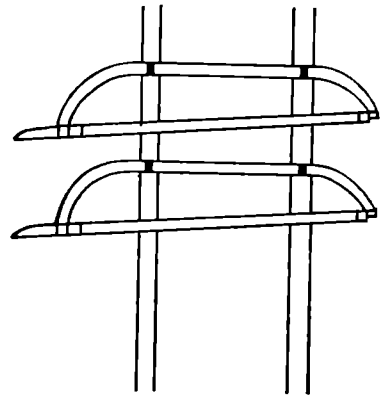


Fig. 17. Bow-Saws Hung on Clips.

fitted must be sufficient to allow spades etc., to be turned at right-angles to the wall so that tools need only be two or three inches apart. Two rows of spades can be fitted, one above the other, on most walls (Fig. 13).

Long-handled tools such as hay forks and pruning saws can be safely held instead of being heaped in a corner (Fig. 14). Axes can be stored with edges overlapping, behind the blade of the adjacent axe, for safety (Fig. 15).

The most popular (and perhaps safest?) method of storing two-man cross-cut saws seems to be to have two battens fixed about three feet apart with slots to hold the saws cut at an angle of about 45 degrees to the face of the batten (Fig. 16).

Bow saws, too, can be held by clips, overlapping them if space demands this. Saws hung on nails have a tendency to come off accidentally. Nails can still be used to support the saw, a clip or clips being used to ensure the saw stays on the nails (Fig. 17).

If a clip or a slot is provided for each tool, then an empty space indicates a missing tool—a reminder to look for it rather than wait until a "count-up" is made for stocktaking.

Some reorganisation of existing tool-store layouts will be necessary to store tools in this manner. This is a job to be done on wet time. If one accident is prevented then the effort has been worthwhile. The visible gains should be the easier issue and check of tools.

THE LEDMORE MOUNTED LINING-OUT PLOUGH MARK III

By

A. ROSE

Forester, East Scotland

Introduction

The plough is designed to fill and level one lining-out trench and to cut and prepare the next simultaneously. An important feature of its operation is that it fills a trench in two stages, first turning and compacting well tilthed soil against the seedling roots and then turning in and levelling the bulk of the soil.

The Mark III plough is a much-improved version built for mounting on a wheeled tractor. The plough has been simplified and made more compact (it now measures only 6 ft. by 4 ft. length and width overall) and the depth control has been completely re-arranged so that the plough, which is tested and pre-set when made, largely controls its own depth of working.

The plough is not upset by soil conditions except where there are a lot of large buried stones, and it will operate on gentle slopes. Working with a well-organised squad and capable supervision, 10,000 seedlings per member of the squad (including tractor driver and supervisor) can be lined-out each working day at costs considerably lower than corresponding hand-lining costs.

The plough has been in use at Ledmore for some time and recently in other nurseries. From evidence at Ledmore the quality of plant produced is as good as by hand-lining and the percentage survival of plough-lined seedlings is at least as high as that of hand-lined seedlings.

Design (See Plate 20)

The main parts are named in Fig. 18. Two attachments have been omitted; these are the spring tine, which works immediately behind the compaction roller, and the fertiliser unit, which fits into the main frame alongside the compaction roller.

The main parts and their functions are as follows:

Tow Bar: By using tow bars of different lengths the plough can be mounted on different makes of tractors.

Front Skimmer: Pushes the fine soil from the bottom of the trench up against the roots of the seedlings.

Compaction Wheel: A pneumatic wheel with screw depth-adjuster. Its function is to compact the fine soil against the seedling roots.

Main Plough Share: Completes the filling of the trench and roughly opens the next trench.

Soil Leveller: Spreads and levels the soil as it turns from the main plough share.

Compaction Roller: Firms the soil and also helps to control the working depth of the whole plough.

Spring Tine: Spreads any surplus soil which may by-pass the roller if the main share runs too deep.

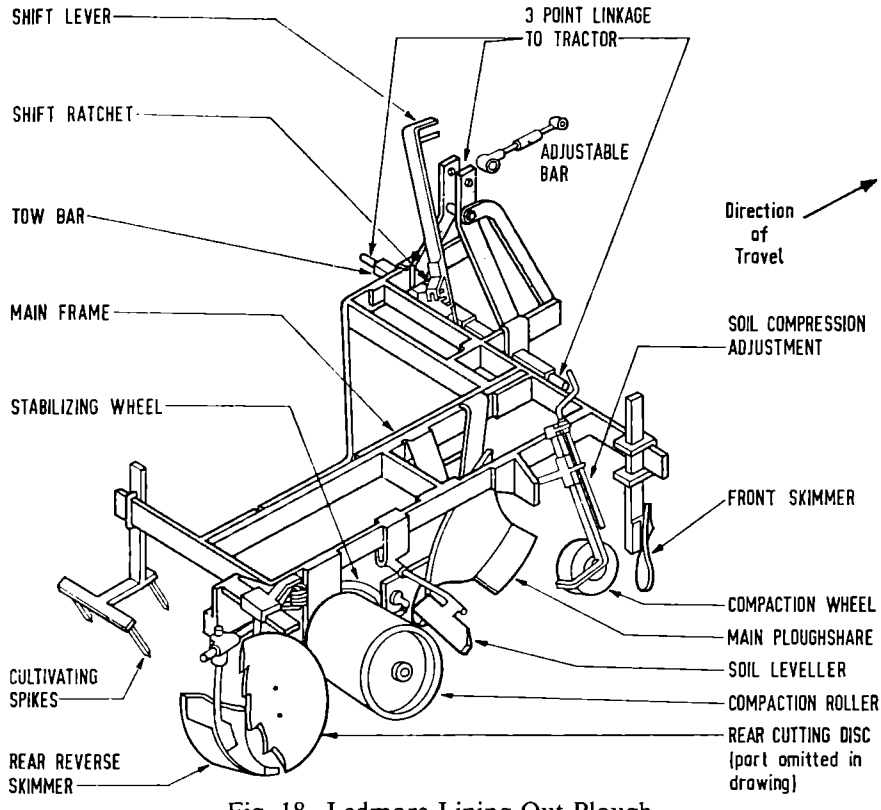


Fig. 18. Ledmore Lining-Out Plough.

Rear Cutting Disc: Cuts the new vertical edge ready for the next line of seedlings.

Rear Reverse Skimmer: Moves loose soil away from the new vertical edge to leave plenty of room for the roots of the seedlings.

Cultivating Spikes: Loosen the soil surface along the line of the next furrow.

Fertiliser Unit: Spreads fertiliser along the trench so that it is mixed with the loose soil ready to be pushed against the seedling roots on the next run of the plough.

The main sequence of operations done by the plough is illustrated in Fig. 19.

The Tractor

The instructions that follow are based on the use of the plough with a standard Ferguson tractor.

The best results are obtained when the tractor is fitted with a gear reduction unit, but tractors without reduction units can be used with satisfactory results.

Nursery Sections

The plough can be used in any length of nursery section but the most suitable length is 36 times the length of the lining-out board, e.g., if 10 ft. boards are to be used then a 360 ft. long section is most suitable. On sloping sections it is best for the plough to be worked uphill rather than across the slope.

Lining-out Boards

The Ben Reid board with the old-type notches replaced by sorbo-rubber strips is best. If nuts and bolts are used to secure the lids these should be reversed and countersunk to allow the compaction roller to run close beside the board.

Operation of the Plough

Preparation of Ground. After normal ploughing has been carried out, the ends of the section should be thrown up and edged. This edge gives the plough a "bite" at the start of each run. When soil conditions permit, the soil should be levelled ahead of the machine by harrow, discs or cultivator, especially when the ploughing has *not* been done by Ferguson one-way plough.

Hitching to Tractor. Front and rear tractor wheels should be set to 4 ft. 6 in. track centres (or nearest).

Important: The top link of the tractor, which is adjustable, should be set at 27 *in. overall, i.e.,* 25½*-inch pin centres.* Correct measurement is most important as the top link controls the functioning and depth of all attachments on the plough. The bottom links are fitted, one to each end of the tow bar, to complete the three-point hitch-up.

The levelling handle is situated to the rear of the driver's right hand on the right lift-arm of the tractor. This arm is telescopic and the levelling handle should be turned until the mark provided is at zero, i.e., the lift-arms are level. The handle should then be turned anticlockwise (*four/five complete turns*) so that the mark disappears into the tube. The plough is now ready for use.

Setting the Hydraulic Lift. With tractor and plough on cultivated ground the plough should be lowered and run forward until it is at correct operating depth, i.e., when the main plough share is turning over enough soil to keep the soil leveller fully employed and the roller is compressing the soil back to ground level. Once the tractor driver has found the correct setting of the hydraulic control lever (on the tractor, beside the driver's right hand), he should *set* the marker on this lever accordingly. In this way the tractor driver can lower the plough to the correct working depth quickly at the start of each run.

General Method of Working. The plough works up the section, filling one trench and cutting the next. At the top of the section the plough is raised and the tractor returns to the bottom of the section ready to start the next run. The tractor is lined-up, the plough lowered and the next working run started, and so on. Once the plough has passed, the boards are lifted from the filled trench and full boards are placed along the new edge.

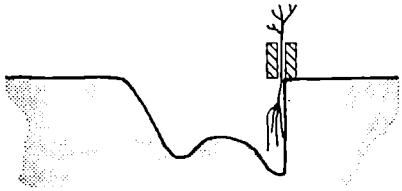
Starting a Section. A garden line should be laid along the section 5 ft. from the edge (6 ft. if starting from a hedge to allow for an alleyway next to the hedge). The tractor straddles the line so that about 3 in. separate the line and the left rear wheel. The driver takes this position as his guide while opening the first trench. When the first trench has been opened the garden line can be discarded and the straightness maintained by keeping the front right wheel in the previous plough track. The driver must ensure that the front right wheel is correctly positioned at the start of each run. *Experienced tractor drivers should be employed for lining-out operations.*

When the first trench is opened the first line of boards can be laid along its edge. Boards must be set straight and flush so that the seedling roots hang close to the vertical edge.

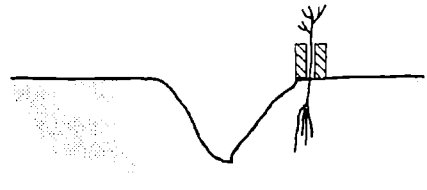
Points to Watch during Operation

(1) That the front skimmer is pushing fine soil against the seedling roots.

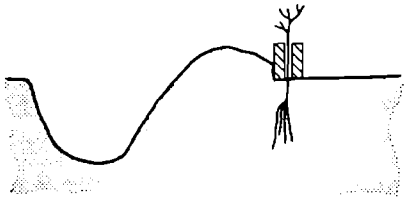
(2) That the compaction wheel is operating so as to press the fine soil firmly against the root tips. This pressure gives the seedlings their initial hold in the soil.



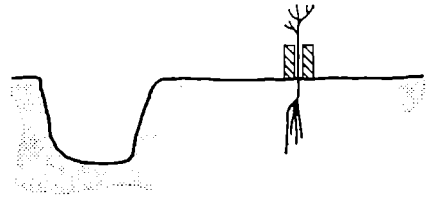
1. Lining out board in position.



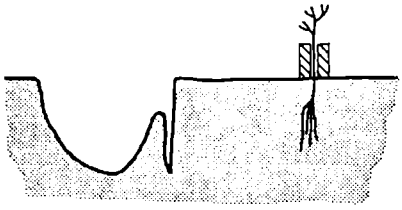
2. Fine soil moved against root tips by front skimmer and firmed by compaction wheel.



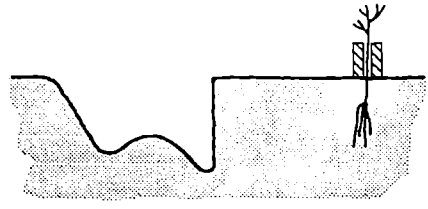
3. Trench roughly filled and next trench opened by main ploughshare.



4. Soil levelled and compacted by leveller and roller.



5. New vertical face cut by rear disc.



6. Soil moved clear of new edge by rear reverse skimmer – board is now removed.

Fig. 19. The Main Sequence of Operations done by the Ledmore Lining-Out Plough.

(3) That the main plough share is turning over the soil against the lining-out boards to slightly above ground level.

(4) That the soil leveller is spreading the soil satisfactorily. Overloading of the leveller indicates that the main plough share is operating too deep and the tractor driver should adjust for depth by raising the plough slightly on the hydraulic lift.

(5) That the roller compresses and levels soil to ground level.

(6) That the spring tine is spreading any surplus soil which may by-pass the roller.

(7) *Important:* That the rear cutting disc is giving a neat and unbroken edge. This is especially important when lining-out small seedlings. The disc should be set so that the leading edge does the work and the trailing edge is very slightly clear of the soil face, i.e., the disc should be set slightly oblique to line of travel.

(8) That the rear reverse skimmer is free to move against its spring loading and that it is set to give a depth of trench suited to the seedlings being lined-out.

(9) That the cultivation spikes are breaking the surface of the soil ready for the next run. The spikes should be running about 3 in. deep.

(10) That the tractor is geared to its lowest speed, especially when a gear reduction unit is *not* fitted.

Strip Lining-out

The plough produces lines at 9 in. apart. It can be used for continuous lining but is normally used to give lines in strips. Five runs of the plough complete one strip of five lines, i.e., a strip 36 in. wide. By making the sixth run without placing any boards a space of 18 in. is left as an alley between adjacent strips. If a wider alleyway is desired, the "shift lever" on the plough should be moved outwards two or three notches, and returned to the centre position once the blank run is completed.

The Fertiliser Unit (Fitted as an extra)

This comprises a hopper, agitator geared to the compaction roller, disc to control delivery rate and a cut-off, and should be removed when fertilisers are not being applied to the lines. The unit sprinkles fertiliser along the bottom of each trench so that it is mixed with the fine soil and thus turned in round the roots of the seedlings. Granulated fertilisers are best suited for even delivery.

