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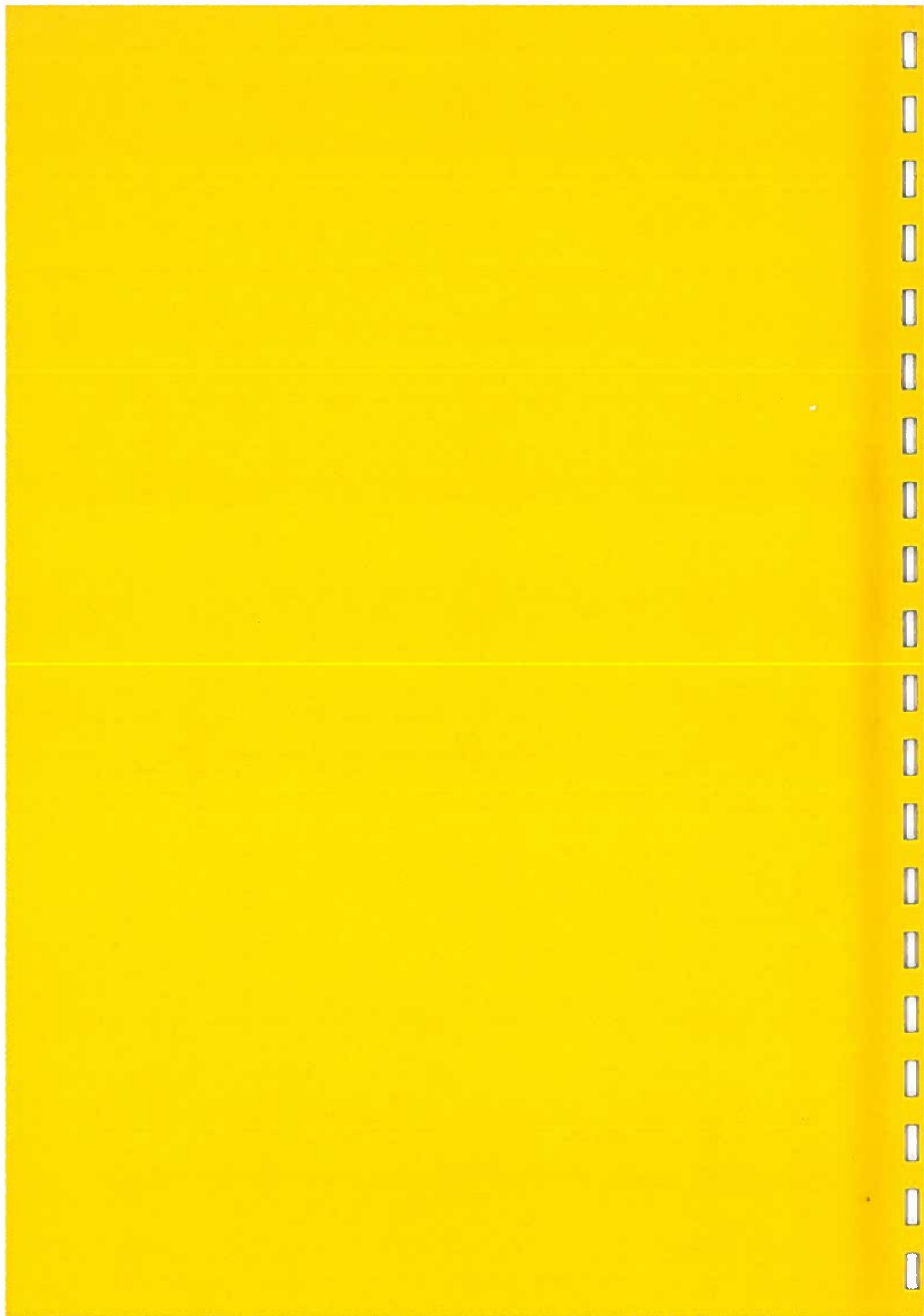
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Forestry & Archaeology

in Dyfed



Dyfed Archaeological Trust Ltd.

Forestry & Archaeology

in Dyfed

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INTRODUCTION

The intention of this report is to examine the scale, mechanics and structure of forestry and woodland operations in Dyfed and assess their archaeological significance.

Although this report confines itself to Dyfed, it is hoped that the discussion will be of interest to those involved elsewhere in the archaeology of the Highland Zone, where afforestation is a perennial problem. During the planting year ending in March 1975, over 8,000 hectares of plantable land were acquired in Britain by the Forestry Commission alone; this presents an archaeological problem of considerable magnitude.

The response to this problem in Dyfed is not a prime consideration of this report. Recommendations are made for future action, but its major function is to provide sufficient information to enable this aspect of the archaeological situation to be understood and subsequently weighed against the many other priorities which exist.

This report has been written mainly by Nigel Kerr, B.A., who, on behalf of the Trust, gathered the information during a 5-week period in 1976. Many people gave assistance during its preparation. In particular, the Forestry Commission's District Officers in Dyfed, Messrs. Henderson, Watt and Webb gave much help and encouragement, as did Mr. Zehetmayer, head of the Forestry Commission in Wales. Mr. Proctor of the Economic Forestry Group Ltd., similarly provided much detailed information about the Group's operations. Other information and assistance were supplied by the Dyfed County Planning Department, the Royal Commission on Ancient and Historical Monuments (Wales), the Department of the Environment (Ancient Monuments Branch, Wales), as well as the Trust staff. Illustrations are by N. Kerr and T. James. Thanks are also due to Miss M. Phillips for typing the Report, which has been edited by D. Benson and C. Houlder.

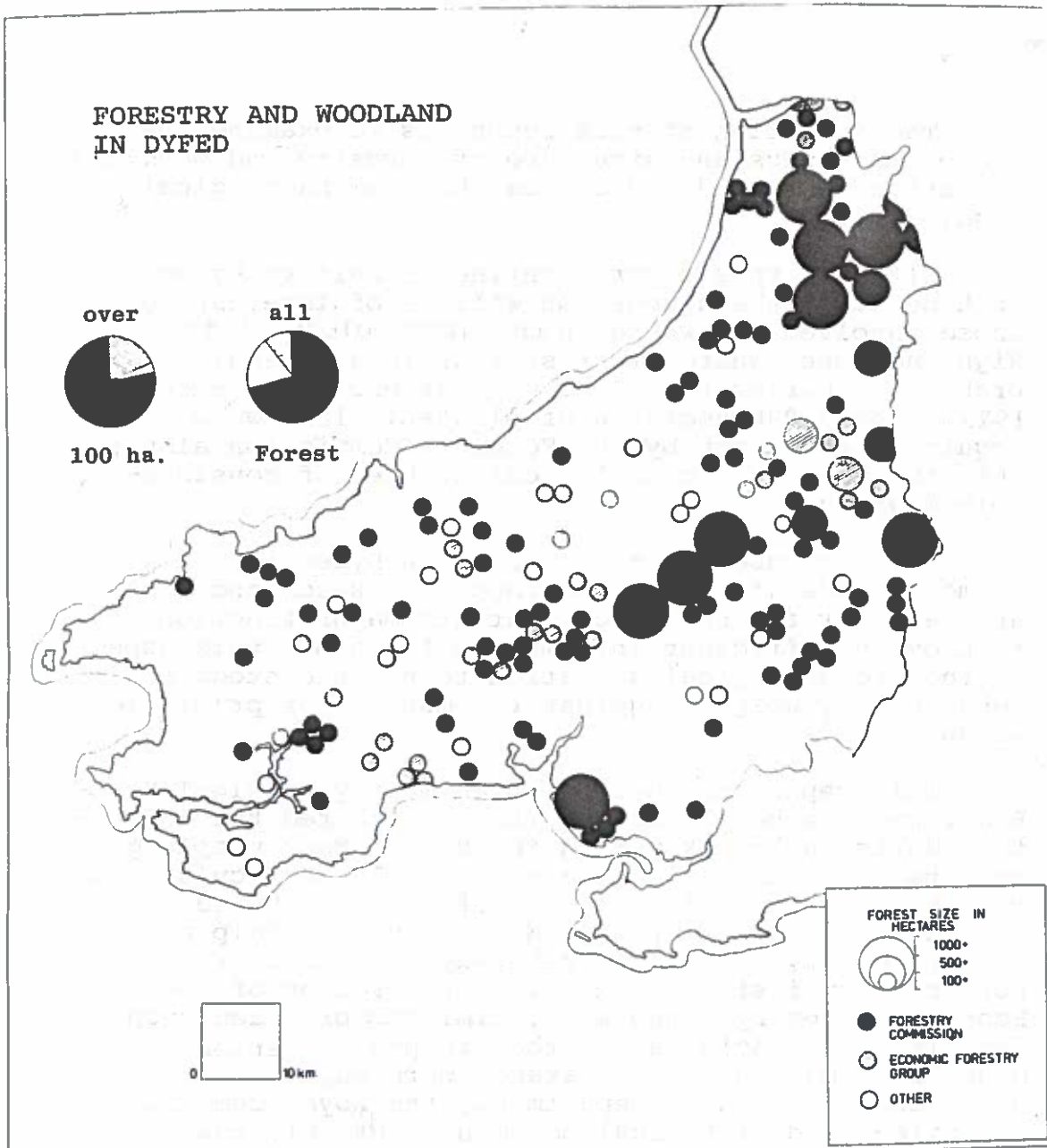


Fig.1

1. *Afforestation*

1. THE EXTENT OF AFFORESTATION

Dyfed is an important forestry county in a country which has 11% of its land surface covered by woodland, as against 8% in England and 10% in Scotland. At present there are approximately 44,400 hectares/111,000 acres of woodland in Dyfed. Over 70% of this total is coniferous woodland planted since the Great War by the Forestry Commission and later by the Economic Forestry Group. The most common tree type is the Sitka Spruce, a native of Western America; this makes up about 60% of the total. This spruce is highly prized for papermaking and goes to the pulp mills at Ellesmere Port. Other 'thinnings' from the forests go to Chepstow and Bristol for making carton board, or hardboard in Gloucestershire. Sawn timber is sent to Glamorgan for pit props and is also used for telegraph poles, packing crates and many other purposes. The yields from Forestry Commission plantations are expected to double by 1990 and treble by 2000, as much of the timber planted during the boom years of the 1950s and '60s will reach maturity by then.

