SCOTTISH WOODLAND HISTORY DISCUSSION GROUP

NOTES IX

NINTH MEETING

MONDAY 22nd NOVEMBER 2004

SCOTTISH NATURAL HERITAGE CENTRE
BATTLEBY, PERTH

A C K N O W L E D G E M E N T S

The Scottish Woodland History Discussion Group is indebted to the undernoted for their sponsorship and help in making the ninth meeting of the group a success:

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Front cover photograph: Beech Wood in Navarra, Spain (Peter Quelch)

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The ninth annual meeting of the Scottish Woodland History Discussion Group was held at Battleby on Monday 22nd November 2004. The following papers were presented

INTRODUCTION

Time flies, even for woodland history, and the meeting of the Discussion Group at Battleby on November 22nd 2004 was our ninth. We had decided to focus on the Ancient Woodland Inventories, an issue of some complexity, but which, in essence, provides an excellent example of the need for a historical underpinning to contemporary management decisions. Here, the question is not *if* the past should be involved, but *how*.

The morning was devoted to a study of the Ancient Woodland Inventories [AWI] in England, Scotland and Northern Ireland. Keith Kirby of English Nature explained what was being done by them to revise it and keep it up to date. Jeanette Hall of SNH did the same for Scotland, and Sian Thomas explained how the Woodland Trust was creating a new AWI from scratch for Northern Ireland. The session was prefaced by a presentation from Neil Mackenzie on the history of woodland inventories and plans for the future for an inventory of native woodlands in Scotland, and concluded by Richard Smithers of the Woodland Trust leading a discussion on the morning's papers.

Our usual very pleasant lunch was extended by the launch of a new book, *The Native Woodlands of Scotland: An Environmental History, 1500-1900*, written by Chris Smout, Alan MacDonald and Fiona Watson. The publisher, Edinburgh University Press, kindly provided a wine reception at which Peter Quelch and Chris said a few words.

For those of sufficient fortitude, the afternoon's papers offered a range of topics. Gordon Gray Stephens continued the morning's Inventory theme, giving us the benefit of his experience of PAWS restoration [Plantations on Ancient Woodland sites]. Next, Mike Smith provided a paper on a subject of long-standing interest of SWHDG, veteran trees and their origins. Finally, Peter Quelch brought proceedings to a close with a look at earthworks in natural woodlands which might be used as evidence of the long-standing nature of such tree cover. As usual, and despite a slightly smaller turnout than usual, it was a most interesting and pleasant day. Now we shall have to think up something really big for our tenth meeting, in 2005.

We have also included a record of our field meeting to Darnaway in June 2003. Many thanks to Anne Elliott for producing this, and apologies for it not being reproduced in last year's 'Notes'. Maternity leave intervened. Any ideas for future meetings, please let us know.

Chris Smout and Fiona Watson

NATIVE WOODLAND INVENTORIES IN SCOTLAND

NEIL MACKENZIE

There has never been a complete and dedicated native woodland survey in Scotland despite the fact that for many years the following four unresolved questions have been asked about native woodlands:

- How much native woodland is there in Scotland?
- Where is it located?
- What types of native woodland are there?
- What is the condition of these woodlands?

It has always been something of a challenge to provide estimated answers to these questions. The first national surveys of woodland began in the 1920s following the creation of the Forestry Commission (FC) in 1919. These FC surveys were designed to establish the current position of productive woodland and the extent of devastation that had been brought about by wartime fellings. But, it was not until the FC's 1947-49 census that a survey of all woodland over 2 ha was carried out in Scotland. This in fact turned out to be the most complete woodland survey ever to be undertaken in this country. It did not specifically identify native woodlands but the main tree species were recorded on the original record cards. Subsequent FC censuses did not identify native woodlands, were sample surveys and could not provide useful site-specific data on native woodland distribution or answer the key questions.

During the last 40 years or so there have been various attempts to determine how much native woodland there is, particularly when concerns began to be raised over the significant losses of native woodland that occurred during the post war years. The first authoritative national survey of native woodland was probably Steven & Carlisle's study of the native pinewoods published as a book in 1959. In recent years, Graham Tuley of the Forestry Commission updated the original list of 35 woods and added many new sites, which led to the current list of 84 pinewoods contained within a database known as the Caledonian Pinewood Inventory (FC, 1994).