The disc can be calibrated by putting a known weight of fertiliser into the hopper and measuring the distance run before the hopper is emptied (5 cwts/acre=3½ lb. per 100 lineal yards run). No fertiliser is needed during the "blank" run (i.e., when the alleyway between strips is being formed) and the cut-off is provided to stop delivery. The cut-off should, of course, be opened when the alleyway is completed and a new strip being started.

Organisation of the Squad

Close supervision is necessary. The success of the whole operation depends largely on a well-organised and well-trained squad. Allocating a daily task to each sub-squad encourages team spirit and makes the work competitive.

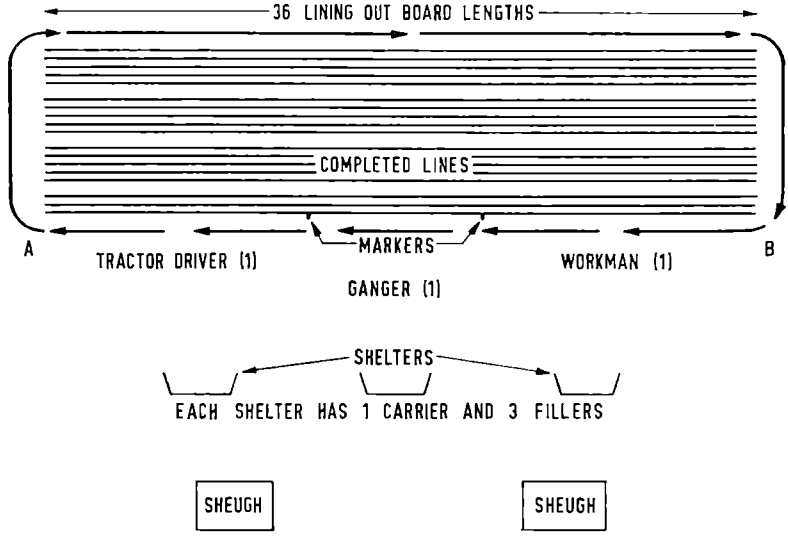
Each member of the squad must know the *correct* procedure for:

(1) Quick and accurate filling of boards.
(2) Lifting and carrying a board or boards.
(3) Setting a filled board on the edge of the trench.

The correct layout of sheughs and shelters in the section being worked is shown in Figs. 20 and 21.

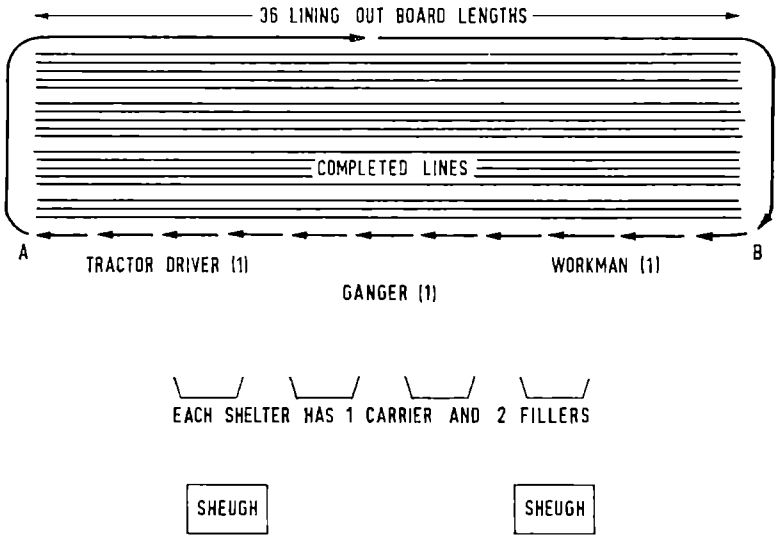
Figure 20 shows the layout for lining at 1-inch spacing.

The working length A–B is divided into three equal parts, each part being kept supplied with filled boards by one sub-squad of fillers and carriers. These



	NOS	WORK	REMARKS
Ganger	1	Supervision	
Tractor driver	1	Plough	
Workman gd. 1	1	Squaring-off behind plough	A man trained in lining out required
Carriers (1 each shelter)	3	Carry boards to line and return empties	Men or strong boys
Fillers (3 each shelter)	9	Filling boards	Women or girls
TOTAL	15		

Fig. 20. Lay-out for Lining-Out at One-inch Spacing.



	NOS	WORK	REMARKS
Ganger	1	Supervision	
Tractor driver	1	Plough	
Workman gd. 1	1	Squaring - off behind plough	A man trained in lining out required
Carriers (1 each shelter)	4	Carry board to line and return empties	Men or strong boys
Fillers (2 each shelter)	8	Filling boards	Women or girls
TOTAL	15		

Fig. 21. Lay-out for Lining-Out at $1\frac{1}{2}$ and 2-inch spacings.

parts should be marked by pegs which are moved as the work proceeds so that each sub-squad can see where their part of the line ends. The ganger is responsible for seeing that the pegs are kept in the right places as the work proceeds.

Each sub-squad will need 12 boards and three in reserve, i.e., a total of 45 boards for the whole squad.

Shelters and equipment should be kept near to the work to reduce foot traffic and conserve the carriers, who have a tiring job. Shelters should not be moved more than one day's work ahead of the last completed line of transplants.

Fig. 21 shows the layout for lining at $1\frac{1}{2}$ and 2-inch spacing. The routine is the same as with 1-inch lining except that each sub-squad needs only nine boards and three in reserve, i.e., 48 boards for the whole squad.

Maintenance of the Plough

All moving parts should be greased or oiled daily. Nuts and bolts should be checked frequently in the case of new machines; loose bolts can put the plough out of alignment.

The front sock of the main ploughshare needs replacement as soon as it is appreciably worn, otherwise the plough will be upset. The main ploughshare is an Oliver Redex and new socks (Code No. 8) can be obtained from John Wallace & Sons Ltd., Agricultural Engineers, 29 Paton Street, Dennistoun, Glasgow, or from any local firm which stocks Oliver Redex plough parts.

It is usually possible to repair normal breakages locally but spare parts can be obtained from the makers of the plough at Ledmore.

Orders for new ploughs or spare parts should be addressed to Mr. A. Rose, Forestry Commission, Ledmore Nursery, Bankfoot, Perthshire.

The ploughs are made in batches and it is important to order in good time, e.g., about July if the plough is needed for the following spring work.

The cost varies as steel prices fluctuate but is approximately £130, complete with the fertiliser distributor. Ploughs are made to mount on Ferguson tractors unless an order specifies otherwise.

When stored away, the mould-board and all working surfaces and moving parts should be carefully cleaned and greased. *Rust on the working surfaces greatly reduces the efficiency of the plough.*

EXTRACTS FROM "FOREST PRODUCTS RESEARCH, 1961"

By

Staff of Forest Products Research Laboratory
D.S.I.R., Princes Risborough

HOME-GROWN TIMBER INVESTIGATIONS

Timber Improvement by Selection and Breeding

Progress has been made in the joint project with the Forestry Commission to examine the timber quality of "plus" trees, that is, trees of good growth characteristics selected as possible sources of seed for future plantings. Large-diameter increment borings have been taken from several plus trees of Sitka spruce and, in order that allowance can be made for the effect of site on the timber quality when comparing the different plus trees, additional samples have been taken from five representative trees in the vicinity of each plus tree. Observations are being made on density and its variation within each sample, grain inclination, fibre dimensions and chemical composition.

Attention has been paid to improvements in methods of measuring anatomical features on these small timber samples, particularly to more efficient means of measuring and recording the lengths of fibres and of determining inclination of the grain. The beta-ray micro-scale method of density determination (which has been further refined) is now in regular use for the study of density variation in individual growth rings.

There is some evidence that density, fibre length and grain inclination, are heritable, and after assessments have been made on the plus tree borings, the existing progeny of these trees will be examined to determine the extent to which the timber characteristics can be passed on. In this way it should be possible to select those plus trees which offer the best prospects of producing future generations of trees superior in respect of timber quality as well as in vigour and habit of growth.

Lodgepole Pine

The examination of the 28-year-old trees from Blessington, near Dublin, was completed and confirmation obtained that this North American species produces a useful timber when grown under conditions similar to those in this country. The test material is believed to have been derived from two different provenances grown on neighbouring plots, and the observations gave some indication of the importance of seed origin in determining timber quality, the timber from one provenance (probably the Olympic Peninsula) being distinctly superior to that from the other (probably Mount Rainier). Seed origin was also found to affect wood structure in thinnings from nine provenances obtained from a high elevation in North Wales. A further series of tests on trees of 16 different provenances grown at Wykeham, Yorkshire, is in progress.

In general the home-grown timber is fairly uniform in texture, of moderate density and comparatively free of spiral grain. As far as fibre length is concerned this species appears to be rather similar to Sitka spruce of like age, and superior in this respect to Scots pine.

Pinus holfordiana

Although based on a single tree, studies of the timber of *Pinus holfordiana* were of considerable interest as the species shows promise as the source of a fine, even-textured wood, comparable to and even finer in texture than that of yellow pine. *P. holfordiana* shows a remarkably uniform fibre-wall thickness across the growth ring, with little, if any, evidence of a distinctive band of thick-walled summer wood tracheids.

Turkey Oak

Turkey oak is generally regarded as a less attractive timber than that of the European (white) oak. This view was confirmed in recent studies which showed that it possesses not only a heavier but somewhat darker wood than European oak. An interesting feature of the consignment under test was that, under forest conditions, the trees, from 106 to 126 years old, had maintained vigorous growth for only 40–50 years; thereafter the growth rate had declined and the sapwood, usually wide in Turkey oak, was narrow, 1¼–2½ in., although representing 40–50 years' growth.

WOOD PRESERVATION

PRESERVATIVE TREATMENT OF HOME-GROWN POLES

A number of home-grown softwoods are accepted by the current *British Standard* 1990:1953, as suitable for transmission poles. Most of them, however, are rather difficult to treat satisfactorily compared with imported redwood, which is normally used for poles in this country. The home-grown species, that is Scots pine, treats equally well but contains a considerably greater proportion of sapwood and as a result needs rather longer to season and a somewhat higher retention of creosote to meet the penetration requirements. An investigation has been undertaken to see what improvements can be made in the preservative treatment of these various species of home-grown poles. Some exploratory experiments have been carried out on Scots pine. The initial object was to examine the practicability of avoiding the long seasoning period by drying and creosoting the poles in one continuous operation in the creosoting plant by the Boulton process. The initial results indicate that the drying part of the operation is quite satisfactory. At present one disadvantage of the process is that, with the normal method of operation, the absorption of creosote during the drying period is rather high and, as a result, the final net retention is considerably higher than the normal specified figure.

THE PRESERVATIVE TREATMENT OF HOME-GROWN TIMBERS BY DIFFUSION

An increasing quantity of sawn softwood, mainly Sitka spruce and Scots pine, is now being produced in this country from the plantations of the Forestry Commission, and it is probable that, as time goes on, this material will be used to an increasing extent by the building industry. Preservation of these timbers could be provided by the same methods of treatment as are at present used for imported softwoods. But since the home-grown material will be available immediately after conversion, while it is still green, it will also be possible to treat it by a diffusion process. This would involve treating the timber with a water-borne preservative before seasoning and it has the advantage that complete penetration can be obtained even with timbers which are resistant to impregnation, such as Sitka spruce. The practicability of treating home-grown timbers with various water-borne preservatives by this method is being investigated as part of the research programme with the Forestry Commission. Some exploratory experiments have been carried out with Sitka spruce to find out how long the common building sizes, i.e., 1 in., 2 in. and 3 in., would have to be close-stacked for an adequate loading of preservative to diffuse to the centre. For this particular work a boron preservative was used.

METHODS OF ESTIMATING PRESERVATIVES IN WOOD

In the work described above there was some difficulty in estimating satisfactorily the distribution of the boron preservative through the wood. The usual method of estimating boron is not very well suited for observing the concentration gradients set up in the wood during the process of diffusion and a search has been made for a method more suitable for this particular work. The main disadvantage of chemical methods is that the boron has first to be separated from the wood and this makes the work slow when a considerable number of estimations have to be made. In general, some physical method would be more suitable. A joint investigation with the National Institute for Research in Nuclear Science was started to examine the possibility of using the high absorption of thermal neutrons by boron as a basis for its estimation. This work has shown that the boron content of treated wood sawdust can be estimated very accurately over a wide range of loadings by measuring the neutron absorption when a sample is placed in an experimental reactor. Unfortunately this method is too costly for routine work and the possibility of using a small neutron source and a bench apparatus instead of a reactor was investigated. This proved to be a lengthier and considerably less accurate procedure and in its present form it is not likely to be sensitive enough for the lower end of the loading range which it is desired to measure in this diffusion work. A report has been published on the work done to date, and ways of improving the sensitivity of the method are being examined.

THE EFFECT OF SIZE ON THE LIFE OF TIMBER IN CONTACT WITH THE GROUND

Field service tests to assess the natural durability of different species of timber have been in progress at the Laboratory for many years. The test consists of inserting standard size specimens in the ground at sites in different parts of the country and recording the time taken for them to decay. The average life of the specimens of each timber is used as a measure of its relative durability and in a report published some time ago results were given for about 130 different species. The results, of course, also provide data on the actual life of the timber in the size used, i.e., 2 in. $\times$ 2 in., when in direct contact with the ground. Such information is very useful for estimating the useful life of fencing, for example. The value of these tests would be greatly increased if it

were known how much extra life to allow when the size is increased to the various larger dimensions generally used in practice. To obtain some guidance on this further tests were started about ten years ago to try to establish how life varies with size. The tests are not yet complete but the results obtained so far have recently been reported. At present the indications are that the life of timber increases in direct proportion to its thickness, whether it is hardwood or softwood, perishable or durable. This knowledge enables the life of any size of material to be estimated from our existing durability data and will add greatly to its usefulness. It has helped to define much more precisely than was possible hitherto the durability of home-grown European oak, about which there has been a good deal of misconception because of the failure to allow for the fact that this species of timber is now generally used in smaller thickness than in the past, when its reputation for very high durability was established.