Location

Most woodland tends to be located on poorer soils which were previously used for rough upland sheep grazing. The majority of this land falls into the Ministry of Agriculture's Grade IV rating in Dyfed, with some Grade III and rarely Grade V. Neither the Forestry Commission nor the Economic Forestry Group use land which is suitable for intensive agricultural purposes; in the first case because their brief is to complement not to compete with agriculture (Appendix 1), and in the second because cheaper land is sought.

The utilisation of marginal land for afforestation has, in

Dyfed, resulted in a distribution of woodland away from population centres and areas with good agricultural potential. Favoured sites are high pastures, as on the Preseli mountains, and steep valley sides. One notable exception to the upland locations is the Commissions's plantation at Pembrey, south of Kidwelly; this was established during the 1920s and 30s to stabilise the sand dunes.

In assessing the location of forestry as it affects archaeology, it is necessary to observe that almost any area of marginal land in Dyfed is potentially under threat, especially if it lies above the 300' contour.

Distribution of forestry in the county (Fig. 1) tends to be associated with upland areas, as described above. The Cambrian mountains support much woodland, including the Forest of Brechfa which, at 6,618 ha., is the largest single unit in the county. Smaller concentrations appear on the Preseli hills and, in the north, inland from Aberystwyth.

Some of the large river valleys contain considerable areas of woodland, as in the Cleddau valley north of Pembroke and the Teifi above Cardigan. The coastal margins of the county tend to be unwooded for reasons of exposure to high winds, which would seriously affect the growth of young trees. Pembrey is exceptional in this respect, but its unusual function has been noted above.

Size of holdings

The size of individual pieces of woodland varies greatly. Small areas of woodland are a common feature of the landscape in all but the extreme west; these are mainly the result of estate and other private planting during the last century. These private stands may vary in size from 0.25 ha. to 5 ha. or more. Many of them are deciduous, planted to give shelter or for their appearance. The larger forests are coniferous, planted as an investment by public or private forestry enterprises, and may extend to thousands of hectares. Since these enterprises began to pay more regard to area/fencing ratios, management of larger blocks has become more common.

2. OWNERSHIP

Of the 44,400 ha./111,000 a. of woodland in the county, the Forestry Commission owns by far the largest share at 31,600 ha./79,000 a. with private woodland owned under the Economic Forestry Group syndicate system coming a poor second at 4,373 ha./10,934 a. Apart from these two major holdings, the bulk of the remainder is privately owned, generally in small units of 5 ha. or less. One exceptional forest, which is under private ownership and several hundred hectares in extent, is Pant Maenog on the Preseli hills, but most private forest is managed by the Economic Forestry Group and is included in their total hectares above. The County Council owns some woodland, but the total is less than 200 ha./500 a. and is mostly in small stands preserved for amenity value.

Forestry Commission

The woodland administered by the Forestry Commission has nearly all been purchased on the open market, normally because of its limited agricultural potential and consequent depressed prices. Occasionally land is sold by them, normally unplanted, to private landowners, and exchanges of land have been made where it is mutually beneficial. Not all the land owned by the Commission is wooded; some is rented out for farming if it is too good to plant and a planting reserve is maintained.

Private

There are two main types of private woodland. The first is straightforward being the property of someone residing on an estate or farm which includes woodland. Apart from exceptional instances like Pant Maenog, this type of woodland has not been conceived as a purely financial undertaking, but is preserved for its amenity value, as shelter or as a handy source of sawn timber for fuel, fencing or other purposes.

The second category is somewhat different in scale. This

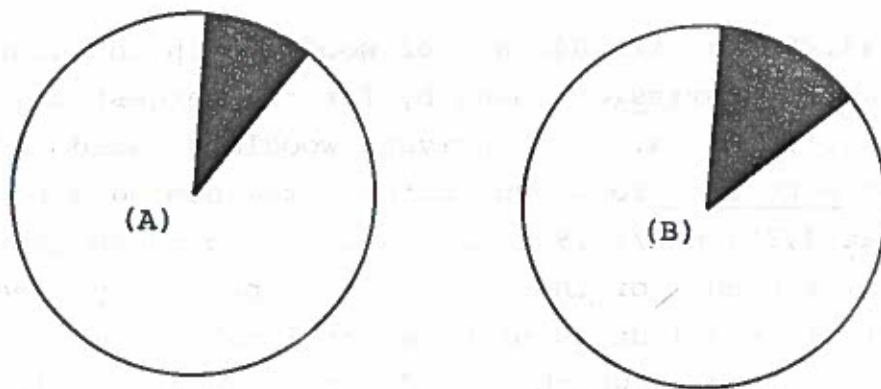


Fig.2(A) Wooded area of Dyfed
(B) Wooded area of Wales.

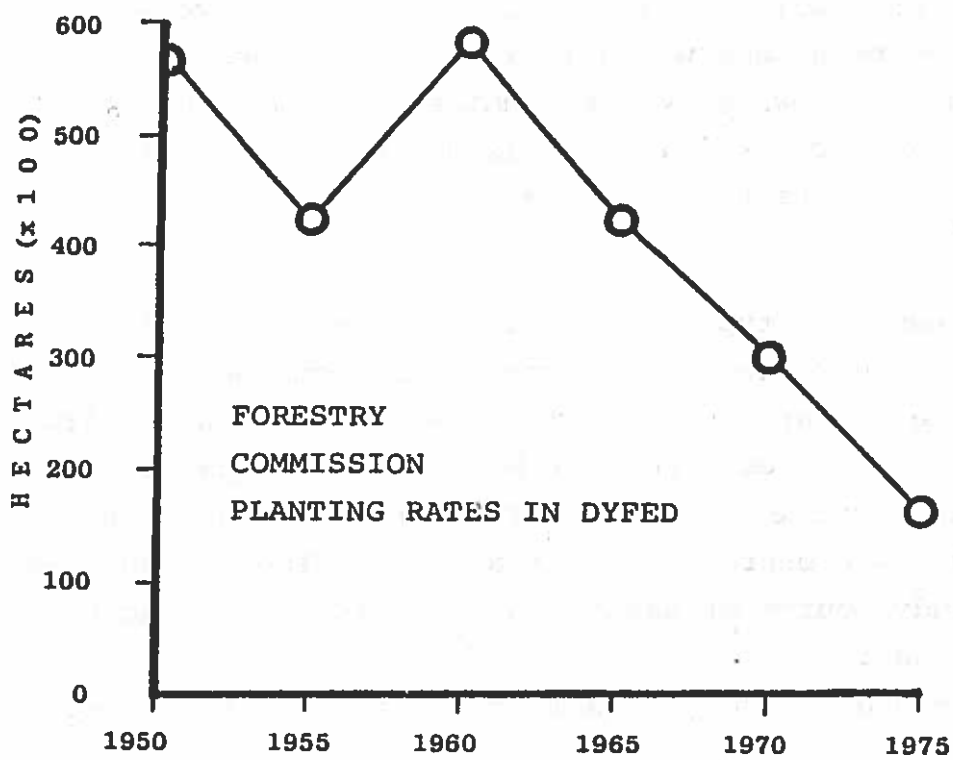


Fig. 3

is the field in which the Economic Forestry Group and other forestry enterprise organisations hold sway. This type of ownership normally comprises large blocks of forest held by a number of people and managed by the Economic Forestry Group. Ownership here is essentially geared to long-term investment interests. The Economic Forestry Group offers the would-be investor a comprehensive service including management of woodland, purchase of land, negotiation of Central Government grants and arrangement of final timber sales.

Private investment in forestry is encouraged by Central Government in the form of Woodland Dedication Grants. These will be discussed in detail in Section 2, but they, together with certain taxation advantages, ensure a steady growth of privately owned woodland in Dyfed. However, as with the availability of land, the continuation of these concessions is dependent on external factors which are outside the scope of this report. Suffice to say that, whilst existing legislation is in force, it is reasonable to expect that private woodland will continue to expand at the rate of 100 ha. or so per annum.