While considerable effort was being focussed on the native pinewoods there was still no information on the extent of the native broadleaved resource. It was not until 1978 when the Deciduous Woodland Survey of Scotland (Bunce *et al*, 1979) was completed before some information became available on the state of the remainder, and by far the largest proportion, of the resource. This project was designed to provide quantitative information on the extent, distribution and composition of the broadleaved resource. It did this by conducting rapid field assessments of the composition of all broadleaved and mixed woods over 5 ha in extent shown on the OS one inch maps. The results were then compared to the 1947-49 census and this showed that the broadleaved woodland area had declined in every county of Scotland. This was a very useful survey but the results had to be treated with some caution and it was not sufficiently comprehensive to provide accurate data on the total area of native woodlands.

The next important national survey that could potentially identify native woodlands was the Ancient Woodland Inventory, which was compiled by the Nature Conservancy Council (NCC) during the 1980s. The ecological and historical significance of ancient woods had previously been recognised by Rackham (1976) and, following a House of Lords Select Committee report (Sherfield, 1980) policy guidelines for their management were about to be adopted by the FC. Consequently, the ancient woods had to be identified and a survey was required. This map-based survey could identify ancient, long-established and some recent semi-natural woodlands most of which are likely to be native. Although very useful for identifying woodland antiquity the inventory was not intended to be a comprehensive survey and could not provide a realistic assessment of the total area of semi-natural woods in Scotland. A paper by Roberts and others in 1993 attempted to ascertain the area of semi-natural woods which had not been included in the Inventory and concluded that there was an under-representation of 30%.

During the 1980s there were several other national surveys that included woodland. These surveys were initiated to assist in monitoring the effectiveness of land-use policies affecting the state of the countryside. They included the Land Cover of Scotland 1988 (Macaulay Land-use Research Institute, 1993), the Land Cover Change: Scotland 1940s to the 1980s (Mackey *et al*, 1998) and the Countryside

Survey 1990. These surveys mapped broad woodland categories or were sample surveys and could not identify native woodland.

Perhaps more significantly however were the large number of regional and site based woodland surveys that were carried out mainly by NCC and latterly by Scottish Natural Heritage during the 1980s and early 1990s. These were mainly carried out to assess the conservation value of the woodlands for possible site designation purposes. More recently they have been used to identify management opportunities for the enhancement of their conservation value or to facilitate the development of a regional management strategy. The surveys were important because they mapped and classified extensive areas of semi-natural woodland. In addition there were a number of regional and localised surveys of woodland carried out by NGOs and by local authorities. Forest Enterprise was also collating information on their native woodland, particularly oak and pinewoods as well as Plantations on Ancient Woodland Sites (PAWS) with a view to preparing Habitat Action Plans for restoring damaged or neglected woods.

However, despite all the survey effort that had gone on during the past decades we were still no closer to answering the four key questions. In the mid 1980s Friends of the Earth Scotland were expressing concerns in their campaign work that native woodlands in Scotland were in a serious predicament but there were no quantitative data on the nature and the extent of the resource to support these claims. With funding from WWF and NCC FoE produced a report which attempted to answer the key questions (MacKenzie, 1987); later the FC's Advisory Panel on Native Woodlands in the Highlands recommended that promoting the management and expansion of native woodlands required a thorough knowledge of the state of the existing resource and, in 1995, commissioned a report on the extent and character of the native woodland resource in the Highlands, followed by a similar report for the Lowlands (MacKenzie & Callander, 1995 &1996); in 1999 the Panel again commissioned an updated report on the extent of the native woodland resource in Scotland (MacKenzie, 1999). In each of these reports all known site-based survey information on native woodlands was collated. The results produced an interesting trend in total area figures for semi-natural woodland (Table 1).

Table 1 Minimum area of semi-natural woodland in 1987, 1995 & 1999

YEAR	TOTAL AREA (Ha)
1987	84,300
1995	121,557
1999	152,194

The huge difference in area between 1987 and 1999 is not because the area of native woodland in Scotland had miraculously almost doubled in about ten years but simply because in the intervening period additional field survey information became available. Although since the early 1990s there has been a significant amount of regeneration under the Woodland Grant Scheme that will have contributed to part of the recent increase. But, the 1999 figure was still a considerable underestimate as most field surveys have a minimum area threshold and a large number of woods are omitted because of differences of definition or simply through lack of time and resources. These reviews of the native woodland resource were therefore not comprehensive and could only provide a minimum figure of the total area and an estimate of the main types of woodland while their condition could only be ascertained through sampling and case study work.