TREATMENT OF HOME-GROWN OAK FENCING

In the construction of home-grown European oak fencing it is the general practice to use freshly converted timber. Because of cost most of the timber used for this work is of relatively low grade and if it were allowed to dry out before being used a high proportion would often become distorted and difficult to assemble. The use of unseasoned timber avoids this difficulty but it is a disadvantage if preservative treatment is called for since standard practice requires the timber to be air dry before pressure or open tank impregnation with a preservative. In co-operation with the Forestry Commission some tests have been undertaken to assess the value of treating the green timber by diffusion with boron followed by a hot and cold treatment with creosote with the object of preventing the leaching of the water-borne preservative. One of the methods being used to assess this treatment is a laboratory leaching test on small samples. The results show that, to begin with, the creosote does very much reduce the rate of leaching of the boron, but the effect is only short-lived and by the end of a few months there is not very much difference in the amount lost from samples treated with boron and creosote and the controls treated with boron alone. At the same time other substances besides creosote are being tried to investigate more generally the possibility of preventing leaching of water-soluble preservatives. So far dipping in bitumen appears to be considerably more effective than a creosote treatment but it is too early yet to say whether it is likely to be of practical value.

PERMEABILITY OF WOOD

The immediate object of this work is to obtain a more fundamental understanding of the way in which preservatives and other fluids move through wood, and of how this is affected by the structure of the wood and the properties of the permeating fluid. From this it is hoped to learn whether there is any possibility of improving the permeability of refractory timbers, and, if so, how this is most likely to be done. One of the primary requirements in this work is to establish a method of measuring the permeability constants of wood along the three cardinal directions of the grain. Although preservation practice is concerned almost entirely with liquid flow, it is generally inconvenient, and often impracticable, to use a liquid for measuring the intrinsic permeability of wood, and in these investigations a permanent, inert gas, such as nitrogen, has been found to be much more satisfactory.

DECAY IN FLOODED BUILDINGS

Following the floods in south-west England and South Wales in the early part of the year leaflets were prepared in conjunction with the Building Research Station telling householders and builders of the risks of decay developing in woodwork of flooded buildings and the measures that should be taken to reduce those risks.

BARK FORM AND VENEER FIGURE IN BIRCH

Practical work to relate bark form with veneer figure in home-grown birch has been completed. The report shows that while rough bark is usually indicative of disturbed grain in the veneer, the decorative value of the latter is not necessarily high. The much-prized "flamy" figure has been found under several definable forms of bark, but not with the regularity that would help in tree selection. The uses of other external features for this purpose are being investigated by the Laboratory and the Forestry Commission.

CHIPBOARD MANUFACTURE AND PROPERTIES

Early in 1960, the British chipboard makers asked the Laboratory to undertake some fundamental research on this material. A first appraisal of the problems involved was made after visiting the firms concerned, studying world-wide literature on the subject, and consulting with French and German research establishments. A short-term experimental project was begun in April 1961 comprising:

Building of a small-scale plant for manufacturing boards (see Plate 5).
Development of a technique for making and testing chipboards.
Basic work on the moisture relation of chips.
Microscopic studies of chip form and the glue bond between chips.

Upon the results of this work, the Wood Chipboard and Particle Board Group of the British Plastics Federation agreed to sponsor continuation and extension of the work for a further period of two years.

TIMBER MECHANICS

QUALITY AND PROPERTIES OF HOME-GROWN TIMBERS

The investigation into the strength and specific gravity of Sitka spruce grown in Great Britain has been completed and a report published as "Variations in the Strength and Specific Gravity of Sitka Spruce Grown in Great Britain", by J. G. Sunley and Gwendoline M. Lavers, *Journal of the Institute of Wood Science* 1961 (7), 15–27. The results described previously were based on green test specimens and the work completed since on air-dry material has given the same general conclusion that the large variations in strength and specific gravity are between individual trees on the same site rather than between different geographical regions. They also indicate that material from Quality Class III sites gives the best compromise between a large volume and material of a reasonable quality.

The preliminary work reported last year on the effect of seed provenance on the quality of lodgepole pine has been completed, and this indicated that provenance could have an effect on timber quality but that further sampling must be carried out to confirm this. Material of 15 different provenances grown at Allerston Forest in north Yorkshire is now being sampled: some of these are grown from seed of the same origins as the Clocanoeg material tested previously. Although the experimental work has not been completed there are indications that there is some interaction between site and provenance. This is illustrated by the fact that the same provenances do not necessarily produce the

best quality material on both sites. Generally the material grown at Allerston appears to be appreciably denser than that from Clocaenog.

An investigation has been started to compare the strength and specific gravity of European and Japanese larch grown in the British Isles. It is proposed to sample both these species from eight different sites to see if there are any significant differences between their properties. So far material from three sites has been sampled. The results are inconclusive and indicate a big site effect. Thus on one site European larch gave the highest specific gravity and strength values whereas another showed Japanese larch equally superior and a third site showed little difference between them. The investigation is continuing.

Four consignments of Scots pine from Bagshot have been tested to study the effects of different thinning treatments on the quality of the timber. There was a slight tendency for the heavily thinned material to be less dense and strong than the lightly thinned material.

Home-grown timbers will probably be increasingly used for purposes where their resistance to nail withdrawal is of some importance (e.g., packaging and fencing). To provide data on the comparative resistance of home-grown timbers to nail withdrawal and also to examine some of the factors affecting such resistance this property is now being examined whenever a general assessment of timber quality is required. Static and impact nail withdrawal tests are carried out using 2 in. × 12 gauge nails driven to a depth of one inch in the radial, tangential and end surfaces of the material. Two nails are driven into each surface of each specimen in the green condition, one being withdrawn immediately. The specimens are then dried to about 12% moisture content and the second nail is then withdrawn. A third nail is then driven into each surface of the dry specimens and then withdrawn immediately.

The table below gives average values obtained for some of the home-grown species tested.

AVERAGE RESULTS OF STATIC NAIL WITHDRAWAL TESTS USING 2IN. × 12 GAUGE ROUND-WIRE NAILS EMBEDDED TO A DEPTH OF 1 IN.

Species	*Nominal specific gravity*	*Moisture condition*		*Maximum resistance to withdrawal (lb)*		
		When nailed	*At test*	*Radial surface*	*Tangential surface*	*End surface*
Sitka spruce . . .	0·322	green	green	77	84	35
	,,	green	dry	45	51	61
	,,	dry	dry	67	91	49
Lodgepole pine . .	0·363	green	green	64	72	37
	,,	green	dry	31	42	65
	,,	dry	dry	57	70	51
American red oak .	0·593	green	green	188	171	127
	,,	green	dry	96	99	146
	,,	dry	dry	275	221	149

These results show that with the two softwoods, nails driven into the tangential face give a higher withdrawal load than those in the radial face. There is little difference between the resistance to withdrawal in the green and dry condition if withdrawn immediately but if nailed green and allowed to dry

there is a considerable reduction in strength on nails driven in the side grain and an appreciable increase for end grain penetration. The reduction in strength resulting from drying on nails driven into side grain shows the advantages of carrying out nailing as near as possible to the moisture contents likely to be attained in service.

WORKING STRESSES

Basic and working stresses for home-grown softwoods and a few imported species were published in 1956 followed by similar information on hardwoods. Since then additional information has been obtained and there has been a demand for stresses for other species. Moreover, a rapid increase in the use of laminated timber has created a need for basic stresses for dry timber in addition to the green values used in solid timber design. A revised version of the Laboratory's information on working stresses has therefore been published as *Working Stresses for Structural Timbers*, Bulletin No. 47 of the Forest Products Research Laboratory, by J. G. Sunley, H.M.S.O. The result of tests on small clear specimens of timber, while enabling comparison between species, cannot be used directly as safe working stresses necessary in structural design. This bulletin shows how basic and working stresses may be derived from these results. The method employed takes into account the natural variability in the strength of timber, and a safety factor is used to ensure that under all conditions of use the stress imposed on a member is a safe one. Permissible working stresses for two grades of timber, both green and air-dry, are derived for the species most likely to be available for structural use in this country.

LAMINATED CONSTRUCTION

During the year a start has been made on a study of the size and incidence of knots in commercial samples of Scots pine (known in the timber trade as "redwood"), a species that is being increasingly used for structural laminating in Britain. From this study it will be possible to compare limiting "knot-ratios" determined from different samples of timber and to assess the effect of thickness on their frequency distributions. This basic information is needed to determine whether or not the same stress modification factors can be applied to all the softwood species commonly used for structural work. If general modification factors can be used, then the resulting simplification will be of considerable practical importance.

To demonstrate the advantages to be gained by laminating, a composite structure was designed and constructed. This was made from a number of species of home-grown softwoods and, as well as demonstrating that they can be just as effectively used for laminated work as the imported timbers, it shows that clear material is not an essential requirement and that the limited size of sawn timber imposes no restriction on the size or shape of a laminated structure. The composite structure was exhibited by the Forestry Commission at the Royal Counties Centenary Show at Windsor.

PROPERTIES OF 30–37-YEAR-OLD SITKA SPRUCE TIMBER

Extracts from the Forest Products Laboratory Bulletin

I. SUMMARY

This investigation of the properties of Sitka spruce timber from widely contrasted sites has added to our knowledge of both its fundamental properties and its suitability for various uses in the following ways:

Variability of Properties

Variability of all the properties investigated could not readily be related to the effect of climate, nor could such variability be related readily to the effect of Quality Class. The reason for this was that the variation in properties between trees within a site, and within individual trees, was much greater than variations which could be attributed to differences in climate or Quality Class. However, there were indications from the seasoning, strength, and woodworking tests that Quality Class III sites produce slightly superior timber.

Although differences were observed in fibre length, strength and seasoning properties of timber taken from different heights in the tree, they were not large enough to be of practical importance.

Of all the properties investigated, only permeability and resistance to impregnation were fairly uniform.

Wood Structure

The fibre length, the incidence of compression wood, and the extent of spiral grain were determined. The fibre length was found to vary between 2·6 and 3·3 mm, adequate for the manufacture of strong paper. Spiral grain was to some degree found in practically all of the material examined, and the direction of the spiral was almost invariably anti-clockwise.

Seasoning Properties

The seasoning tests showed that Sitka spruce can be kiln-dried rapidly using the most severe drying schedules without any increase in the amount of degrade. A certain amount of twist, due to spiral grain, invariably occurs if the boards are allowed unrestrained movement—as was the case in this investigation.

Specific Gravity and Strength Properties

The average nominal specific gravity of whole discs was 0·331 (green volume) and for small clear specimens 0·313 (green volume) or 0·336 (at 12% moisture content). The maximum crushing strength=2,130 lb. per sq. in. (green) and 4,120 lb. per sq. in. (12% m.c.), and the resistance to impact (height through which a 3·3 lb. hammer must fall to cause fracture)=22 in. (green) and 20 in. (12% m.c.).

Woodworking Properties

Machine woodworking tests were carried out at moisture contents of both 12% and 20% moisture contents of the oven-dry weight. Hard knots can damage the cutter blades and result in a poor finish to the timber surface. However, it was found that this disadvantage could be overcome by the technique of jointing, in which a second bevel is given to the cutter blades.

Nailing tests were also undertaken.

Wood Preservation

It was found that retentions of creosote of between 6·6 lb and 11·5 lb. per cubic foot of heartwood could be obtained, but it was necessary to use slightly lower temperature and pressure combinations during treatment than those generally used for softwoods in order to avoid collapse. The sapwood was of course readily treated.

It is stressed that the above findings are applicable to logs from the larger trees between 30 and 37 years old, and it does not follow that they will apply to wood accruing for the crop grown on a longer rotation. There are, in fact, indications that timber from older trees will have somewhat different and generally improved properties.

II. INTRODUCTION

Sitka spruce (*Picea sitchensis* (Bongard) Carrière) is the most widely planted exotic forest tree in Britain. It was introduced a little more than a century ago from the maritime areas of North-west America, and by October, 1961, more than 400,000 acres of Sitka spruce plantations had been established. About threequarters of this area has been planted by the Forestry Commission, and the remainder by private woodland owners.

Sitka spruce grows remarkably well under a wide range of conditions, even on the poor quality soils generally available for afforestation. Not only does it withstand exposure to wind better than most other conifers, but it also produces a higher volume of timber per acre per annum than practically any other forest tree grown in Britain.

Nearly 90% of the total area of Sitka spruce forest is less than 25 years old. As the species is likely to be grown on longer rotations, it is evident that increasing quantities of timber of sawlog size will become available. It is estimated, for example, that by 1980 the volume of timber over 8 in. butt diameter produced from Forestry Commission thinnings and fellings will exceed 12 million Hoppus feet per annum.

The properties of mature Sitka spruce imported from the natural forest of Canada are fairly well known, but rather less is known of the plantation timber grown in the British Isles. Nevertheless, the home-grown product has already proved suitable for a number of industrial uses including the manufacture of paper and board, pitwood, carpentry and packaging.

The Forest Products Research Laboratory has already made a number of investigations into Sitka spruce thinnings, and general information based on the limited data has been published in the Laboratory's reports, including "A Handbook of Softwoods". However, this large-scale assessment was undertaken to study the variation in timber properties between climatic regions, between sites and between individual trees.