3. RATE OF AFFORESTATION

The rate of afforestation is almost entirely dependent upon the availability and price of land. At present little land of suitable type and in large enough blocks is coming on to the market in Dyfed. Normally land areas for afforestation have to be at least 20 ha./50 a. in extent to make planting and fencing economically viable. Although the Economic Forestry Group has a theoretical capacity of 200 ha./500 a. per year in South Wales as a whole, they have been unable to obtain this much for several years. Also, the E.F.G. does not hold a particularly large planting reserve; at present the figure stands at 300 ha./750 a. in Dyfed.

For several years now the Forestry Commission has fallen far short of its notional 18,000 ha./444,000 a. of bare plantable land acquired per annum in Britain. In 1975 the total was only 8,224 ha./203,200 a. with the North and West Scotland Conservancies providing the vast majority of this figure. Total acquisitions in Wales amounted to only 336 ha./8,300 a. and much of this was located in the north.

Throughout the majority of Dyfed, a position of near stagnation appears to prevail with little prospect of radical change in the foreseeable future. This situation is not a product of purely local circumstances. As much of the land which the forestry bodies acquire is poor grade farmland, normally permanent grazing for sheep, the amount of land coming onto the market tends to reflect the success, or otherwise, of the farmers. The position could change quite quickly if, for example, hill farming grants were cut back, or some other circumstance arose in which the cultivation of marginal land became even less attractive than it is already. Were such changes to be made, it would be reasonable to expect much more land suitable for afforestation to come onto the market.

Last year in Dyfed approximately 350 ha. of new planting was undertaken by the Forestry Commission and the Economic Forestry Group (250 ha. and 100 ha. respectively). This level of activity seems likely to be maintained in the foreseeable future, but is very low when compared to the halcyon days of forestry in the '50s and '60s. Most new planting in the county consists of extending existing areas of woodland, as at Brechfa, though some entirely new schemes have been initiated, the new planting at Brwyno being an example.

2. Procedure for Afforestation

This section examines the procedures involved prior to afforestation and the practices adopted in relation to archaeological sites. The obligations imposed upon the state and private sectors of the industry are somewhat different, and the points at which archaeological interests may be best represented vary accordingly.

1. STATE AFFORESTATION

The present powers of the Forestry Commission are exercised under the Forestry Act 1967 (see Appendix 1). The Commission is nevertheless obliged to observe other statutes in force where these are relevant, e.g. the Ancient Monuments Acts. It should be noted at this stage that, as in the case of private afforestation, planning consent under the Town and Country Planning Act 1962 is not required, since afforestation constitutes an agricultural change in land use.

If the Commission intends to purchase a piece of land, permission must be sought from the Ministry of Agriculture Fisheries and Food, which may refuse the application on economic and environmental grounds. As far as the archaeology of the area is concerned, one other agency is generally informed, the Inspectorate of Ancient Monuments. In some cases information on land acquisitions, planting and felling may be given to the Local Planning Authorities, but there is no obligation for the Commission to do this.

Consultation with Archaeologists

In Wales, the Welsh Ancient Monuments Branch (Cardiff) is responsible for liaison with the Forestry Commission not only for Scheduled Ancient Monuments but also for pre-planting

surveys. The work of surveying threatened areas may be delegated, normally to the R.C.A.H.M. The D.O.E. remains the State Agency primarily responsible for the protection of all ancient monuments, whether scheduled or not. This responsibility also extends to any question of the selection of monuments for preservation.

Under the new Forestry Commission procedural guidelines, several areas of archaeological interest have been regularised. Periodic inspections of sites are to be arranged, to ensure that the site is not being overgrown by scrub or disturbed by tree growth. In addition, there is a standing order to all Commission employees to hand in any object of possible archaeological interest to the appropriate body, normally the local museum.

Apart from dealing with these ongoing aspects of the Commission's policy with regard to archaeology, the arrangements for initial contact in cases of new planting have been changed. Each October Forestry Commission officers are to supply the Department with a variety of information which should be quite sufficient to provoke adequate archaeological response. The D.O.E. has not, as yet, made any arrangements in Dyfed for dealing with this information. There is a danger that this opportunity for closer co-operation with the Commission will be missed unless archaeological bodies concerned do not come to a clear working arrangement.

The response to the information provided by the Commission should be considerably more controlled than in the past. The difficulties faced by District Officers in locating and marking-out monuments must be allayed by ensuring an archaeological presence on the site at the time. Embodied within the guidelines is the arrangement whereby the District Officer and an archaeologist visit the site, in order to agree the line of the new 10m. unplanted margin around the monument. This margin, extended from 6' to 10m. in the new arrangements, is a great improvement on the earlier situation; it should be noted, however, that it still does not ensure full protection of a monument, as tree roots can certainly cover 10m. and more. For most sites, this will probably not matter greatly, but for sites which are likely to contain friable

pottery or evidence for complex timber structures, the effects could be severe; the question of marking-out sites is discussed in more detail in Appendix II;

The role of the Dyfed Archaeological Trust in this situation is ill-defined. The Trust brief, in part at least, is to investigate and record threatened sites, as well as organise surveys to look for hitherto undiscovered ones in areas to be developed. The effective operation of the Trust in this area is governed by communications and resources, both of which are discussed in the section on 'Recommendations'. If the Trust is to be involved, it is highly desirable that it be informed at the earliest practicable stage of the intention of the Commission to plant sites, in order that adequate response can be made. The precise details of this process should be discussed at a meeting of the D.O.E. and the surveys agencies.

2. PRIVATE AFFORESTATION

As mentioned above, afforestation is not subject to the Town and Country Planning Act and it is perfectly possible for a landowner to plant such woodland as he likes without permission or consultation with an official body. In practice however, financial inducements offered in the form of Woodland Dedication Grants present opportunity for close planning control. Most landowners avail themselves of these grants which are paid by Central Government and administered by the Forestry Commission.

The bases upon which these grants were previously given were known as 'Basis I' and 'Basis II'. In order to conform with E.E.C. regulations, a new basis for the grants was introduced in October 1974 - 'Basis III'. The obligations which this imposes upon the recipient of the grant cover many aspects of the process of afforestation. Conditions include proper planning and layout, adequate maintenance, and requirements concerning notification of granting of felling licences, if no 'Plan of Operations' is in existence. In addition, the landowner has to agree to discuss questions of access, amenity and recreation with the Local Planning Authority, if that authority so desires. In the case of the Dyfed County Planning Authority it is a mandatory requirement that such enquiries be made.

Following notification by the Forestry Commission of an application for grants made by, or on behalf of, a landowner, the latter is approached by the Planning Authority and two basic stages of discussion are negotiated. These are:

- i) An initial stage in which the landowner tells the planning authority the area he intends to plant, with no further details;
- ii) A second more complicated stage, in which detailed plans of the proposed woodland are submitted, together with information on geology, soils, vegetation, climate, boundaries, access, previous land use, tree types and so on. In addition, a specific question on scheduled Ancient Monuments is included. The protection of Scheduled Ancient Monuments is, in any case, an official provision of the Basis III Dedication Scheme.

The first stage is normally fairly straightforward. Grounds for outright objection would only be that it was a waste of good farming land, or that it had some other quality which the scheme would not utilise to the best advantage.

The second stage is more demanding. The plan is reviewed for such considerations as public access, under the provisions of the Countryside Acts of 1949 and 1968; its potential for interpretation, (e.g. nature trails and school plots) and its effect on ancient monuments, both scheduled and unscheduled, if any.

The planning authority has a statutory obligation under the T & C Planning Acts to give a decision within two months of the first notification and within three months of the second. If necessary, however, the latter time limit may be extended. Provided the scheme meets the requirements of the planning authority, it will be passed and planting may begin at any time afterwards.

Archaeological Representations

It is estimated that over 99% of private forestry in Dyfed is undertaken with the aid of Woodland Dedication Grants and this proportion seems likely to be reflected in the country at large. Throughout the various stages involved in processing grant application there does not seem to be any consultative arrangement in force between the Forestry

Commission or the Local Planning Authority on the one side, and the Ancient Monuments Branch and the R.C.A.H.M. on the other. The applicant must assure the Forestry Commission and the Local Planning Authority that Scheduled Ancient Monuments will be protected, but this assurance is generally achieved by the insertion (in the section of the application which must include obligatory objects of management) of a standard phrase to the effect that any Scheduled Ancient Monuments will be protected in accordance with the relevant statutes. The applicant is not required, or even encouraged, in the Forestry Commission guidance booklet (no. 35) to mention the existence of a Scheduled Ancient Monument either in the description of the woodland area or in the section dealing with proposed methods of working.

As noted above, the Planning Authority should satisfy itself that Ancient Monuments will be protected, but, in practice, should no consultative arrangements exist with archaeological bodies the onus is placed heavily on the landowner to ensure that such sites are protected.