At the start of the 21st century yet another map based woodland survey was completed – the Scottish Semi-natural Native Woodland Inventory (SSNWI). This EU LIFE funded GIS based database was also supported by the Millennium Forest and was compiled by Caledonian Partnership/Highland Birchwoods. It was the most dedicated and the most comprehensive survey of semi-natural woodland because it mapped stands down to 0.1 ha. It had limitations too – it used black & white aerials and could only identify semi-natural conifer and broadleaved categories. Nevertheless, the area figure produced from this survey was considerably higher (409,000 ha) than the previous estimates of Scotland's semi-natural resource. The principal reason for this high figure was that the survey used the simple definition of "not obviously planted" when analysing the aerial photos. Consequently, it includes large numbers of planted woods and it will have overestimated some categories as it could not recognise non-native broadleaves and semi-natural non-native conifers.

The SSNWI therefore added a bit more information to the knowledge base and the total area of semi-natural woodland in Scotland probably lies in the range of 152,000 to 409,000 ha. However, any such survey is a snapshot in time and much of the data were collected from 1988 aerials – now well out of date. The proportions of the main woodland types and their condition are still unknown.

The technology now exists for the production of accurate maps from ortho-rectified aerial photos, satellite imagery and computers and there is an increasing amount of information being compiled by various organisations. Yet the four questions remain unresolved and so there is a need for a new inventory that will strive to answer these questions precisely and in greater detail.

A New Native Woodland Inventory

Sustainable forest management is now a cornerstone of forest policy and there is a need to be able to track both quantitative and qualitative changes in the overall forest resource. As there are now targets for the restoration and expansion of the seven Scottish native woodland HAP types their successful achievement requires site-specific action – hence the need for a map based inventory. In 2003 a ministerial directive identified key targets relating to the delivery of the Scottish Forestry Strategy. One of these targets made a commitment to undertake a new survey of the nature and extent of Scotland's native woodlands. The Forestry Commission is leading on carrying out this project in collaboration with SNH and other potential partners. In April 2004 FCS and SNH commissioned a report on the methodology, costed options and a project plan for the survey (Clifford & MacKenzie, 2004). The report can be viewed on the FC website (www.forestry.gov.uk).

This new inventory will undertake a complete field survey of the composition, extent and condition of all native woodlands in Scotland and will include semi-natural and planted native woods. Such a task has never been done before and it will be the largest woodland field survey undertaken in Britain since the 1947 FC census. It is expected that the fieldwork will take at least 5 years to complete, depending on the resources that can be obtained, and the methods selected.

In the report a series of options was presented on how the survey could be carried out and on what attributes should be collected in order to, at the very least, provide answers as accurately as possible to the four fundamental questions.

The first task for the new inventory is to establish a digital base map to determine the location of the woods to be surveyed. One possible option is OS Mastermap as it is likely to become the industry standard. Although there are anomalies and some misclassification in the OS maps large scale colour aerials can be used to update the base map. Complete colour air photo coverage is not yet available for Scotland but there is an ongoing aerial survey and the latest estimates indicate that it could be completed in 1 to 2 years, weather permitting. However, some aerial coverage is available now. Other options being considered for the update of the base map are the use of ortho-rectified radar images or the new infra-red satellite images.

The second task is to identify what woodland on the base map is native. As there is no single dataset that can do this a range of existing sources will be utilised. For example, the SSNWI can filter out all woodland that is definitely not native and also identify all woodland that is probably native. This can be supplemented by other datasets and regional field surveys to aid identification. Inevitably there will be an unknown category, which could be native and will require a site visit to check. Recent full colour aerials at 1;10,000 scale may help with this while aerials in general will assist with the confirmation of boundaries.