The home-grown Sitka spruce timber which has been available has been produced mainly from silvicultural thinnings of the older plantations. Only the earliest established plantations, together with some wartime clear fellings, have produced saw timber. About 10% of the existing plantations are old enough to yield saw timber. Most of the existing stands were planted after the Second World War.

Many of the first plantations were prematurely felled between 1939 and 1945 to meet the acute shortage of timber. While this wartime experience established the suitability of home-grown Sitka spruce for a number of uses, the prevailing conditions of felling, conversion and marketing, at that time, were not well-suited for a fair assessment of the timber properties. It is understandable, therefore, that some of the prejudices which originated in those days against Sitka spruce timber still persist. It is hoped that the information contained in this report will allow an objective assessment to be made.

When the methods to be used in sampling were decided, the following six factors, which might influence the properties of the timber, were taken into consideration:

Geology and Soil

As already mentioned, Sitka spruce is tolerant of a wide range of site conditions and has been planted on a great many types of soil overlying greatly contrasted types of parent rock. The samples were therefore taken from stands on sites with varied soil types on widely differing geological formations such as Carboniferous Limestone, Granite and Old Red Sandstone.

Climate

A scheme used by the Meteorological Office, by which Britain is divided into eleven zones, was adopted with slight modifications as a basis for the sampling scheme. Samples were taken from the six zones which contain a substantial acreage of Sitka spruce, i.e., North Scotland, West Scotland, North-west England, South-west England, North Wales and South Wales.

Age of Stand

The stands from which the sample trees were selected were restricted to those between 30 and 37 years of age. This restriction was observed in order to minimise the effect of age on the variation in timber properties.

The Past Management of the Stand

The initial spacing, the method and type of thinning, were not features of the sampling scheme, but where the thinning history of a stand was known, it was recorded.

Quality Class

Quality Class is a term used in forest management to define the vigour of a stand of trees in terms of its age and its height growth. In the current yield tables for Sitka spruce, five Quality Classes are recognised. Thus a Quality Class I stand is one that has made extremely good height growth (with consequent good volume production), while a Quality Class V stand is one that has made very poor height growth (with consequent poor volume production). Quality Classes II, III and IV refer to intermediate rates of height increment. It should, however, be pointed out that a stand of trees does not necessarily remain within one particular Quality Class, but can, in fact, cross into another. This is a fairly frequent phenomenon in Sitka spruce, when a young plantation can spend 10 or more of its first 30 years in check (that is making extremely slow growth), usually on account of competition from ground vegetation, and then grow vigorously once the ground vegetation has been suppressed.

In the actual investigation all five Quality Classes were not sampled individually, but were considered in three groups, i.e., Classes I and II together, III alone, and IV and V together. A sample from each group was taken from each of the six climatic regions. This ensured that differences in timber properties which could be related to the effect of Quality Class would be revealed in the statistical analysis of the results.

Provenance and Seed Origin

It has long been appreciated that seeds of the same species from different geographical sources may produce trees with widely differing characters. When imported seed (or nursery stock) is used for the establishment of an exotic species, it often becomes clear that certain particular geographical sources or provenances are better suited to the new environment than others. Moreover, differences in sources of seed or provenance might even be reflected in the properties of the timber. In fact, earlier work at the Laboratory on 30-year-old thinnings from four different provenances indicated that this is almost certainly the case with Sitka spruce.

Early plantations in this country clearly demonstrated that the Queen Charlotte Islands off the coast of British Columbia provided a generally suitable source of seed for British conditions. Since 1922 this provenance has been used almost exclusively for Forestry Commission plantings. All the material collected during the sampling was of the Queen Charlotte Islands provenance in order to avoid provenance differences confounding observations on the variation in timber properties.

III. PROPERTIES IN RELATION TO END USE

The results of the survey have shown that there are no significant differences in the properties of Sitka spruce timber from different climatic zones. Variations within trees and between those grown on one site were greater than variations between trees from different sites and climatic zones. Consequently no climatic region of Britain can be expected to produce Sitka spruce timber with distinctive properties characteristic of that region. It is therefore apparent that a consumer could not expect to derive any advantage by specifying Sitka spruce grown in a particular area of Britain.

In the same way it was found that differences between the Quality Classes of the stands from which the sample trees were taken had little influence on the properties of the timber because differences *within* Quality Classes exceed those *between* Quality Classes. However, in this connection, there was an indication that Quality Class III stands produce timber with slightly superior specific strength, woodworking and seasoning properties. It was also observed that Quality Class IV and V produce timber with higher specific gravities than the other quality classes, but their strength properties were no higher. It should be remembered that the effect of Quality Class does, of course, influence the gross features of the logs and the yield and grade of sawn timber.

At a given age trees of larger girth tended to have lower specific gravity and lower crushing strength than trees of smaller girth but there was no marked relationship between girth and specific strength (i.e., crushing strength/specific gravity). However, within the wide variation exhibited by the samples there were trees of large girth with moderately high specific gravity and comparatively high crushing strength. Selection and breeding from such trees can be expected to yield timber of improved specific gravity and strength without undue loss of girth. This would appear to be a more promising approach to timber improvement than that of adjusting thinning regimes to produce timber of smaller girth in an attempt to increase specific gravity.

Other variability of the timber due to past treatment of the crops, as reflected by differences between sites, was not sufficiently great to be of interest to those concerned in forest management. In fact, it is clear that knottiness is the one timber property which it would be most feasible to control by management techniques. In this connection it will be recalled that difficulties were experienced in the woodworking tests on account of damage to the cutters of machine tools by hard knots. Trouble of this type could be much reduced by high-pruning the tree crop at the small pole stage, thus decreasing the size and incidence of knots.

The seasoning tests established that Sitka spruce can be kiln-dried rapidly under fairly severe conditions (i.e., at 220°F and a relative humidity of 30%), with little tendency to develop splits and checks. If the boards undergoing seasoning are allowed unrestricted movement, twisting invariably occurs, and it is therefore advantageous in practice to restrain the boards during drying. (This defect is due to spiral grain which was observed in practically all of the sample trees, although it was seldom severe enough to affect the strength properties adversely or to exclude it from Grade I.)

In the wood-preservation tests it was found that the heartwood of the samples was uniformly difficult to impregnate under pressure, and retentions of between only 6·6 and 11·5 lb. per cubic foot were achieved. Furthermore, there was, in a few instances, a tendency for the timber to collapse during treatment. In view of these modest retentions, it is not possible to recommend pressure-treated sawn Sitka spruce for continued use in localities where a high degree of resistance to decay is required or where attack by insects or marine borers is

likely. On the other hand, poles of Sitka spruce with an outer layer of sapwood, which is not so resistant to penetration by preservatives, can, if treated with an appropriate preservative, be used in contact with the ground or in sea water, with a good expectation of a long service life.

Although the woodworking tests showed that satisfactory finishes can be obtained, it is not recommended that Sitka spruce from large trees less than 40 years of age should be used for conversion into joinery timber. This is because none of the material examined exhibited the rate of growth required by British Standard 1186 Pt. I (i.e., eight or more annual rings per inch).

Selected timber of suitable dimensions can be used for carpentry and other load-bearing structures. The selection should aim at a slope of grain not exceeding 1 in 8, a rate of growth displaying not less than four annual rings per inch and complete freedom from dead knots as required by Grades I and II of the grading rules for sawn softwood. In this connection it can be mentioned that, while the strength properties of Sitka spruce are usually lower than those of most common softwoods, its strength/weight ratio in practically all important strength properties (other than resistance to shear) is often superior. Furthermore, it is extremely stable in conditions of changing atmospheric humidity and, once seasoned, subsequent movement of the timber is unlikely to cause trouble.

Sitka spruce timber too fast grown to comply with the British Standard 1186 Pt. I, can be used for the cladding of portable and prefabricated buildings.

The species nails with little tendency to split, and is thus suitable for the manufacture of boxes and packing cases, but care should be taken to ensure that nails with a high degree of resistance to withdrawal are used for the heavier type of packing case. The clean white colour facilitates the printing and stencilling of destinations or advertisements on the container.

Note: This Bulletin, by J. A. H. Broughton, B.Sc., is No. 48 of the Forest Products Research Laboratory, and is published by H.M.S.O. at 3*s.* 0*d.* (3*s.* 5*d.* post free). Copies are available in all Conservancy offices.—*Editor.*

MORE MIGHTY OAKS

By

A. F. MITCHELL

District Officer, Research Branch

The very biggest oaks in girth are the most decrepit and collapse rather fast. I've rather lost interest in these old pollards. Maiden trees are not always easy to distinguish but if apparently sound and only three or four branches arise at about 8 feet, I tend to class them as maidens. It is extremely rare for an oak of 20-foot girth to fail to branch disastrously by 8 feet or so clear; obvious maidens are not in the record class.

However, here are some that I have seen and consider good trees, and likely to remain so for a reasonable time.

1. Maidens

King's School (Hazelgrove in "Elwes & Henry"), Bruton, Somerset	70 ft. × 32 ft. 3 in. Several trunks at 8 feet but very fine.

Walcot Park, Salop	70 ft. × 26 ft. Fine bole, 20 ft.?
Birnam, Perthshire	*ca* 65 ft. × 21 ft. 10 in. Huge spread. Fine tree.
Blair Drummond, Perthshire	115 ft. × 20 ft. 8 in. Very fluted but clean bole.
Tilford, Surrey	45 ft. × 26 ft. 3 in. (1953!) Well preserved (concrete and iron).
Bounds Oak, Bidborough ..	40 ft. × 25 ft. 6 in Well patched up.
Coaches Gate, Powis	70 ft. × 24 ft. Good tree.
,,	× 24 ft. 3 in. Good tree.
Cowdray Park, Sussex ..	70 ft. × 27 ft. 5 in. Very sound. Good bole.
Bayfordbury, Herts.	90 ft. × 20 ft. 11 in.
Yazor, Hereford. By road	65 ft. × 27 ft. 9 in. May be pollard. Hollow but fine.
Mells Park, Somerset ..	65 ft. × 21 ft. 9 in. Fine bole. 65 ft. × 22 ft. 3 in. 20-*foot* bole.

2. Probable Maidens

"Elwes and Henry" say "decaying". Rubbish! Quite splendid in 1962:

Holme Lacey, Hereford	75 ft. × 34 ft. Huge branches at 8–10 ft. *Superb.*
Powis Hybrid "Giant"..	90 ft. × 33 ft. 6 in. Forks from ground. Dying back.

3. Pollards, seen

Mells Park, Somerset	60 ft. × 25 ft. 11 in. at 4 ft. Very fine shape.
Billy Wilkins, Melbury	35 ft. × 34 ft. Burry. Awful!

4. Pollards, not seen

(Cannot give evaluation, health or decay, disappearance, etc.)

Mottisfont Abbey, Hants.	—	× 34 ft. 3 in.	R.C.B.G. 1940
Danbury, Essex	—	× 34 ft. 0 in.	,, ,,
Fredville Great Oak, Kent	—	× 36 ft. 6 in.	,, ,,
Manton, Cheshire..	—	× 43 ft. 0 in.	,, ,,
Cowdray Park	—	× 38 ft. 0 in.	,, ,,
Windsor (Conqueror's Oak) ..	—	× 35 ft. 9 in.	,, ,,
Leigh, Kent	—	× 35 ft. 9 in.	,, ,,
Bitterley, Salop	—	× 34 ft. 8 in.	,, ,,
Chaceley, Worcs.	—	× 34 ft. 6 in.	,, ,,
Monnington, Herefordshire ..	—	× 34 ft. 4 in.	,, ,,
Lydham, Salop	—	× 34 ft. 0 in.	,, ,,
Bowthorp, Lincs.	40 ft.	× 39 ft. 9 in.	M.G. 1955
Cowerne Ct., Hereford	40 ft.	× 39 ft. 0 in.	,, ,,
Ickworth, Suffolk	45 ft.	× 36 ft. 7 in.	,, ,,

Haughley, Suffolk.. ..	48 ft. × 35 ft. 3 in.	M.G. 1952
Kings Walden, Herts. ..	50 ft. × 32 ft. 5 in.	,, 1955
Lullingstone, Kent ..	— × 32 ft. 6 in.	R.C.B.G. 1940
Barrington Hall, Essex..	50 ft. × 34 ft. 8 in.	M.G. 1956
Nettlecombe, Somerset	— × 32 ft. 2 in.	J.D.U.W. 1953
	— × 31 ft. 10 in.	,, ,,

Of the Sessile oaks, the two in my new Royal Horticultural Society Journal list are two of the finest trees, let alone oaks, in the country.

Nettlecombe, Somerset	120 ft. × 21 ft. 1 in.	A.F.M. 1959
Easthampton Fm., Shobdon, Hereford	90 ft. × 29 ft. 1 in.	,, ,,
	Appears quite sound but actually hollow (there is a way in). Branches sprout at 10 ft.	

The Knightwood Oak, by the way, was 100 ft. × 22 ft. 10 in. in 1950—authority lost.

Note: M.G.=Maynard Greville; R.C.B.G.=R. C. B. Gardner; J.D.U.W. =J. D. U. Ward; A.F.M.=A. F. Mitchell.

A DAY IN THE FOREST

By

W. E. REYNOLDS

Clerical Officer, Headquarters

A short bus ride took us to the edge of Epping Forest. It was our intention to ramble through the forest then make our way to one of the many streams which run through Waltham Abbey for a spot of fishing. We set off through the forest in high spirits; the sun shone brightly from a blue and cloudless sky and a gentle, warm breeze helped to prevent the day from becoming too hot.