Whilst this position with regard to Scheduled Ancient Monuments may appear somewhat unsatisfactory, there may be no provision at all for dealing with unscheduled monuments. In the case of public access the planning authority may fall back on the Countryside Act; the discussion of terms for amenity and recreational facilities is not backed by legislation and the fate of unscheduled sites (assuming that their existence is known to the planning authority) rests on the force with which the case for their protection is presented by the planning authority to the landowner.

Happily, in Dyfed, the County Planning Authority has agreed to notify the Trust of all afforestation notices received for comment and recommendations. Provided that pre-afforestation surveys can be carried out, there should, in theory, be adequate opportunity for negotiating the protection of monuments.

The pattern of forestry applications, however, may present a practical problem. In Dyfed, and perhaps elsewhere, such notifications tend to 'bunch up' during September and October in any one year, in time for processing before

the Spring planting season. This often results in a dozen or more notifications being received by the planning authority in the space of a few weeks, all of which have to be processed before the deadline expires. This situation would probably impose considerable strain on the archaeological resources available if adequate pre-planting surveys were to be carried out within a restricted period. Moreover, should such surveys be possible, and should unscheduled monuments be discovered as a result, a choice may have to be made between emergency scheduling, rescue survey and/or excavation, or abandonment to destruction without record. Whatever alternative was favoured, the decision would have to be made with some dispatch.

Two further categories of private planting must be briefly mentioned. The first is planting which falls below the Basis III scheme nominal threshold of 1 ha. The second comprises woodland planted with the aid of Shelter Belt Grants, the nature of which is evident from their name. These are always small areas of trees, frequently in rows only one or two deep. The recipient of such a grant is obliged to sign an undertaking to the effect that no Scheduled Ancient Monuments are threatened by planting. No planning or other consent is required once the Ministry of Agriculture, which administers the grants, has given its approval.

There is no direct archaeological monitoring of either of these categories. However, both are very minor in terms of archaeological threat, and it is unlikely that they will expand in the future.

3. *The Effect on Archaeological Sites*

Introduction

This section outlines the various processes involved in afforestation and their general implications for archaeological sites.

1. PLOUGHING

Probably the most remarkable feature of current British forestry practice is the attention paid to thorough ground preparation by mechanical ploughing and subsoiling on all suitable new afforestation areas. Former woodland still holding sound stumps, or steep slopes, or rocky ground, cannot readily be ploughed, but elsewhere some form of cultivation is the rule. The expense of this work is considered to be well repaid by the better and more even growth of young plantations, the lower weeding costs and the reduced risk of damage by fire in the first few years. Complete ploughing is not found satisfactory or worthwhile; the ploughing of furrows 2m apart is considered best, with depths of between 23 to 46 cms. This technique originated in trials of the Belgian method of drainage combined with planting on turfs in the 1930s. For many years hand drainage and turf planting had been followed with good results, but increased labour costs and planting areas led to the introduction of a more mechanised system. From 1935 onwards various ploughs, drawn by tractors, were developed to produce both drains and turves mechanically.

Ploughing as now carried out falls into three main classes:

- (a) On peaty soils, to provide drains and turves,
- (b) On heaths with podsoils, to cultivate the soil and

break down the 'hard pan' layer below ground and to suppress heather,

- (c) On grassland, to provide shallow cultivation and to suppress vegetation.

Different types of plough and tractor are used for each kind of ground.

The effect of this type of work is on the whole less serious than normal agricultural practice. The ploughs are quite small and the furrows 2m. apart; on most sites it is unlikely that such treatment would cause considerable damage.

A more serious type of forestry ploughing is that employed for draining afforestation sites. This is a highly variable area of the afforestation process, being completely dependent upon local soil conditions. There is a formidable range of draining ploughs of various sizes and shapes in common use by both public and private forestry. The largest are the 'arched beam' models, with deep draining mouldboards, which have an effective penetration of 90 cms. At the other end of the scale, slightly larger versions of standard agricultural ploughs may be used, with a penetration of around 30 cms.

Plainly, these huge ploughs, drawn behind heavy track-laying vehicles, are capable of doing an immense amount of damage to any archaeological material which they contact. In Dyfed, however, the minimum spacing of furrows is not less than 40m. even on the wettest ground. Although this is destruction enough, especially if a furrow happened to be aligned on the centre of a barrow, at least there are the spaces between. Although there is no 'normal' spacing of drains, the 40m. layout is unusual; in practice, as few furrows as possible are cut as it is an expensive operation and cuts down the planting area.

The introduction of these really large draining ploughs is quite recent, and although they are probably more destructive than a hand-dug drain, the principle is the same. Just as one would not expect to find a field whose surface was completely dissected by drainage channels, so with a plantation. These ploughs are never used for overall ploughing, so the damage is at least localised.

2. PLANTING

The usual planting distance for conifers is now 2m., but was until recently only 1.5m. Closer spacings are used for deciduous trees. On mineral soils, planting by the notch method is the rule ('heel planting'). On peat soils, planting is done on turfs or mounds, and for this work the Belgian semi-circular spade is favoured in several forests. Elsewhere a straight-bladed notching spade or mattock is usual. High rates of planting are achieved with satisfactory results. It is usual for one man to plant 500 to 1,500 trees per day; he can do this because he carries the plants in a bag slung from his shoulders, leaving both his hands free. Ploughing enables small trees to be planted successfully. Transplants from 15 to 30 cms. are favoured for bare ground. Larger transplants from 30 to 60 cms. are used in former woodland.

3. CUTTING AND 'ROADING'

Coniferous woodland normally works on a 55 year cycle; the planted area is clear-felled at the end of this period and new trees planted. Replanting can take place almost at once.

Not all the trees are left for 55 years, in fact the normal policy is to leave only 1/3 of the original number to reach full maturity. The other 2/3 are cut at intervals after the first 20-25 years and the 'thinnings' sent for paper pulp or small sawn logs. For many years to come, thinnings will form the major source of production from forests; they are estimated to account for half the total yield of an average plantation, since their aggregate volume equals that of the final crop.

'Roding' is an essential preliminary to removing any felled trees. This is potentially one of the greatest archaeological hazards of the entire process of afforestation.

The Forestry Commission and the Economic Forestry Group both follow similar methods. Once the logs have been drawn to the roadside, they are loaded onto lorries or timber wagons for transport. Today the typical timber lorry is equipped with its own hydraulic hoist, powered by the

road haulage engine. Loading has become a quick and simple business with a consequent saving in costs; but roads of sufficient dimensions and quality have to be provided.

The Forestry Commission maintains its own staff of qualified professional and technical engineers who are responsible for the planning, construction and maintenance of forest highways. Intensive mechanisation of forest engineering operations has taken place over the last ten years, and the Commission's mechanical plant and vehicle fleets are among the biggest in the country. In the private sector, roading is normally undertaken by outside contractors specialising in such operations.

A forestry road is required to have a formation width of 5.20m., a carriageway of 3.0m., curves not sharper than 13.50m. in radius, and gradients that do not exceed 1 in 10. This is an exacting specification for many kinds of terrain in which forests are grown.

On easier ground, the road formation is prepared by bulldozers and back-acter machines, which quickly remove surface soil and shape the remaining subsoil to the outline required. On steeper, cross-sloping ground, back-acters and bulldozers are used to cut into the upper side of the hill and push the excavated spoil over to the lower side to form an embankment; spurs of hard rock are cleared by blasting.

When the road formation is ready, it is provided with base and surfacing courses of roadstone. To save transport costs, metalling is normally obtained from small quarries blasted or dug on the site. Finally, heavy rollers compact the surface to fit it for lorry traffic.

The length of roads in the Commission's network is now over 20,000km. and current construction is over 800km. per year; there are over 160km. in the Forest of Brechfa alone.

This activity represents a major archaeological hazard and it is difficult to keep under observation. Much of the roading is done after the forest has become established, prior to thinning, so, unless the Commission and the Economic Forestry Group were prepared to give notice of operations, they would probably not come to the attention of archaeologists.

4. ROOT DAMAGE

Apart from the basic processes of afforestation which potentially affect archaeological material, the trees themselves must be considered. As anybody who has excavated a previously-wooded site will know, the amount of damage caused by tree roots to earthen features can be very considerable and, in extreme cases, may render a site impossible to interpret in detail.

Comparatively little research on tree rooting patterns has been undertaken, so precise details are not readily available. In broad terms, the height of a tree provides, in the case of conifers at least, an indication of the root spread below ground. This means that a Sitka Spruce 10m. high would have a circular zone of roots about 20m. in diameter.

In general, conifers tend to be fairly shallow rooted trees, as opposed to the deeper rooted deciduous species. Most conifers have widely spread roots with a normal penetration of less than 2m. Unhappily, this feature is not as advantageous to the archaeologist as it might at first appear. On many marginal afforested sites in the county, soil cover is very shallow and certainly less than 2m. This results in dense rooting of the available soil cover which exacerbates damage to buried features. Similarly, any pits or other excavations into the bedrock might well attract roots under such circumstances.

With the normal planting distances, formerly 1.5m. and now 2m., the effect of root damage can be very considerable. Foresters have described the soil of mature plantations as being 'matted' with roots, as the systems of the various trees compete over the relatively short distances between them.