"Is this one of your forests, Dad?" enquired Pam, my elder daughter. Fortunately I had been reading the local guide a day or two previously and here was a chance to air my knowledge to the family. "Well, no," I began, then went on to explain that at one time this lovely forest was known as the Royal Forest of Waltham. In medieval times the forest provided the favourite hunting grounds of many English monarchs and Queen Elizabeth I spent much of her time in and around the forest. She is also supposed to have established a hunting lodge which still stands to this day at Chingford and is now used as a museum. In Tudor times, the lodge had open galleries and it was through these that their friends could watch the huntsmen on the forest plain. Tennyson liked walking through the glades to what is now one of our favourite picnicking spots—High Beech, the one-time haunt of the notorious Dick Turpin. Probably it was here that he—Tennyson—was inspired to write *The Foresters.*

There is no land like England,
Where'er the light of day be;
There are no hearts like English hearts,
Such hearts of oak as they be!

William Morris, born in Walthamstow, also spent many pleasant hours in Epping and is reputed to have had the forest in mind when he wrote, in *Shameful Death*, about the knight who was murdered:

In the place where the hornbeams grow,
A path right hard to find
For the hornbeam boughs swing so
That the twilight makes it blind!

Regrettably, however, toward the close of the Middle Ages the forest was fast disappearing through enclosures, and it seemed as though the ancient rights of the people would be completely extinguished. It was not until the latter end of the nineteenth century that a certain Thomas Willingale, who lived at Loughton, made a stand against the loss to the citizens of their heritage. His cause was taken up by the City of London Corporation and, after a lengthy battle in Parliament and the Courts, the freedom of the forest was won. In 1881, Queen Victoria visited High Beech and dedicated "this beautiful forest to the enjoyment of my people for ever".

I then went on to describe how the word Waltham, derived from Wealdham, meaning a forest homestead, gradually came to be associated with anything of the forest. Thus we have *Waltham Abbey*, the abbey in the forest; *Waltham Cross*, the cross in the forest—one of the monuments erected by Edward I to mark the resting place for one night of the body of his beloved wife, Eleanor of Castille, whilst it was being carried to London for burial; *Walthamstow*—the village in the forest. There are several other Walthams throughout Britain, each having some association with forests.

Naturalists claim to have found in a survey that Epping contains ash, alder, hornbeam, Sweet chestnut, Black poplar, elm, Pedunculate oak, Turkey oak, Sessile oak, Holm oak, Crab apple, Sloe, Horse chestnut, and Silver birch. We had fun identifying the various trees, but as our nomenclature differed somewhat from the experts we could hardly claim to have spotted all the different species, and as we rambled leisurely on through the forest we hoped to get a glimpse of the herd of fallow deer which still haunts the glades.

THE WHITE BUCK OF CANNOCK CHASE

By

R. J. JENNINGS

Head Forester, Dean Forest

Inhuman man! curse on thy barbrous art,
And blasted be thy murder-aiming eye!

—ROBERT BURNS

Under the shade of a group of birch trees that grew in the sandy heath and bracken of Sherbrooke Valley on Cannock Chase stood a fallow deer.

It was a hot summer day and the faint breeze that blew stirred the leaves and pendulous branches of the tallest tree, making a moving picture in light and shade on the creature's head and shoulders. Now and then it raised its forefoot restlessly, twitching its coat and tail to disturb the flies that sought to alight on its body. Out of the shade the sun shone brilliantly, a heat haze shimmered in the air and a hum of bees could be heard in the heather.

Across the other side of the narrow valley, a quarter of a mile distant, a man strode along a wide path in a vast forest of pine trees; at his heels trotted an obedient brown and white spaniel. The dog seemed exhausted by the heat, with tongue lolling from the side of its mouth it panted as it moved, longing for water.

As the man walked along, slasher in hand, the iron tip struck a pebble on the ground with a sound that was audible in the still air. The deer, alerted, turned its head towards the noise, betraying its presence as the sun shone on its neck. This slight movement of the animal might have escaped the notice of an unobservant man, but the forester saw it; he had spent his life in the woods and fields. Knowledgeable in the ways of wild creatures, he paused a while, his

keen eyes searching the scrub and vegetation on the opposite bank, then, seeming to have made up his mind, he called the dog and turned from the path on which he stood, making his way through the pine trees and striking dead branches from the scrub and undergrowth as he headed towards the deer.

Sixty yards from the group of birch trees the spaniel's pace began to quicken. The dog uttered a sharp cry and moved its tail vigorously as it ran in a wide circle. Again it barked quietly as it picked up a scent and turned towards the place where the deer stood. The buck, now conscious of danger, bounded from its cover, sprang up the steep bank and made for the open heath of the Chase. The forester watched it as it moved over the hill, a slight frown and a puzzled look on his face as though seeing something unusual.

Cannock Chase, a high-lying, open waste of land that covers some fifty square miles in Staffordshire, has been a haunt of deer for a thousand years. It was a royal preserve at the time of Domesday. Kings, princes and noblemen have hunted here. For centuries past the cries of men and hounds have been heard as they pursued their quarry across the hills and valleys, but the deer that they hunted were seldom like the beast that the forester had disturbed. Dark-coated in winter, with dappled lighter hair in the summer, they were brown in colour; but the buck that the spaniel had put up was pure white.

At the top of Sherbrooke Valley, against the road, an oak paling fence surrounds a rectangle of grassy land. Stone crosses in regular rows stand out in the neatly-trimmed turf. Here are the graves of many young men, but the names engraved on the stones are not those of the youth of Staffordshire, for this is a German military cemetery. Here lie the prisoners of two world wars who never returned to the Fatherland; they died in the camps on Cannock Chase, away from the battlefields.

During the two world wars the Chase was used as a training ground for the Forces. Young men were taught to use a rifle on the ranges; infantrymen learned military tactics; the Royal Air Force practiced bombing targets. Some of the live bombs dropped by the R.A.F. failed to explode—they lie where they fell even now, hidden in the sand and pebbles of the Chase.

The figure of a woman passing the cemetery gate was small. It was autumn and a chill wind blew. With her head held down she hurried homewards in the dark. It was the night of a new moon, no stars were showing yet, and the woman appeared nervous as she passed the cemetery gate, her step quickened and she seemed anxious to get to the light in the house a half-mile away. Suddenly her heart leapt and a cold shiver ran down her spine as a white figure moved in the woods at the roadside. She gasped and began to run, her pace not easing up until she reached the door of her house. Almost in hysterics she burst into the room, apprehensive of something she could not understand. Her husband shook his head as he heard her story, unlike his wife he did not believe in ghosts, besides . . . he remembered the white deer.

In the bar of an inn near the River Trent at the northern end of the Chase two men sat talking at a table. The taller of them wore the uniform of an American soldier. He was dark and swarthy, with black hair and high cheek-bones. He was in fact an American Indian. His home was in Idaho and he had come to Staffordshire as a sergeant in the U.S. Army. Before joining the forces he had worked in the United States Forest Service as a ranger.

The second man, a tractor driver, wore overalls that were soiled and worn, and he rolled a cigarette with grubby hands. He had thin reddish hair under a tattered greasy cap that shaded his eyes—unshaven and unkempt, he had a mean look: he spoke as though he wished the soldier to follow him from the bar. Presently both men went outside and drove off in a car; their journey

took them through the pinewoods on the Chase. It was dark and, after concealing the car in an abandoned quarry, they set off on foot through the trees, carrying with them a powerful electric torch, a length of rope and a coil of thin steel wire. The Indian led the way through the woods, looking all the time on the ground by the light of the torch as though seeking something. Presently he seemed to find what he was looking for and his pace became slower as he pointed to a small tree on the edge of the track. At the foot of this tree were the signs of the passing of many deer—in the bare earth were slot marks, some of the smaller trees had signs of rubbing on them, the bark was smooth and polished. Here the two men stopped while the Indian glanced around in the trees, then, pointing to a slender pine, he bade the other man climb up with the rope. When some fifteen feet from the ground, the shorter man made fast the rope to the top of the tree and after descending both men hauled on the rope until the tree bent like a bow. The Indian then cut off a length of wire which he formed into a noose and fastened to the top of the pine tree which was bent to the height of the head of a deer; then cunningly concealing the noose and after carefully attaching the wire to a tree on the side of the track, the two men moved on. Great tension was on the bent pine, it would spring up in the air when moved or knocked. After setting several more snares the men left the wood as silently as they had entered, and unseen. It was winter and the air was still.

Back in the woods a half a mile distant the white buck grazed on a grassy flat, the frost had gone, there was no wind and it was warmer. Near the buck were three does, it was dark and the beasts felt at ease for human beings seldom moved in the woods at night. Suddenly the buck raised his head into the air and sniffed, alarmed at an unfamiliar scent he moved off into the woods gaining speed as he ran, two of the does left him and swung towards the open land of the Chase, the younger animal followed the buck. As he ran he held up his head so that his antlers lay flat on his back as he moved through the pine trees when without warning his legs left the ground, his head was snatched violently into the air, he struggled and gasped as the full weight of his body hung on a noose of steel wire that encircled his throat. With rolling eyes and helplessly aimless movements of his limbs he swung from the pine tree. His tongue protruded, he could no longer breathe, his heart pumped to bursting point. Slowly but certainly the wretched creature's life was choked from it, gradually its convulsive movements ceased as with relaxing limbs and with hindquarters now dragging in the pine needles it sank into lifelessness. One hundred yards or so distant the young doe went through a similar death struggle.

In the morning the two men met early. It was Sunday and few people were about as the two poachers covered the ground where they had set their snares the previous night. They moved carefully, keeping under cover in the pine trees all the time. The cold wind whistled through the woods as they made their way to the spot where the doe had choked to death. The deer was visible twenty yards away, its white belly showed easily as it hung in the rows of trees in the forest. The two men smiled with satisfaction as they lowered the stiffened carcase to the ground and covered it up out of sight in amongst the dead bracken, then they made their way towards the white buck. Seeing the animal swinging in the snare they hurried to collect their kill but on reaching the deer they seemed to disagree. The Indian shook his head and did not touch the buck, he returned to the place where the carcase of the doe lay hidden, protesting to his colleague as he went, he was unhappy and felt that bad luck would come his way if he handled the animal. Albinos are said to be unlucky and the Indian was very superstitious and could not forget what he had been taught as a boy by the members of his tribe. The man left behind hesitated for a few moments before making his decision; then, untwisting the steel from around the deer's neck with

some difficulty, he lowered it to the ground. It was a heavy carcase and he wondered how he would be able to carry it from the wood without assistance. He dragged it into the cover by its antlers, noticing as he hauled it along that the brow tine on its left antler was broken. He meditated that the buck had been fighting, then together with the Indian they carried the dead doe to their car, still unseen. Later that evening they took it to a small butcher's shop in the nearest town where they sold it for twenty-five shillings. The money bought them drink at the inn near the river. That night it snowed and the white buck lay covered in the forest.

The following morning was bright and sunny, the cold wind whipped the snow from the high ground on the top of the Chase as the forester and his assistant walked briskly through the woods with their dogs. The two spaniels quartered the ground backwards and forwards across the forest rides and paths, sinking up to their shoulders in the snow, bouncing and leaping in the high heather, ploughing their noses into the small drifts as they sought the exciting scent of pheasant, grouse or hare. Their pads made holes in the snow, some of which froze to the long hair on their legs. The forester gave a shrill whistle, bringing one of the dogs obediently to heel, but the other seemed to ignore the call and continued to hunt and move through the heather and bracken flattened by the snow. In a few moments it stopped and barked; the forester called the dog but it barked persistently until the two men made their way to the animal, stepping through dead litter and branches on the ground until they came up with the dog which stood excited over a mound half covered with snow. It scratched at the mound vigorously and the forester saw the swollen head and antlers of the white buck, his face darkened, anger and bitterness showed in the hard lines around his mouth. The two men stood talking for a moment or two; then, as they looked around them and the forester saw the wire and rope tied to the tree, hard words were spoken.

The younger of the two men took from his pocket a knife in a leather case which he handed to the forester; then between them they expertly severed the head and neck from the carcase and together they left the wood, making their way home, carrying the head of the white buck between them by the antlers as they walked.

That night the foxes on the Chase fed on the flesh of the white buck and the next day many crows could be heard cawing and flapping their wings as they pecked at the meat. Soon, all that could be seen was the bones of the deer, some of them were scattered about the Chase.

It was spring now and the larks sang as they rose into the air on the top of the Chase; a cock pheasant called, his challenge echoing across the open ground in Sherbrooke Valley. The forester stood amongst a group of workmen on a piece of ploughed ground. Deep furrows had been cut in the heather and white pebbles shone in the sun. A police officer wrote in a notebook and the scene was one of tension and drama. One of the men pointed to a hole in the ground at the side of a yellow caterpillar tractor that stood attached to a double-furrow plough. The policeman picked up pieces of metal and there was talk of an unexploded shell.

A mile away at the forester's house a tractor driver sat in a chair, he wore blue overalls and he was of untidy appearance. His face and thinning reddish hair was streaked with dirt and sand; he wore no hat, the cap that usually covered his head lay in the heather beside his tractor on Cannock Chase. He had been ploughing and the iron-tracked machine had struck a hard metal object that lay half buried in the sandy soil.

The man's eyes were bandaged and he was unable to see the forester's wife when she spoke to him. He sat with his head resting in his hands, for he was

in great pain, awaiting the arrival of the doctor and the ambulance. Above the door of the room in which he sat was the mounted head of a white buck. The brow tine of the left antler was broken.

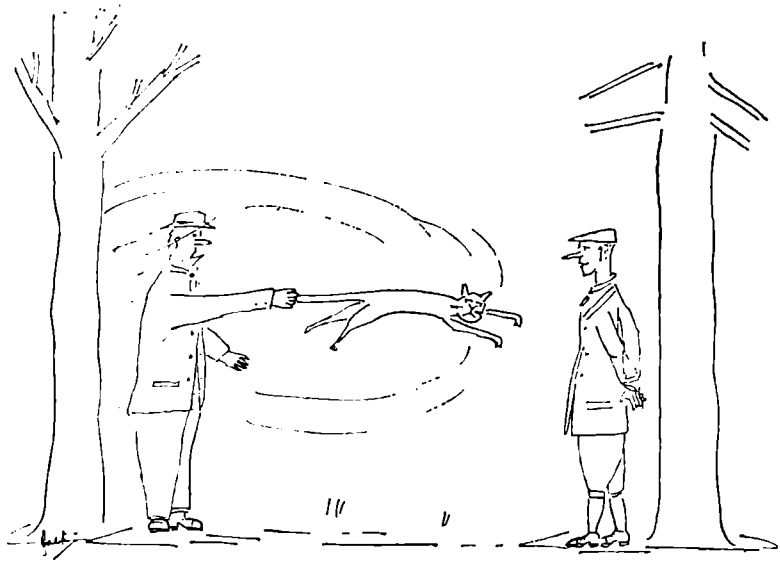


Fig. 22. "By the old builder's rule of thumb there is plenty of room here for the foresters office".

PINE CONE COLLECTION—THETFORD, SOUTH DISTRICT 1962

By

H. A. E. TILNEY-BASSETT

District Officer, East England

Introduction

The cone crop of pines which matured in 1961 over Thetford Forest was the most prolific ever known for Corsican pine, and probably for Scots pine as well. Advantage was taken of this soon after the issue of S.M.102, and the designation of several stands of pine in the forest as seed sources.

As the cone collection was restricted to the registered seed sources, and within each source to the seed stand itself, it was decided that collections would have to be made from the standing seed trees in order to reach the collection targets set. Cone collection was not entirely confined to standing seed trees, although this is the normal and desirable procedure, and the main reason lay in the generally high quality of the Corsican pine at Thetford. The seed sources were thinned during the winter of 1961–62 and cones were picked from the best of the felled trees, which were, in most cases, almost of seed tree standard and were removed to encourage the development of the crowns of the seed trees.

The problem was how to collect the cones from the standing trees. The scrambling net and associated climbing equipment were not really designed for use on pine trees, which bear relatively larger and fewer cones than trees like *Thuja plicata* and cypresses, so that one erection and dismantling of the equipment would result in a small and expensive collection of seed. Some form of transportable platform or ladder was in mind, when it was suggested that we hire a Simon hydraulic platform for the job from Scaffolding (Gt. Britain) Ltd. This machine proved ideal, lifting two men on a fenced platform 54 feet (maximum) off the ground, leaving them free to pick with both hands, and allowing movement control of the platform from both the ground and the platform: the men very soon learnt how to manoeuvre the platform themselves. (A picture of this machine appeared in the Commission's *Annual Report* for 1961.—*Ed.*)

Therefore the costs of collecting by two methods, from the platform and by picking off felled trees, became available. Naturally the cost by the platform greatly exceeded that from the ground, but sufficient was done from the platform to give an idea of costs to be expected by this method in future, when it may not be possible to collect cones from felled trees.

Collecting from the Hydraulic Platforms

Two 54-foot platforms were used, the first for four weeks, the second for three weeks. Each machine consisted of a hydraulically-operated platform, mounted on a special lorry chassis, looking like a huge angelpoise lamp.

The machines were only used on rides, hence all the collection was from ride-side trees. The rides had to be fairly level, and before the platform was raised the lorry was stabilised by legs lowered on either side to the ground.

Each team consisted of a responsible forest worker and a boy, and the machine operator, whose wage was included in the hire charge. From the platform, which could be easily manoeuvred in any direction, the cones could be picked from the lowest branches to about 60 feet. One team picked the cones into bushel skips on the platform, the other merely dropped them on to the platform, which had sides, and shovelled the cones into sacks when the platform was lowered.

After all cones within reach had been picked, the platform was lowered, and the machine was moved on to the next section and set up again. Thus density of cones on the trees, and nearness of trees to each other, could affect the rate of collection because of the more frequent machine moves required, each of which took several minutes.

All collecting was paid for on piecework, the rate agreed varying a bit, depending on cone density. To avoid stoppage for wet time, an extra 25% was paid for each bushel collected in wet weather. At weekends the same rates held, and the men received their due overtime pay also.

The men who started on each machine stayed with it, and went with it when it moved to other beats.

Machine No. 2 (because it was the second to come to Thetford) was in use at Aldewood before coming to Thetford, and because two machines were being hired at Aldewood initially, the hire rate had been reduced from £2 10s. 0d. per hour to £2 0s. 0d. When we hired another one, No. 1, the firm would only accept the full rate, because by that time the second machine at Aldewood, a 40-foot platform, had been returned as being no good for the job.

My first table shows, in columns 3, 4 and 5, the machine-hours paid for by the week, by species, broken down into "collecting" and "not-collecting"

periods, and the hire charge per week. Travelling time of the machines to Thetford had to be paid for.

After a day of wet weather when No. 1 stood idle, it was realised that we paid £2 10s. 0d. per hour whether it worked or not, so an incentive of an extra 25% on the piecework rate per bushel was given to keep the men picking in the rain. This was successful, but could not in all conscience be applied during the heavy snowstorms after Christmas, when many idle hours had perforce to be paid for.

Very soon after his arrival the Liverpudlian operator of No. 1 raised the question of weekend working, as he was far from home. The firm, S.G.B., agreed to a reduction of the hire charge on No. 1 to £2 per hour for all work if we worked both it and No. 2, when we got it, over Saturday and Sunday. We were due to get No. 2 at £2 per hour in any case, so it was equivalent to a 5/- reduction on each machine, but even this was estimated to save a few shillings per bushel, as it would be partly offset by having to pay overtime to both our men and the S.G.B. operators. This proved to be the case, and working weekends showed an overall reduction of 2/- per bushel on Corsican pine.

Wages paid by the week are shown in columns 6–8 of the first table. Columns 6 and 8 include overtime of Forestry Commission workers and the travelling time, subsistence and overtime paid to S.G.B. for their machine operators. The Forestry Commission labour overhead percentage of 30 is the Forest Year 1962 figure for East England Conservancy applicable to the Seed Account.

Corsican Pine

The overall cost of collecting 392 bushels of Corsican pine cones from the hydraulic platforms was £2 5s. 3d. per bushel. This included hire of the platforms, wages including overtime and subsistence, and overheads on Forestry Commission labour at 30%.

If no arrangement had been made for weekend working, the estimated cost would have been £2 7s. 3d. per bushel for 315 bushels over the same hire period.

If no incentive for collecting in the rain had been made, the estimated cost would have been £2 6s. 8d. per bushel for 376 bushels. After the arrangement had been made, only 16 bushels were actually collected in wet weather.

While these savings are not very much per bushel, they do indicate that the cost per bushel can be reduced by obtaining maximum use of the equipment.

The average Corsican pine collection rate for an 8-hour day was 12·4 bushels per team of two men, from the densest sections of each seed stand available.

The average piecerate paid for the actual hand collection of Corsican pine cones under normal weather conditions was 6s. 10d. per bushel, shared between the two collectors.

The number of bushels collected each week from each machine is shown in column 11 of this table. Cumulative totals of cost and number of bushels in columns 10 and 12 combine to give the cost per bushel to date in column 13. This column shows the reduction in the cost per bushel of Corsican pine with longer use (spreading the cost of the initial travelling time), and less time lost on weather, and the reduced hire rate with weekend working, so that by 24th December, 1961, the cost per bushel had fallen to £2 3s. 0d.; but in the last week 17 "not-collecting" hours were paid for, in the snowstorms at the end of the year, and this raised the unit cost to its final £2 5s. 3d. per bushel.

Scots Pine

In the Scots pine seed source of Brandon Park, the main source of cones was in older trees, up to 120 years old, and the collection target was thought

CONE COLLECTION COSTS USING THE SIMON HYDRAULIC PLATFORM

Species	*Week ending and machine*	*Machine hours paid for*		*Hire charge*	*Wages, etc., paid £ s. d.*			*Total cost in week*	*Total cost to date*	*Bushels collected*		*Cost per bushel to date*
		Collecting	*Not collecting*	£ s. d.	*Forestry Commission*		*S.G.B. operators*	£ s. d.	£ s. d.	*In week*	*To date*	£ s. d.
					Labour	*Overheads at 30%*						
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Corsican pine	3.12.61 No. 1	28	18	114 0 0	12 0 0	3 12 0	3 6 4	132 18 4	132 18 4	32	32	4 3 1
	10.12.61 No. 1	61¼	—	122 10 0	32 16 9	9 17 0	9 1 6	174 5 3	307 3 7	81	113	2 14 6
	17.12.61 No. 1	57¾	—	115 10 0	31 0 8	9 6 3	9 1 6	164 18 5	—	80	—	—
	No. 2	52	4	120 0 0	35 5 3	10 11 7	9 1 6	174 18 4	647 0 4	93	286	2 5 3
	24.12.61 No. 1	22½	1½	46 6 0	12 17 6	3 19 3	1 13 2	64 15 11	—	36	—	—
	No. 2	27	4½	63 0 0	18 7 7	5 10 6	1 18 9	88 16 10	800 13 1	50	372	2 3 0
	31.12.61 No. 2	15	17	64 0 0	12 10 9	3 15 1	5 15 3	86 1 1	866 14 2	20	392	2 5 3
Scots pine	24.12.61 No. 1	16	—	33 14 0	9 0 0	2 13 10	1 13 2	47 1 0	47 1 0	8	8	5 17 8

to be attainable from ground collection off mature and overmature felled trees.

But as future cone collections may have to be done from large and relatively isolated trees, the hydraulic platform No. 1 was used for two days on this type of work to see how much it would cost.

The proportion of the total hire charge for No. 1 machine applicable to these two days was £13 7s. 0d. Although trees were selected with the densest cone crop accessible to the machine, only 8 bushels were collected, at a piecework rate of 22s. 6d. per bushel. The cost per bushel came to £5 17s. 8d.

Conclusions and Recommendations on the Use of the Machines

The hydraulic platform proved to be an ideal, if expensive, tool for collecting cones under the conditions at Thetford, with level ground and easy access right up to the ride-side trees. The seed stands had not been thinned to seed stand density before this year, and therefore the seed trees inside the stands bore relatively small cone crops and there was no point in trying to get machines to these inside trees, but in future good cone years the seed trees will have to be picked from—will the machines be able to work among the trees? The machine operator, giving a demonstration at Aldewood, said he could get into a heavily thinned stand (D+ grade), but I suspect that, if these platforms are to be used inside seed stands, a certain amount of special rackway cutting or widening may be necessary until the seed trees are so isolated that the machines can work round them easily.

As the machines are so expensive to hire, the fullest use should be made of them, and the following recommendations are made, some of which were tried out with some success:

(1) Start the cone collecting as early in the season as possible, so as to avoid the risk of really bad weather stopping the work while the machines are still being paid for.

(2) Obtain reductions in hourly hire rates for (*a*) use of more than one machine at a time, (*b*) full 7-days-per-week working.

(3) Pay an extra incentive to keep the men picking in wet weather.

If there is more than one forest requiring these machines, it might be possible for hire rates to be negotiated centrally for several machines to be in use at the same time but at different forests, thus satisfying both requirements 1 and 2(*a*) above.

Collecting from the Ground

For the reasons given earlier, it was permitted to collect cones from felled trees as long as they were not of bad form—in the Corsican pine seed stands from thinnings; in Brandon Park from Scots pine fellings of mature trees.

Corsican pine: A total of 729 bushels from the various seed stands was collected from the ground, at an average labour cost, including 30% for overheads, of 7s. 7d. per bushel. Most was collected on piecework, at about 5s. per bushel, but some was collected on day work.

Scots pine: 346 bushels were collected in Brandon Park, at a piecework price of 6s. per bushel, which came to 7s. 10d. per bushel with overheads.

Costs for the whole Collection

Adding the platform and ground collections, the total quantities and costs are shown in my second table.

Editorial Notes

(1) When considering these figures, it must be remembered that 1962 was a very good year for Corsican pine seed. On average, each bushel of cones

SUMMARY OF COMBINED PLATFORM AND GROUND COLLECTIONS

Species	*Seed Stand Location*	*Ident No.*	*Bushels*			*Cost*				*Cost per bushel*
			Platform	*Ground*	*Total*	*F.C. wages*	*Labour overheads at 30%*	*Other costs (S.G.B.)*	*Total*	
Corsican pine	Elveden: Compartments 114–117, 126–129	61(4253)	204	452	656					
	Downham: Compartments 8, 15	61(4253)3	99	170	269					
	High Lodge: Compartments 9, 27, 40	61(4253)	14	56	70					
	Redneck: Compartments 10, 90, 92	61(4251)	75	51	126					
Totals for Corsican pine			392	729	1,121	£ *s. d.* 366 8 3	£ *s. d.* 109 18 0	£ *s. d.* 685 4 0	£ *s. d.* 1,161 10 3	£ *s. d.* 1 0 9
Scots pine	Elveden: Brandon Park, Cpts. 1–25	61(4253)1	8	346	354	112 16 0	33 16 1	35 7 2	181 19 3	10 3

yielded one pound of seed. As the "world" price of seed was around £3 15s. 0d. per lb., all but the most costly collections were well worth while economically.

(2) When comparing costs of collection, as between standing and felled trees, one must never forget that the latter method is (like killing the goose that lays the golden eggs) a once-for-all operation. Also, that one is working on sources that, although perhaps satisfactory, have never been specially selected.

(3) The easy conditions for cone collection, by means of a travelling platform, which obtain in East England, are somewhat exceptional. We have therefore included, at the suggestions of Messrs. R. F. Wood and P. F. Garthwaite, the two reports from North-west England which follow.

(4) The general experience in England was that, in Conservancies with more difficult conditions of soil and slope than are found in East Anglia, costs of collection with the travelling hydraulic platform could be alarmingly high.