Plainly, therefore, the cumulative effect of fifty years' root growth in a plantation, despite thinning, is considerable. This growth, coupled with replanting of the same ground after final clear felling, is likely to exhaust, or at least seriously impair, the archaeological potential of any afforested area.

5. OVERALL EFFECTS

Apart from the detailed effects of afforestation outlined above, the wider implications must not be overlooked. These effects occur in two main areas: the breakdown of the physical character of the land and the impossibility of further archaeological investigation of afforested areas for a very long time, if at all.

The first point relates to the loss of vegetational types, especially peat, which may well be of significance to the archaeologist or paleobotanist. This is especially important in areas where peat measures are scarce, and so vital for local environmental research. At the very least, a sampling procedure for threatened areas could be developed, in order to record the composition of deposits before destruction or contamination of the material has been caused by tree roots.

The second point concerns the adverse effects of afforestation in the longer term. Unless an area which is to be afforested is carefully researched and surveyed before planting, it may well be that its archaeological potential will never be realised. Eventually, of course, reafforestation may cease, and the land revert to open country, but the cumulative effects of root damage, stump removal and other activities associated with afforestation and deforestation may have entirely obliterated all archaeological evidence. It is, therefore, of vital importance that these areas be adequately investigated before afforestation, as a second opportunity may never arise.

4. *The Situation in Dyfed*

1. ANALYSIS OF AFFECTED SITES

The object of this part of the survey was to discover the total number of sites affected by woodland and afforestation in Dyfed, together with details of their type, ownership and relationship to size of holdings. The results of this analysis are shown in Figs. 4 & 5 and Table 1.

Method

Some cautionary remarks are needed about this analysis, because of the methods employed. In the time available to carry out this survey, it was not possible to undertake any checking of either affected sites or the extent of woodland/plantations on the ground. This is something which would be an enormous task, but which should be attempted in future, albeit on a selective basis.

The distribution and size of woodlands in Dyfed was obtained using information on O.S. maps, supplemented by up-to-date information obtained from the Forestry Commission and the Economic Forestry Group. The lower limit of approximately 100 ha. shown on Figs. 1 & 4, represents in general terms woodland of industrial significance; new industrial planting of stands of less than 100 ha. may occur, but these are generally additions to extant larger tracts.

Information on the number of archaeological sites affected was derived from the Trust's Sites and Monuments Record. Fig. 4 includes those sites affected by woodland of less than 100 ha. in extent, this woodland being almost unexceptionally in private ownership. The lower limit of these stands is 0.25 ha.

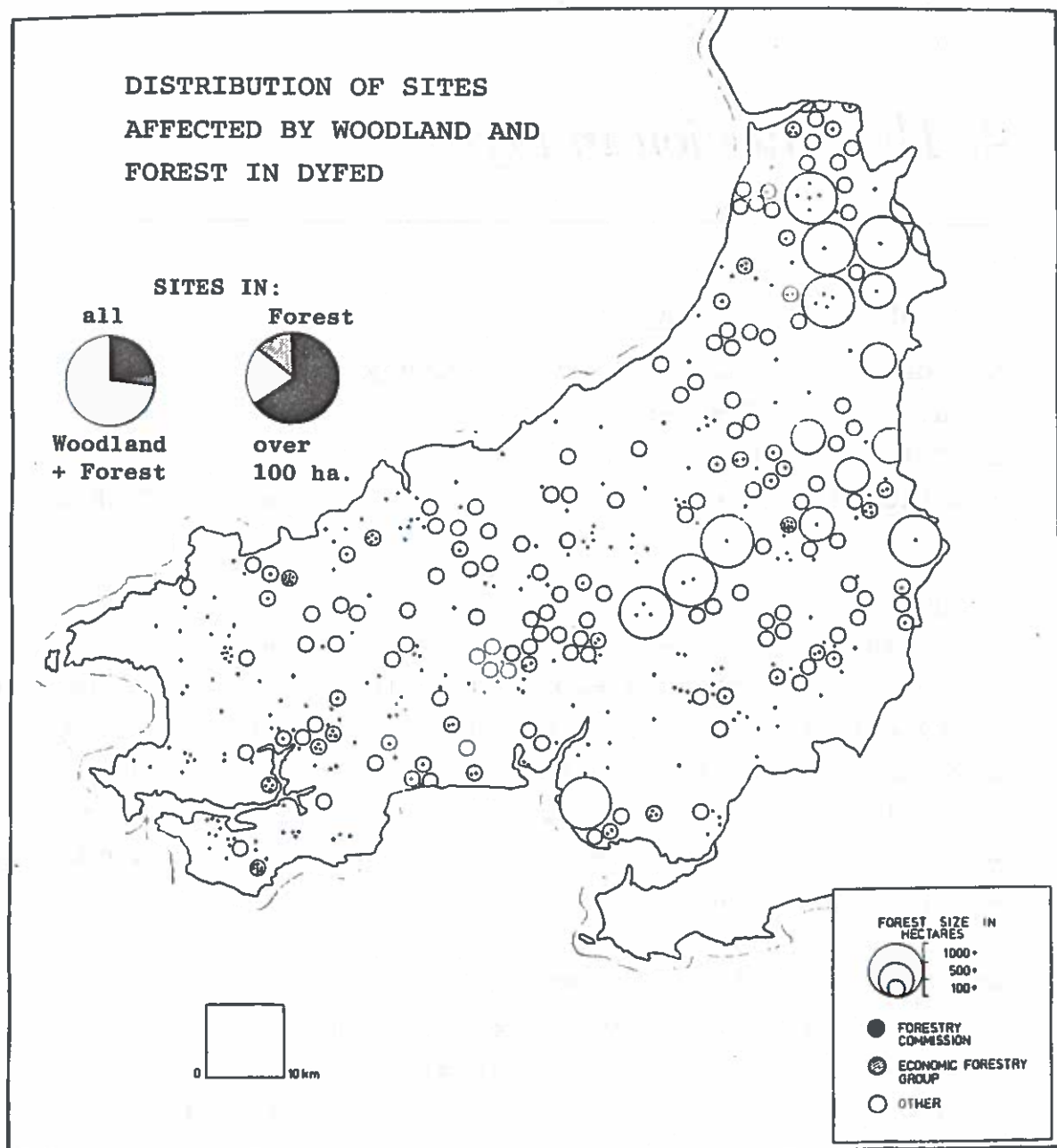


Fig. 4.

The definition of 'affected' sites includes, using the information available, wooded and partially wooded sites. Sites which are in sufficiently close proximity to woodland so as to be affected by root damage have also been included. Two other categories of lesser proximity were originally intended to complement these, but the degree of threat was so difficult to determine in each case that they were discontinued.

In the absence of field investigation the real effect of woodland upon each individual site cannot be determined, the figures in Table I presenting therefore only a crude picture. It should be remembered however that, in considering the effect of tree growth on archaeological sites, prominent earthworks such as round barrows with a small number of trees planted on top of them, do not figure in the provisional lists. Had it been possible to include such sites, the numbers of sites affected would have been very considerably increased.

Sites Affected

Despite the reservations noted above, the presented figures provide the basis for some general conclusions. The total number of sites affected by woodland and forest as indicated on Table I is 332, which represents c. 4% of the sites known at present in the county. It will also be noted that the distribution of these sites throughout the ownership categories is uneven.

The figure of 4% may seem low, or even trifling, but the absence of any organised policy of pre-afforestation survey makes it impossible to be certain what the archaeological potential of these areas was. It may be that these were the only sites affected; that even if an intensive survey campaign was initiated, few new sites would be found, but this is improbable. Remarkably, the number of known sites on Forestry Commission land (74 on Table I) represents a frequency of rather less than one site per 400 ha., which is an extraordinarily low density even on marginal land. These figures strongly suggest that we are looking at the 'tip of an iceberg' and until more pre-planting surveys are undertaken, there is no means of

SITE TYPES	WOODLAND SIZE IN Ha.			OWNERSHIP/MANAGEMENT			TOTAL NO OF SITES
	<100	<500	<1000	>1000	Private	E.F.G.	F.Comm
<u>Prehistoric</u>							
Hill forts & related sites	67	34	-	6	69	6	32
Hearth sites	27	6	-	-	30	-	3
Burial mounds & sites	17	8	1	9	18	3	14
Standing stones & structures	14	6	-	2	16	1	5
Other occupation sites	6	2	-	-	8	-	-
<u>Roman</u>							
Sites	1	5	-	-	5	-	1
<u>Mediaeval</u>							
Ecclesiastical sites	8	7	-	-	9	2	4
Mottes	16	2	-	-	18	-	-
Other earthworks	6	5	-	-	10	-	1
<u>Post Mediaeval</u>							
Sites	11	-	1	1	11	-	2
<u>Miscellaneous Finds</u>							
Undated	12	4	-	-	12	-	4
Enclosures	26	9	-	-	27	4	4
Miscellaneous	8	5	-	-	9	-	4
TOTALS	219	93	2	18	242	16	74
							332

TABLE I. SITES AFFECTED BY WOODLAND & FOREST: PROVISIONAL LIST

ascertaining how much of its bulk is hidden from sight.