CORSICAN PINE CONE COLLECTION AT SHERWOOD, DELAMERE AND CANNOCK, 1962

By

G. G. STEWART

Divisional Officer, North-west England

The past year's collection of Corsican pine cones has been the largest we have achieved and a report on the work is given below.

Forecasts and Programme

Assessments were made in June/July and the results, along with the targets later given, and the quantities actually collected, are shown in the table headed "Estimates and Achievements".

ESTIMATES AND ACHIEVEMENTS

Forest	*Stand*	*Estimate (bushels)*	*Target given (bushels)*	*Achievement (bushels)*
Delamere	(4277) 1	330		140
	(4277) 2	70		32
	(4277) 3	170		140
	(4277) 4	110		379
		680	300	691
Sherwood	(4243) 1	1,840	800	65
	(4243) 2	1,360	—	121
	(4243) 4	880	400	667
		4,080	1,200	853
Cannock	(4231) 1	300	300	34
Totals	—	5,060	1,800	1,578

Two points from these figures are worth noting:

(1) The very large estimate we made for Sherwood was almost certainly correct. But the total quantity was based on the whole area of the three seed sources which extend to almost 700 acres. In any future assessment, we should need to relate the estimate not to the total area but to a small part, which it would be practicable to cover in collection.

(2) The assessment at Cannock was based on a sample taken on a bank facing directly to the south. When we came to collect over the whole stand, it was found that there were very few cones on the trees on the flat ground at the top of the bank. The lesson is, of course, to make sure the sample taken is truly representative.

Collection Methods and Organisation

The tables which follow give details for Sherwood and Delamere.

The main method used at Sherwood was a ladder plus the usual safety line and strops. Short wooden extending ladders were used to begin with, but later 35 ft. aluminium ladders were obtained.

A team of three men (two men up trees and one man on the ground) was found to be the most suitable organisation.

The tree bicycle was tried but was not found satisfactory as too few of the trees are pruned and the crops are too small in girth. Further, the trees are still short enough to make a ladder the more practical means of reaching the crowns.

Later, at Sherwood, a Simon hydraulic platform was hired from Scaffolding (G.B.) Ltd., on the recommendation of East England. This machine worked along level rides, and enabled collection to be made from ride-side trees. The machine helped greatly in the work of collecting a large quantity of cones, but proved very expensive. With two men in the platform, 7–10 bushels per day were collected.

At Delamere, where the trees were bigger, the main methods used were tree bicycle and ladder; these proved very successful. The collection team was organised into a team of six men (mainly Forester Training School candidates) which was supervised by D. Wood, the Assistant Forester in charge of the Conservancy seed collection teams.

Costs

The Sherwood and Delamere tables give details of costs. The methods table gives a summary of costs by methods of collection, as far as these can be given. It seems probably that the main factor in cost is the quantity of cones per tree.

Problems

In general, the difficulties encountered in collection were: inexperience of teams to begin with; shortage of equipment, especially safety ropes (again, to begin with); cones not being ripe until the beginning of January and needing hard twisting to remove them up to that time; very cold, frosty weather in December.

Outside Assistance

Two-man teams from South-west England and from North-east England were lent to us; the former team worked at Delamere and the latter at Sherwood, and we were most grateful for this help.

Conclusions

The main lessons to be learned seem to be these:

(1) Wherever possible, ladders should be used to reach the crowns; tree bicycles are needed only for the largest trees.

(2) With a large programme, it is essential to concentrate on the trees bearing the most cones.

(3) Teams must be well-trained and have adequate equipment.

(4) The use of the hydraulic platform proved very expensive, mainly because of the small number of cones per tree. Where numbers are high, or where a large programme must be achieved in a short time, the machine would seem to be useful.

NOTES ON CORSICAN PINE CONE COLLECTION AT DELAMERE FOREST 1961–62

By

T. C. MITCHELL

District Officer, North-west England

Planning

Cone assessments were carried out in the late summer on the four registered seed sources. These assessments gave the following results:

Identity No.	*Year of Planting*	*Area*	*Cones/Tree*	*Estimated Quantity (bushels)*
(4277) 1	1920	80 acres	66	336
(4277) 2	1919	12 ,,	96	73
(4277) 3	1903	22 ,,	158	173
(4277) 4	1902	15 ,,	152	114
				696

Though the 1920 crop was seen to contain the largest amount of cones, the fact that this source gave the lowest number of cones per tree indicated that collection from it would be the most time-consuming and costly. Furthermore, cut-tests on cones from the various sources showed that the 1919 and 1920 crops would yield on average only 3–4 fully developed seeds per cone, while the 1902 and 1903 sources contained 8–10 seeds per cone. In the light of these facts it was decided to concentrate the use of labour and climbing equipment on the 1902–03 crops, and concurrently with this, to collect from dominants and co-dominants, felled in a thinning of the 1920 crop, which was purposely postponed to November. The 1919 source, which was not due for thinning, was held in reserve in case of a shortfall in any of the other sources.

Organisation

Collection started on 22nd November, 1961, and finished on 9th February, 1962, when 691 bushels had been collected. A team of six men (four ex Grizedale and two ex South-west England), supervised by Assistant Forester Wood, worked in the 1902–03 sources and latterly in the 1919 crop. This team was equipped with tree bicycles and one 35 ft. aluminium fruit-ladder, plus the ancillary equipment comprising safety belts, strops, nylon ropes, etc. In addition, two local men using shorter wooden ladders and safety belts, collected from outside trees on the south and west edges of the 1920 crop, and one man collected from the felled dominants and co-dominants, also in the 1920 crop. The three local men were given normal supervision from Forester Jenkins.

SHERWOOD

CORSICAN PINE CONE COLLECTION 1961–62: DATA BY STANDS

Stand	*Year of Planting*	*Top height (approx.) of trees from which collection was made (ft.)*	*Method of collection*	*Cones collected (bushels)*	*Average No. of bushels per tree (approx.)*	*Method of payment*	*Labour cost* (£)	*Labour overheads* (38%) (£)	*Total labour cost* (£)	*Total labour cost per bushel* (£)	*Machine hire charge* (£)	*Local supervision cost* (37%) (£)	*Total cost* (£)	*Total cost per bushel* (£)
(4243)4	1926	50–55	Ladder	521	0·3	Bonus of 9/6 per bushel, later increased to 13/–*	969	371	1,340	2 11 6		361	1,701	3 5 4
			Hydraulic platform	146	0·3	Bonus of 3/– per bushel†	99	38	137	18 9	444	37	•618	4 4 9
(4243)1	1926	50	Ladder	16	0·2	As above*	23	8	31	1 18 0		8	39	2 8 4
			Hydraulic platform	49	0·2	As above†	42	16	58	1 3 10	150	16	224	5 11 6
(4243)2	1927	50	Ladder	43	0·4	As above*	58	22	80	1 17 3		22	102	2 7 4
			Hydraulic platform	78	0·2	As above†	67	26	93	1 3 8	239	25	357	4 11 5
Totals	—	—	—	853	—	—	1,258	481	1,739	2 0 10	833	469	3,041	3 11 3
										Haulage to seed extraction plant			56	
													3,096	3 12 8

Notes: (1) "Ladder" covers the use of short extending wooden ladders and 35-ft. aluminium ladders.
(2) Figures for labour and local supervision overheads taken from Statement of Accounts for Forest Year 1961.
(3) Collection began on 28th November 1961 and finished on 23rd February 1962.

DELAMERE

CORSICAN PINE CONE COLLECTION 1961–62: DATA BY STANDS

Stand	*Year of Planting*	*Top height (approx.) of trees from which collection was made (ft.)*	*Method of collection*	*Cones collected (bushels)*	*Average No. of bushels per tree (approx.)*	*Method of payment*	*Labour cost* (£)	*Labour overheads* (38%) (£)	*Total labour cost* (£)	*Total labour cost per bushel* (£)	*Local supervision cost* (37%) (£)	*Total cost* (£)	*Total cost per bushel* (£)	*Remarks*
(4277)1	1920	60	15-foot wooden ladder	69	0·3	Bonus of 7/– per bushel	103	40	143	2 1 5	38	181	2 12 7	
			From felled trees	71	Not known	Piecework at 15/– per bushel	54	20	74	1 0 9	20	94	1 6 4	Dominants and co-dominants in thinnings
(4277)2	1919	65	Tree bicycle and 35-foot aluminium ladder	32	0·3	Bonus of 8/– per bushel	609	233	842	1 10 7	227	1,069	1 18 9	
(4277)3	1903	85	As above	140	0·4	As above								Lowest safe branch whorls were 30–40 feet from ground
(4277)4	1902	85	As above	379	0·6	As above								
				551										
Totals	—	—	—	691	—	—	766	293	1,059	1 10 8	285	1,344	1 18 10	
							Haulage to seed extraction plant					12		
												1,356	1 19 3	

Notes: (1) Figures for labour and local supervision overheads taken from Statement of Accounts for Forest Year 1961.
(2) Collection began 22nd November 1961 and finished on 9th February 1962.

METHODS

CORSICAN PINE CONE COLLECTION 1961–62: DATA BY METHODS OF COLLECTION

Forest	*Stand*	*Year of Planting*	*Top height (approx.) of trees from which collection was made*	*Method of collection*	*Cones collected (bushels)*	*Average No. of bushels per tree (approx.)*	*Method of payment*	*Labour cost* (£)	*Labour overheads* (38%) (£)	*Total labour cost* (£)	*Total labour cost per bushel* (£)	*Machine hire charge* (£)	*Local supervision cost* (37%) (£)	*Total cost* (£)	*Total cost per bushel* (£)
Sherwood	(4243)1 (4243)2 (4243)4	1926 1927 1926	50 50 50–55	Extending wooden ladder and 35-ft. aluminium ladder	580	0·2 to 0·4	Bonus of 9/6 per bushel later increased to 13/–	1,050	401	1,451	2 10 0	—	391	1,842	3 3 6
Delamere	(4277)1	1926	60	15-ft. wooden ladder	69	0·3	Bonus of 7/– per bushel	103	40	143	2 1 5	—	38	181	2 12 7
Delamere	(4277)2 (4277)3 (4277)4	1919 1903 1902	65 85 85	Tree bicycle and 35-ft. aluminium ladder	551	0·3 to 0·6	Bonus of 8/– per bushel	609	233	842	1 10 7	—	227	1,069	1 18 9
Sherwood	(4243)1 (4243)2 (4243)4	1926 1927 1926	50 50 50–55	Hydraulic platform	273	0·2 to 0·3	Bonus of 3/– per bushel	208	80	288	1 1 1	833	78	1,199	4 7 10
Delamere	(4277)1	1920	60	From felled trees	71	Not known	Piecework at 15/– per bushel	54	20	74	1 0 9	—	20	94	1 6 4
Totals	—	—	—	—	1,544	—	—	2,024	774	2,798	1 16 3	833	754	4,385	2 16 10
										Haulage to seed extraction plant				68	
														4,453	2 17 8

Comments

The average rate of collection, using tree bicycles or ladders, was approximately two bushels per man per day, the range being about 1¼ to 3 bushels. As expected, outside trees, particularly on south and west aspects, gave a very high yield of cones, and from some exceptionally prolific specimens in the 1902–03 crops, approximately two bushels each were recorded. Furthermore, seed counts in cones from these trees were also high, with as many as 10–14 viable seeds per cone.

It is considered that a team of six men, using tree bicycles, ladders, etc., is about right for one full-time supervisor, who also acts as anchorman and arranges the bagging of cones and their transport to the local depot. A larger team would place an undue load on the supervisor and lead to inefficient working, and perhaps a slackening of safety precautions. During bad weather, when collection was impossible, the team was usefully employed in the cone store, removing needles and other debris from the collection.

Though it is not possible, from the data available, to compare the costs per bushel, using a ladder, as opposed to a tree bicycle, it was fairly obvious that in cases where a choice was possible the former was much quicker. This was particularly so on unpruned trees, or on trees pruned to no great height, where the "tree cyclist" had to spend some considerable time pruning the tree to a point where he could park the bicycle, and climb into the crown. Some of this pruning will not be wasted, since quite a few of the pruned trees will remain as seed-bearers; many, however, will be removed in the near future and their pruning will only have served one collection. Though a ladder is to be preferred where conditions permit, it is thought that one of 35 ft. length is the maximum for easy manoeuvrability, and manipulation in the crop. There is also an element of risk to the climber in the use of a ladder on an unpruned tree, since it is impossible to position it against the bole of the tree where it can be secured with a fastening chain. In this respect, the use of the so-called "one-legged" ladder, which can be placed against the bole of an unpruned tree more easily and then secured, should be investigated.

COYPU

By

J. W. PARKER

Forester, East England

For the forester the coypu, *Myocaster coypu*, is an animal of no consequence, because even if they become numerous, they are unlikely to do any damage, and if they are found to have acquired the habit of eating certain trees, then they are about the easiest of all animals to eradicate from a forest. In some areas these animals have eaten the tops from beds of young basket willows and have also attacked young poplars, but on my own forest during the hard winter of 1963, no damage could be directly accredited to these animals, and yet they were so numerous that on our north-eastern boundary 330 coypu were destroyed in about six weeks. A certain amount of skill is required to destroy roe deer, hares and any other type of forest vermin because no matter what the weather, these animals have the advantage of being in their own environment, and the trapper is at a disadvantage. With the coypu, however, being an introduced animal and completely foreign to its adopted environment, its life becomes completely disrupted in severe weather and it is thus completely at the mercy of anyone who has evil intentions towards it. Once the animal

is back in its own environment where it can swim out of man's way and take refuge in the reed beds, it will naturally survive and becomes a difficult quarry.