The distribution of site types across both the ownership categories and holding sizes tends to reflect geographical factors and it is not surprising, for example, that the Forestry Commission sites are predominately prehistoric since these forests are sited on upland and largely marginal land; Unfortunately, the actual numbers registered for each type of site can have little predictive value since no figures on the overall distribution of these types throughout the county as a whole are yet available.

A notable feature is the predominance across the various groups of site types with prominent surface manifestations and their concentration in the 'private' ownership group. These sites are affected more by woodland than afforestation: in many cases the presence of earthworks has acted as a deterrent to cultivation in the past, thus providing convenient ground for woodland use.

The largest proportion of affected sites falls into this category and such sites are not likely to be as much at risk as the smaller number situated in holdings larger than 100 ha. where cutting, roading and replanting may occur on a large scale. Further information is required on the programmes for these activities together with field inspection of the 200 or so individual sites concerned, since operations affecting even only one or two major sites could cause considerable archaeological problems.

Protection

Of the 332 sites noted in this survey, 84 (c.25%) are Scheduled Ancient Monuments. Each ownership/management group also has roughly 25% of its sites scheduled. A higher proportion of sites in stands of over 1000 ha. in extent are scheduled in comparison to those at the other extreme, in stands below 100 ha. (38% as opposed to 24%).

When only those sites with prominent surface manifestations are taken into account, the percentage scheduled is nearer 40%, i.e. on this basis, slightly more than 1 in 3 sites affected by afforestation are scheduled.

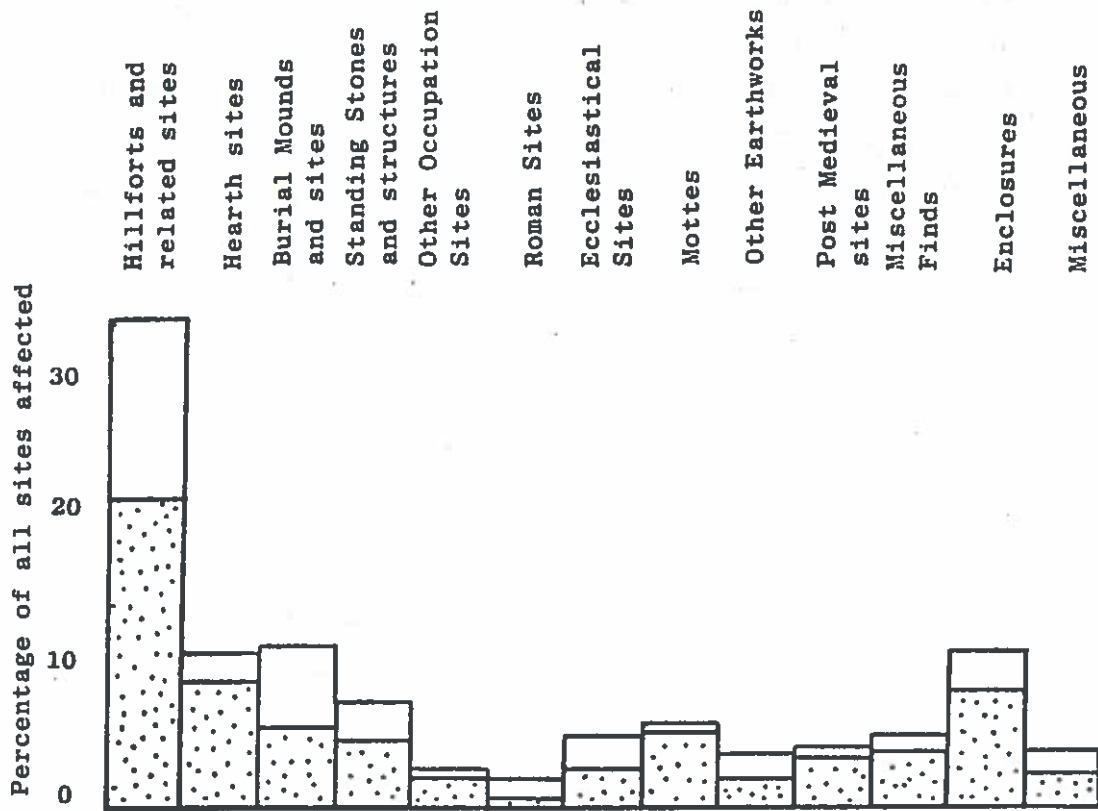


Fig. Site Types affected by Woodland in Dyfed
 (Pecked area indicates woodland and forest
 of less than 100 ha.)

This should not lead us to ignore the fact that 84 scheduled sites are affected and that, for example, 1/3 of all the scheduled camps and enclosures in the county come into this category. Clearly further fieldwork is needed to establish the condition of each of these scheduled sites before meaningful comments on the effectiveness of this means of protection may be made. One aspect which should receive particular attention is the extent of unplanted margins around monuments. (Appendix 2)

Absence of Intensive Surveys

This aspect has already been touched upon in the preceding section, but it is worth drawing attention to some of the reasons for the limited amount of pre-afforestation survey in the past. One of the most important is probably the remoteness of many afforestation sites. The distribution of forestry and population centres in Dyfed is practically mutually exclusive. Similarly, these areas tend to be away from communication routes: this geographical factor has meant that, unless somebody in the past has happened to hear of afforestation activities in a particular place, there was comparatively little chance of them being encountered accidentally. A second factor has been the absence of sufficient numbers of trained personnel systematically to monitor forestry operations, even if advanced warning was given. Thirdly, the low level of response from archaeologists has militated against more archaeological involvement in the problems posed by afforestation: as neither the D.O.E., nor the R.C.A.H.M., has any policy of visiting afforestation sites, unless monuments are known to exist, only a low level of cover has been afforded.

This is an important consideration for two major reasons :

- (a) Positive and negative site-distribution may well be seriously affected, as certain types of site (those with above-ground manifestations) will tend to occur, whilst those without such traces will be absent.

This may in turn result in serious mis-interpretation of the significance of these areas in the past. In

addition, sites which are buried beneath peat will not be represented at all.

(b) The apparent low site-densities may lead to an under-deployment of archaeological resources in these areas. Because there are few known sites it does not necessarily follow that these areas really were unused in the past. There is an urgent need for more investigation of threatened areas before any more definite conclusion can be reached.

The last point brings the potential archaeological advantages of afforestation into focus. Provided that the archaeological structure in the County is capable of meeting this challenge on an adequate scale, it may be possible to gain a great deal of information about these areas which have not perhaps had their due place in the list of archaeological priorities.

2. CASE HISTORIES

Three examples have been selected to provide an illustration of different aspects of the varying situations created by the interaction of forestry and archaeology in Dyfed. The first two are retrospective whilst the third may be termed 'current'.

a) Cefn Gwernffrwd, LlanddewiBrefi (PRNs 7431-4, 7646)
This site was found and reported to Mr. C. S. Briggs of the R.C.H.A.M., Aberystwyth, by Mr. T.M. Proctor of the Economic Forestry Group.

When the site was acquired by the E.F.G. in 1974, it was under permanent pasture and constituted an ideal site for afforestation. Mr. Proctor visited the site prior to planting in his official capacity as an executive of the E.F.G.; he noticed a cairn and stone circle, and reported his discoveries. When Mr. Briggs visited the site, he also saw a ring cairn and a stone alignment. These features were duly surveyed and a report was submitted to the D.O.E., who undertook the scheduling of the site as an Ancient Monument.

Here then is an example of a situation in which the man on the spot was sufficiently knowledgeable and interested in archaeology to notice the site, and to report it to the

appropriate authorities. Even so, it should be noted that if only the ring cairn and the stone alignment had been present, the chances of such a discovery would have been small. Thanks to the continuing co-operation of Mr. Proctor and his client, it has been possible to leave the site unplanted.

b) Cwm Gloyn Bayvil (PRN 963)

This hillfort was a scheduled Ancient Monument when, in 1957, it was purchased by the Forestry Commission for afforestation. The R.C.A.H.M. and the M.P.B.W., as it then was, were informed. An on-site meeting was arranged between the M.P.B.W. and the Forestry Commission, and discussions took place about the protection of the site. It was eventually decided that a 6' swathe be left unplanted along the line of the ramparts, though the interior was to be afforded no protection.

In part, of course, the decision to protect the ramparts rather than the interior was a product of the then current views of archaeologists, but this situation does also illustrate one aspect of the problems of a 10m. mean for the protection of monuments. Once one is dealing with a larger site, then the 10m. swathe becomes meaningless, it is far preferable to have a less rigid system for defining areas of archaeological interest, as discussed in Appendix 2.

c) Graig Lwyd or Careg Lwyd, Pembrey (PRN 1645)

The hot dry summer of 1976 resulted in one of the worst fire seasons ever encountered by the Forestry Commission. Although Dyfed was not as severely affected as other areas, several outbreaks did occur. Whilst being extremely unfortunate, this does have a useful archaeological aspect. An opportunity is created for investigating forest land which was planted with little or no pre-planting survey.

One such location is at SN42180210 near Pembrey, south Dyfed, where an area of 12 year old trees was destroyed. Within this area lay a small hillfort (unrecorded before 1958 and unpublished before 1974) and several lesser features, the date and function of which are uncertain.

At the time the site was visited, in November 1976,

clear-felling of the remains of burnt trees was already in progress with a view to replanting. This meant that visibility on the ground was good, and many features could be observed. Apart from the hillfort itself, probable hut-sites could be seen within it, as well as a series of features beyond the ramparts. These comprised a possible second earthwork enclosure, strip lynchets, ridge and furrow and irregular terraces along the slope below.

The problem which now presents itself is whether or not the site should be replanted once cleared. In the opinion of the writer, it probably should not; but it is a new situation and will require careful consideration. Although the trees had been there for 12 years or so, the amount of damage which they have done will probably not match the additional disturbance of replanting. If, however, the site is preserved, even after having been forested, then a major new principle has been established; would it then be possible for other sites which are now planted, like Cwm Gloyn, to be cleared? Given that the fire was a fortuitous event in this circumstance, must we wait for another hot dry season before other sites can be relieved of their covering of forest?

3. FIELD WORK

Survey

In the section on the 'Rate of Afforestation', it was seen that c.350 ha. of new planting was taking place in Dyfed per year. In order to appreciate the archaeological implications of this total, it is necessary to make some assessment of the amount of time which detailed survey of threatened areas would take, quite apart from the monitoring of roading and other activities in existing forests.

During the course of this survey, two afforestation sites were investigated non-intensively. By 'non-intensive', it is meant that only one in two of the planting furrows was walked, and that in a somewhat cursory fashion. From this activity it is possible to give some estimate of the man-days required for such work.

The two sites in question differed from one another;

one was exceedingly precipitous and difficult to negotiate, whilst the other was less demanding. No absolute allocation of man-days is possible, as weather conditions, site densities and the fitness of the fieldworker, among other considerations, are largely imponderable. On aggregate, it was found that one man-day was sufficient to cover c.20 ha. in the manner described. An intensive survey would therefore probably result in 10 ha. per man-day being covered.

From this figure of 10 ha. per man-day, it is possible to suggest that basic field survey of the annual planting area in Dyfed would take c.35 man-days. In addition, time would have to be set aside for any detailed planning of sites before ploughing and planting, if they were not to be excavated or preserved; writing-up this information would, of course, take a further allocation. Apart from these basic investigative and recording tasks, time for site visits to discuss threatened sites with the relevant authorities, together with organising appropriate action must be allowed. It would seem probable that as many as 100 man-days per year could be needed. The cost of providing a comprehensive service of research, recording and communication of material arising out of forestry operations could thus be quite considerable. In order too, that this be carried out efficiently, it will be necessary to employ experienced fieldworkers who are able to observe traces of archaeological evidence under adverse conditions, and who are capable of at least basic surveying of monuments encountered. Given the nature of many afforestation sites, the writer is of the opinion that horses could well be used to considerable advantage. This would speed up the process of survey, and afford the fieldworker additional height in rough country, a valuable asset. The cost of such work need not be excessive; it should be noted that there is a considerable co-incidence of afforestation areas and trekking centres, as both require marginal land in the main.

The problem of 'bunching' of private forestry planting could well make the organisation of pre-afforestation surveys difficult. Were large numbers of areas to come up simultaneously, it is likely that several teams of field-

workers would be needed. Two people would probably be the best size for such teams, as surveying and recording procedures could be carried out with much greater efficiency. The presence of more than one team in the field at any one time would, however, impose strains upon the archaeological resources. Practical problems may also arise due to adverse vegetational and climatic conditions during October and November when the majority of pre-afforestation surveys have to be undertaken.

Excavation

Under existing arrangements with the Forestry Commission it has been acknowledged that only the most important sites will be preserved, the remainder being recorded on maps prior to the continuation of normal forestry operations. However, in some cases excavation must be an essential pre-requisite to determine or confirm the nature and importance of a site and it is hoped that opportunities for such work will be afforded by the Commission.

In instances where preservation is not recommended, detailed recording should take place, which may include full or partial excavation as well as a ground survey.

Decisions on these aspects naturally relate to the whole question of site selection. The responsibility for this selection lies with the D.O.E., and it is presumed that the D.O.E. also has responsibility for negotiating with the Forestry Commission to obtain permission for excavations. Negotiations with private forestry enterprises on the other hand would be on a direct basis by the survey agency.

4. ORGANISATION

At this point it will be useful to summarize the existing arrangements for securing information on afforestation projects and also the arrangements for responding to the problems presented. For convenience, the following abbreviations are used: FC (Forestry Commission); RCAHM (Royal Commission on Ancient and Historical Monuments); DOE (Department of the Environment, Ancient Monuments Branch); LPA (Local Planning Authority - Dyfed County Council); EFG (Economic Forestry Group).

State Afforestation

1. The FC notifies the DOE of intention to purchase land.
2. The DOE responds with comments on any Scheduled Ancient Monuments and informs the RCAHM.
3. The RCAHM responds via the DOE with information on Scheduled and non-Scheduled sites.
4. No pre-afforestation survey is generally carried out by DOE or RCAHM.
5. Individual Scheduled Ancient Monuments may or may not be visited by DOE: marking out is often left to the FC.
6. From October 1977 the FC will provide information on its 5-year programmes (which include felling and replanting programmes in outline) for DOE. No arrangements have yet been made by DOE for responding to these programmes.

Private Afforestation

1. No information is received about private planting which does not involve Woodland Dedication Grants, though all landowners have a statutory responsibility to inform the DOE of any proposal to alter or damage a Scheduled Ancient Monument.

Afforestation using Woodland Dedication Grants

2. The LPA at present informs the Trust of all applications whether or not they affect archaeological sites, scheduled or unscheduled.
3. The Trust at present responds with field inspection and observations are sent to the LPA.
4. The LPA does not, as a matter of course, inform DOE, even where Scheduled sites are involved (the onus is placed on the landowner); nor is the RCAHM informed.
5. Similarly the FC does not forward this information to either DOE or RCAHM.
6. The EFG on an ad hoc basis, informs the RCAHM of applications which it considers may have some archaeological implications. This is due to the interest of an EFG executive officer who is sympathetic to archaeology.
7. No arrangements exist for the provision of information on cutting, though it is possible that tree-felling licences could be monitored to achieve this.

Since it is not easy for the archaeological bodies to disentangle the various lines of communication indicated above, it is not surprising that outside organisations find it difficult to know whom to approach over archaeological matters and to know what is required of them. The DOE is responsible for the administrative arrangements for the scheduling of sites by the Ancient Monuments Board, and for matters affecting sites already scheduled. But owing to the limited number of staff in the Ancient Monuments Inspectorate it is difficult to check on the condition of existing Scheduled Monuments, let alone to investigate known but unscheduled sites, or to carry out pre-afforestation searches for new ones. A rigid interpretation of the functions of the Inspectorate might in any case not include this latter activity. As far as inspection of Scheduled sites is concerned, some marginal improvement in the situation might have been made if the provision for wardens, associated with the Field Monuments Act 1972 had been put into effect, but this seems unlikely to come about. The RCAHM's function is directly related to field survey and the needs presented by afforestation might therefore be expected to come within this organisation's brief, but work programmes are geared to survey work in counties for which no inventories have been produced. Finally, the Trust (financially dependent upon the DOE for its continued existence) is expected to concentrate on excavation.

Clearly therefore, there is danger of a lack of adequate archaeological response, because of the lack of definition of areas of responsibility on the part of the archaeological bodies as far as afforestation problems are concerned. This is a fundamental problem which must be tackled at the outset.

5. Recommendations

1. Archaeological Information

1. More pre-afforestation surveys should be initiated.
2. Attention should be paid to the effect of afforestation on peat deposits and sampling procedures should be initiated prior to afforestation.
3. Selective inspections and, in some cases, excavation of sites affected by afforestation should be carried out in order to gain information on their condition (see 2.3).
4. Every opportunity should be taken to examine existing forests during post-planting operations to check on the archaeological content of these areas.
5. Further survey should be undertaken to identify sites in afforested areas where such sites could be incorporated within amenity and access schemes.

2. Protection

1. Sites selected for preservation should be marked out in the presence of an archaeologist.
2. Replanting should be avoided where opportunities occur for preventing further damage to important sites.

3. Liaison and processing

1. Discussions should be held between the archaeological bodies concerned in order to define areas of responsibility.
2. Whatever conclusions are reached as a result of such discussions, duplication of effort should be avoided and the body undertaking field surveys and inspection should also be responsible for liaison

with the public and private forestry organisations and the Local Planning Authority. (The exception to this being that liaison between forestry organisations and the DOE in respect of Scheduled Ancient Monuments must be reserved.)

4. Recording

1. Full ground survey of all affected sites should be undertaken whether they are to be preserved or not.
2. No reference is made in the new Forestry Commission guidelines to the excavation of threatened sites. Where necessary provision should be made for the excavation of sites which are not selected for preservation.