The coypu is a South American beaver and an animal of the fresh-water swamps; it differs from the beaver mainly by the fact that it has a round rat-like tail and does not fell trees. They spend a lot of their time swimming and a great deal of their feeding is done in the water. They are mainly vegetarians and feed mainly on water plants; on land they feed on short grass, dock leaves and sorrel. In some cases they have acquired the taste for certain other foods —among these are farm root crops, standing corn, and some colonies have even acquired the taste for swan mussels. Another habit associated with their feeding is their habit of chewing through the standing stems of *Phragmites* reeds and constructing large mounds of them, upon which they recline. Some mounds are hollow, which they probably use to have their young in. In places, these mounds are numerous and in one place there were eighteen in a square chain. During the hard weather, their habits changed with their environment. The animals vacated the frozen *Phragmites* beds and dispersed in three different ways. Type 1 wandered aimlessly along roads and on to farmland and were more or less exterminated. Type 2 moved towards the seashore; some took up residence in any open holes, but in the main they lived rough in the long dense grass and fed on seashore plants. Type 3 made their homes in woodlands and dug into the litter. They did not venture from their litter beds very much and subsisted mainly on bramble leaves, willowherb roots, dried grass and bracken. To the amazement of the experts, these swamp animals, which supposedly could not survive the intense cold or live without drinking, have gone two months without a drink, experienced the severest weather known in this country and emerged with a gloss on their coats and in almost perfect breeding condition. They did possibly eat the snow, however.

To engage the enemy at a disadvantage is usually considered more than half the battle, but in the campaign against coypu, it is nine-tenths of the battle. For once the water is frozen the coypu cannot dive in, and if the ice is hard enough to bear a man's weight, then he can venture into the heart of the animal's normally inaccessible territory, the shallow swamp of black oozy mud. Then they can be easily chased and overtaken. Provided the weather is suitable, the very best method of exterminating these animals is to use a dog for scenting them out. Tests on the Type 2 area and the Type 3 areas, show that an average catch with a dog was six coypu per hour, and there are no other methods yet devised to approach anywhere near these figures.

The scent of a coypu must be extremely strong because a dog can pick it up instantly. It would not be considered prudent to take a valuable gun-dog after these animals because they would, no doubt, have been trained to have a soft mouth and they may be inclined to try and pick coypu up. Several of the gun-dogs in the locality of this forest, when sent after winged game, have crossed the path of a coypu in their travels and they have immediately diverged and followed the scent of the animal and in several cases the dogs have got the worst of the fight. In one instance, it was thought the dog (a big yellow Labrador) was going to die. My dog started killing young coypus and was doing very well at it until the day she met a full-sized one, after which she painfully lay in her basket for a full week. The best method is to teach the dog to follow the scent, to find and worry the coypu. Then the dog can attract the owner with its bark and the coypu can be tapped on the head; this will knock most of the fight out of it and the dog can be left to claim credit for the kill.

A very strange thing about these coypu is that they seem to lose consciousness at the slightest blow; they would probably lay on their sides if one only hurt their feelings. They have a very thick neck which seems well-protected

with a layer of blubber and this in turn is covered with a layer of very thick hair, and a blow on the neck often only stuns them. They soon recover, but the skull itself appears to be very thin and one accurate, hard blow with a heavy stick kills them.

Another method of getting these animals is the cage trap, and the main point to bear in mind, about any sort of trap, is that it works while one sleeps. Several types are available but the most effective is the new 10×10×48-inch. This is lighter and half the price of the 12×12×48-inch, and just as effective. These traps are of very simple construction and are sprung by the animal treading on a grille at the opposite end to the entrance. Once the entrance closes it rides over a catch and prevents the animal's escape. They can be baited with any sort of root crop but the bait must be large enough not to foul the moving grille, so as not to impede its action. The traps should be set in the runs of the animals and a few scraps of root crop can be scattered near the entrance. It is possible to construct these traps from wirenetting, but the coypu have been known to bite through it! Unless the specimens are required alive, the best way of removing them from the trap is to turn the trap on its back and put a sack over the mouth of the trap. The door will then fall open and lay on the trap floor out of the way. The animal can then be driven into the sack and, by feeling for its head, it can then be located and given a blow with a blunt object. The cost of these traps is about 17s. 6d. If required alive, the best way to handle these animals is to pin them down with a stick and either grab them by the scruff of the neck or take them by the tail. Personally, I prefer the tail method.

The first coypus were brought over from the Continent in 1929 and kept as breeding stock on the fur farms. There was then a very good trade for the furs and the average price for the skins then was 10s. to 15s. each. The average price of the adult breeding stock was £7 each and the general trade for coypu fur was so flourishing that trapping restrictions had to be placed on the animal in its natural South American habitat and there was fear of the animal becoming annihilated. What happened next is not very clear, but in my opinion the "Nutria" fur most probably priced itself out of the market. The fur in its original state is nothing striking to look at but the furrier shaves off the outer layer of guard hairs and the result is a very pleasant-coloured, hardwearing fur sold as "Nutria". In today's fur adverts., the big stores are offering coats of "Nutria shade", so it is reasonable to suggest that the ladies were quite pleased with the natural colour. The name seems to be a corruption of the Latin for "otter" (*lutra*), for which the early Spanish settlers in South America mistook this animal. It is said by the wise men who know these things, that today's wild population in East Anglia is due to animals escaping from these fur farms, but by the bottom having dropped out of the market, the inference is obvious to any decent naturalist, and thus future generations of naturalists have inherited a legacy.

Coypus have no natural enemies; only a fox would be strong enough to tackle a fully-grown coypu, but observations during the winter of 1963 showed that foxes do not eat coypu meat. However, it is quite possible that mink and stoats may take the odd live baby. Rough-legged buzzards increase with the population of coypu and it is possible that they do take the very young ones if presented with the opportunity. There are several types of human enemy of the coypu—the ornithologists objected to them so strongly that coypu were made the centre of discussion at a special meeting in London, and yet, apart from talk, I do not know of a single ornithologist who has done anything constructive towards their removal. This animal does, however, have a habit of reclining on the nests of bitterns, Marsh harriers, rails and other waterfowl.

Farmers dislike them, the intensity of the dislike being usually inversely proportionate to the amount of effort the farmer has expended on his own crop protection. River Board officials are after their blood for the damage they cause to the banks (but as I usually spend my holidays cruising the Norfolk Broads it is my opinion that speedboats, possible lack of funds and sheer neglect cause a lot more damage). Reed-cutters and thatchers know the animal's love of constructing mounds of reeds cause them financial loss and complain quite freely, but I have never yet seen a reed man with a coypu trap.

Not only do these animals have no natural predators, but apart from rats, nothing eats their flesh. Having inspected dozens of freshly killed coypu carcasses in the snow, apart from the odd gull and crow, the only thing to touch them was rats. The inside of a coypu resembles the inside of a freshly killed hare, and rats devour them most greedily. Footprints in the snow showed where a couple of rats ate the whole of the pulpy middle out of a large coypu in a single night, and yet there was no comparison between the relative sizes of the dead and live animals. The flesh is supposed to be very good for human consumption, in spite of the fact that, after months of freezing weather, no starving wild animal, no matter how ravenous, would touch the flesh! It is supposed to look and taste like hare, but I trust that our firm never reduces pay to such an extent that I am compelled to eat one! Several people (including one former forestry head for India) use them for dog meat. Some of the shops which cater for strange tastes in London, sell an imported tinned meat labelled "Myocaster", which, if the label displayed a picture, would show none other than our old friend, *Myocaster coypu*.

Coypu have no set breeding season but produce their offspring all the year round and litters average from four to seven babies. The females are in young for 120 days, and therefore it is quite possible for five litters to be born in two years. They commonly breed at five months of age, but, no doubt where the breeding stock have been decimated, they will produce in future at a much earlier age, probably at three to four months. The babies are born with their eyes open and are equipped with teeth and can feed on grass at about two days old. A full set of teeth consists of sixteen grinders (four on each side, top and bottom) and four incisors. These front teeth are the animal's main weapons and in an adult coypu average an inch and a half long. They are constantly growing, but if for any reason they are broken, the growth rate seems to speed up and a new tooth grows in about five to six weeks.

A fully-grown male animal weighs up to twenty pounds and the heaviest female has been about twenty-four pounds. The call of the coypu is something like the mooing of a cow, but, of course, in a different tone. There are other notes emitted by these animals, plus the sound of the gnashing of the teeth, which they produce as a defence mechanism when attacked or when two males are fighting. Generally, in the wild, these animals tend to be gregarious and live a communal sort of life. They put up rather a ferocious fight when captured, but, when confined, they tame down very quickly. The males are sometimes inclined to fight among themselves, but the resulting wounds heal very quickly.

Coypu dung resembles a large, dark brown slug, and has longitudinal, parallel lines on its upper surface. In the case of an adult animal the droppings are about one and a half inches long and a large female produced 45 droppings in twelve hours. These droppings are sometimes round-ended and sometimes sharp-ended, but unlike those of the Red deer, they probably do not indicate the sex of the animal, but may probably indicate what the animal has been feeding on.

The front feet of the animal are armed with claws and are equipped for digging, as not only do they feed on growing water plants, but they also dig

up the roots. The back feet are webbed and are equipped for swimming. When disturbed, the animal usually prefers to take to water and swims along the surface with a dog-paddle motion. If at this stage they are again frightened, they will submerge and proceed to swim under water; the stroke then appears to take on a different motion. The front legs appear to swing downwards and outwards and the back legs thrust forward and swing through an arc of 180 degrees. The speed under water seems to be slightly faster than when on the surface. They do not dig holes very often, but when they do they are usually situated at water level, and, as in the case of most other hole-habiting animals, they provide an exit in the form of a bolt hole, or a rear entrance on land. It is also interesting to watch these animals navigate when swimming submerged, for they seem to take their bearings from landmarks on the dyke-bottom, judging from the manner in which they sometimes suddenly swing off course and make for their hole.

The coypu is now deemed a public enemy in the British Isles and considered a pest, but it is treated in a completely different manner in parts of Eastern Europe and is considered an economic crop, and one of the natural assets of the country. They are not trapped indiscriminately as, say, we do with rabbits, and although they are absolutely wild, they are selected before killing and pelting. Rafts are constructed with built-in swinging floors and the animals are conditioned to feeding on these rafts. Not only can they be accustomed to feeding on these rafts, but they can be encouraged to change their natural feeding habits and encouraged to eat grain, normally in the form of barley. The rafts are usually anchored, and served by boat. Only the adult males in pelting condition are killed, the females are released to breed and the young males are released to grow bigger. It is said that the females very quickly learn that nothing will happen to them and even clamber into the attendant's boat to be the first in the corn queue. To ascertain whether the British animal was as trainable as their European counterpart, a batch of six rafts were constructed and placed on a marsh evenly over about twenty acres; each raft was issued with eight pounds of wheat and twenty-five carrots. Within a few days all the rafts were discovered and tested by the coypu and they became very popular. The ration was replenished each evening and it was not very long before the whole contents would vanish overnight. One evening I found an adult and six two-month-old youngsters on one raft, and instead of dispersing and beating a hasty retreat, they simply entered the water and swam around the vicinity in a most contented manner.

The demand for the animal's fur in this country is almost non-existent. One company obtained a small quantity and paid 7s. 6d. each for them in 1962 but have since stopped taking them.

Owing to the animal's habit of suckling the young sometimes when swimming, Nature has solved the situation of making sure the milk does not get watered down, and during the stages of evolution, positioned the teats above the waterline. So instead of unzipping the fur along the belly, the trade insist that in the case of the coypu they are unzipped along the back.

Whether it was the sound of the animals chewing or the indications of good feeding in their scent it is hard to say, but they were definitely prone to being decoyed. If it was the sound, it is then feasible to decoy coypu with a tape-recorder and amplifier (as if the poor old warrener has not already got enough to carry!).

FORESTRY COMMISSION STAFF
At 31st October, 1962

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ASSISTANT FORESTER

Anderson, D. F. (Rannoch); Bain, J. (Drumtochty); Bowie, A. G. (Bin); Elliott, D. M. (Rannoch); Findlay, J. C. (Monaughty); Fraser, D. (Blairadam); Greenlees, C. V. (Clashindarroch); MacCallum, L. C. (Glenlivet); McConnachie, K. (Glenlivet); MacDonald, A. M. (Drummond Hill); MacDonald, I. D. (Glendevon); McLean, J. P. (Ledmore); MacMillan, T. W. (Drumtochty); Menzies, J. D. (Rannoch); Priestley, P. (Blackcraig); Rose, J. (Alltcailleach); Salmean, C. (Glendevon); Stewart, W. B. (Bennachie); Thirde, G. S. (Glenisla); Tracy, C. R. (Craigvinean); White, P. A. (Clashindarroch).

FOREMEN: Anderson, R. M. (Tentsmuir); Anderson, S. C. (Keillour); Grant, A. M. (Elchies); McCann, W. G. (Drummond Hill); Soppit, J. (Montreathmont)

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CIVIL ENGINEERING ASSISTANT: McMillan, J. G.; Welding, R. A. (Newton Stewart)

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FORESTER

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SENIOR CLERK OF WORKS (ESTATE):	MacKellar, D. L. (Cairnbaan); McLay, J. D. (Aberfoyle)
CLERK OF WORKS (ESTATE):	McClory, J. (Benmore); MacDougall, H. (Barcaldine)
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MECHANICAL ENGINEER: Low, W. L.

ASSISTANT ENGINEER (CIVIL): Egerton, F. C. (Llanrwst); Jameson, V. O. (Aberystwyth); Philbrick, G. E. H.; Thomas, P. A. (Dolgellau)

SUPERINTENDENT OF WORKS: Dummet, E. J. (Llanrwst); Dunroe, J. R. (Ruthin); Gwynne, G. (Dolgellau); Redford, H. (Llanbrynmair); Whiteford, G. (Aberystwyth)

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CIVIL ENGINEERING ASSISTANT: Davies, W. S. (Dolgellau); John, E. E. (Llanrwst)

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FORESTER

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