APPENDIX ITHE FORESTRY COMMISSIONGENERAL

Before the First World War, Britain had little economic need to grow her own supplies of wood. A strong international trading position meant that timber could be imported cheaply from Scandinavia, Russia and America, who were then less developed industrially and were glad to fell their virgin forest at low cost.

The First World War ended Britain's sense of security. A major German submarine campaign was directed against timber imports, particularly pit props for coal mines. Had it succeeded, coal production would have ceased and vital war industries ground to a halt.

In 1917, Lloyd George appointed a forestry sub-committee in his Ministry of Reconstruction to frame the country's first national forest policy. After this committee had reported, the Forestry Act of 1919 set up the Commission with adequate powers, but not an acre or tree to its name.

Between 1919 and the outbreak of war in 1939, the Commission had planted 600,000 acres at an average rate of 30,000 acres per year. Heavy fellings to meet wartime requirements again led to reduced reserves and, in 1947, a new programme of planting was begun. It advocated the formation, by the year 2000, of 5 million acres of economically productive and well-managed woodlands, part being owned by the Commission and part privately. By 1970 there were 1,800,000 acres under Commission ownership and 1,200,000 in management schemes on private estates. It is hoped that the Commission will have planted an additional 500,000 by 1978 and that, together with the private sector, Britain will have 3,700,000 acres of managed woodland.

Structure

The Commission, as now constituted under the Forestry Act, 1967, consists of ten members appointed by the Queen for a set term of years. The Commission is responsible to three government ministries, namely the Ministry of Agriculture Fisheries and Food; the Secretary of State for Scotland; and the Secretary of State for Wales.

The Commission is required to make an annual report to Parliament. Funds for its operation are provided in part by the Treasury, and in part from sales of timber and other receipts from its estates. The principal duties entrusted to the Commission are the promotion of forestry and the maintenance of an adequate reserve of growing timber within Great Britain, and it has wide legal powers to pursue these objectives. Its staff are recruited, and operate, under the same conditions as members of the Civil Service.

Under its central headquarters, in Edinburgh, the Forestry Commission organises its work on a territorial basis. The country is divided into smaller charges, known as Conservancies, comprising a group of about eight pre-1974 counties or parts of counties. In Wales, there are two Conservancies, designated North and South, with headquarters in Aberystwyth and Cardiff respectively (Fig.7). Over Great Britain as a whole there are eleven Conservancies. Each Conservator is a senior forest officer with a complement of office and field staff.

In each of the three countries, England, Scotland and Wales, a National Forest Committee assists the Commission in the application of policy, while each Conservancy has a Regional Advisory Committee representative of local interests, particularly as regards the private estates. Special committees advise on research and timber utilisation.

The activities of the Commission are organised on three main lines :

- (1) Formation and management of National Forests;
- (2) Encouragement of forestry on private estates;
- (3) Research, development and education.

Dyfed falls mainly into the South Wales Conservancy (south of Aberaeron). It is further subdivided by the boundaries of the three District Offices, based at Llandovery, Carmarthen and Aberystwyth (see Fig.8). These Districts are under District Officers, who hold the responsibility for all Commission and private (grant-aided) forestry within their areas. Under normal circumstances, it is to them that any enquiry concerning local forestry matters should be addressed.

MAP SHOWING FORESTRY COMMISSION CONSERVANCIES IN WALES AND
COUNTY BOUNDARIES



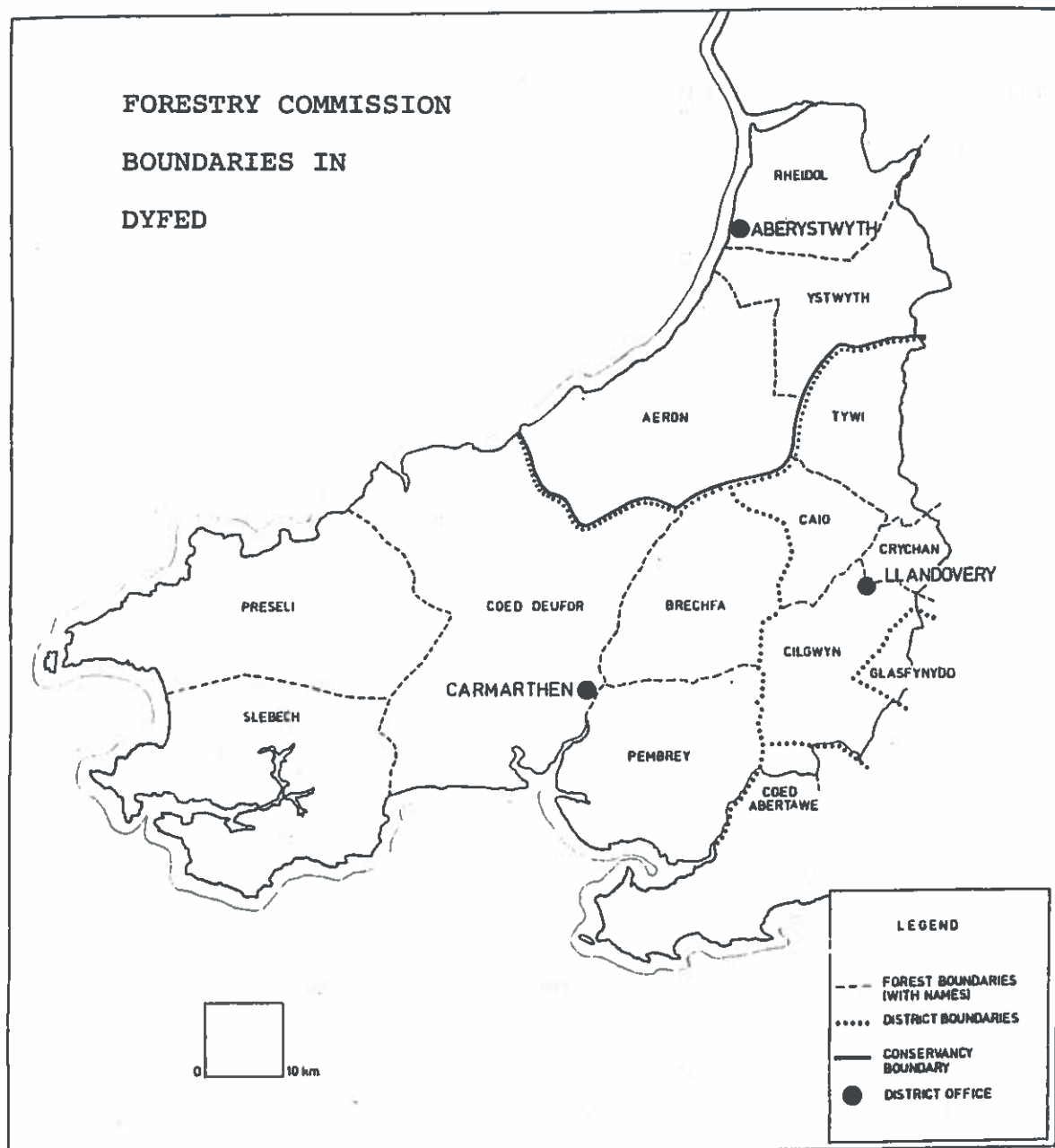


Fig.7

APPENDIX 2THE MARKING OUT OF SITES

References to the difficulties attending the Forestry Commission's recommended mean of a 10 m. unplanted margin around monuments have already been made in Section 2. Problems relate to the definition of the edge of a monument itself, and to the nature of the recommended margin. The danger of root damage has been discussed in Section 3; the present margin does not afford complete protection from such agencies in all cases.

The reasons for the adoption of a figure for the margin in the first instance no doubt related to economic considerations but also to the need for guidance to be given to forestry personnel in the absence of an archaeologist at the time the sites were marked out. However, the recommendation that an archaeologist should always be present at the time of this operation removes part of the reason for having a rigidly defined margin.

The decision on how much clearance should be afforded, should be made in each case by the archaeologist present. It is further suggested that the present approach of a horizontal measurement away from the monument be changed to an unplanted area of whatever size is deemed suitable, in which the monument be contained.

Although this system is not as simple to apply as a standard margin it is certainly more desirable. Should such a system be adopted, it should be noted that it imposes certain responsibilities on the archaeologist who makes the decision. He should neither endanger a site by being over-anxious to minimise inconvenience to forestry operations, nor should he make excessive demands of the forestry enterprise concerned.

Physical methods of marking out sites have, in the past, caused much discussion. The best system is probably staking out the perimeter of the site at fairly wide horizontal intervals (say 50 m.) and arranging for a forestry ploughman to be at the site when visited to enclose the marked area with a continuous plough furrow, where practicable. In this way, a continuous, clearly visible marker is present on the ground, which can be avoided during later operations. Ideally, this process would take place fairly close to the time of planting (say, one month) so that the furrow would be reasonably fresh when ploughing began. Whatever the system adopted the presence of an archaeologist on site at the time of marking-out is highly desirable. Close liaison between the forestry enterprises and the archaeological body would be necessary to ensure that this operation was carried out at an appropriate time.