Native woodland is to be defined by the agreed HAP definition of "semi-natural and planted native woodlands", where the canopy is predominantly (> 50%) composed of site-native species. The inclusion of a low canopy/wood pasture category (< 10% canopy) has also been considered. There will have to be a minimum woodland size threshold for inclusion in the inventory. Three possible threshold options have been suggested which breaks the population data into the following respective groups:

- Native woods > 2 ha
- Native woods 0.5 – 2 ha
- Native woods 0.1 – 0.5 ha

Table 2 Estimated proportion of woods > 2 ha, small woods and sparse canopy woods in the native woodland population

	Area (ha)	Number of woods
All woods > 2 ha; > 10% canopy	352,292	data not available (minimum 26,666)
Small woods 0.5 – 2 ha	41,299	40,859
Small woods 0.1 – 0.5 ha	13,691	53,517
Sparse canopy woods (< 10% canopy; > 0.5 ha)	73,936	9,806
Sparse canopy woods (< 10% canopy; 0.1 – 0.5ha)	1,565	8,353
TOTAL all native woods	482,783	

Table 2 shows the size breakdown of the nominal baseline population of 482,783 ha that will be used as the starting point for the native woodland inventory. This figure was obtained from a query of the SSNWI, supplemented by new planting and regeneration data from 1989 to 1999. The baseline population should incorporate all semi-natural and planted native woods, including Scots pine, down to 0.1 ha. There will be misclassifications and probably an underestimate of some categories eg Scots pine of non-Caledonian origin, and these will require to be amended during the field survey. However, based on the information currently available, the total estimate should be a fair assessment of the resource.

An important point from this table is the very high number of small woods and the amount of effort required to survey these relative to the overall area covered. For example, there are almost 54,000 woods under 0.5 ha but they only contribute to 3% of the area of the total resource. Small (& remote) woods are very important in certain parts of the country, particularly in those areas where semi-natural woodland cover is sparse. It is important therefore that they be considered for inclusion in the new inventory.

The following attributes are likely to be collected during the field survey:

Classification	Record NVC and/or HAP type plus broad habitat categories for non-woodland.
Composition	Record main canopy and understorey species (including exotics).
Condition	Record attributes needed to assess individual compartments (eg structure, regeneration, dead wood, habitat quality, veteran trees) and take account of adjacent woodland in landscape.
Threats & damage	Record browsing, exotics, muirburn, die-back etc.
Archaeology	Record various monument classes and modified trees.
Timber potential	Record qualitatively using density and tree form from a filtered population of woods

There are other desirable parameters listed in the report, which potentially could be included in the field survey although many of them could also be obtained from existing data sources or will be generated automatically in the database. The final selection of survey parameters and protocol will partly be dependent on the information from the forthcoming pilot surveys provisionally due to begin in 2005. These will trial the various options and test the feasibility of data collection, base map and survey equipment.

The completion of this inventory in about 6 years time will provide comprehensive and consistent answers to the four fundamental questions: the total area of native woodlands; and the location, type and condition of these woodlands. In addition, the enormous amount of data generated will serve as the basis for providing answers to many different issues. For instance, by linking with other habitats it could form the first step in the planning of an integrated land-use strategy. But, at the very least, if native woods are

to be managed on a sustainable basis, be they ancient or recent, planted or semi-natural, we need to have a detailed knowledge of the resource.

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WHITHER THE ANCIENT WOODLAND INVENTORIES IN ENGLAND?

KEITH J. KIRBY & E.A. GOLDBERG

Introduction

Ancient woodland is widely understood to be an area that appears to have been wooded continuously since at least 1600. The concept was first promulgated in this form about 30 years ago by Peterken (1977) and Rackham (1976). Rackham (1976) however thought that there would be almost no ancient woodland left by the turn of the century (ie 2000) except in nature reserves.

In the subsequent years awareness of ancient woods and their value (Peterken 1983) has increased immensely. In part this has been through the creation of the ancient woodland inventories – a not insignificant undertaking. The inventory project was initiated in 1981 by George Peterken of the Nature Conservancy Council. Subsequently the inventories have been maintained by its successors, English Nature, Countryside Council for Wales and Scottish Natural Heritage (Spencer & Kirby 1992; Roberts and others 1992; Kirby and others 1998).

The original aims of the project have been largely fulfilled and protection of ancient woodland now features increasingly in the countryside policies of different organisations. However the future development and use of the inventories in England should be seen in the context of how the inventories, our approaches to ancient woodland; and even what we understand by the term have changed since 1981.

Development of the concept of ancient woodland since the 1970s

Ancient or primary woodland?

'*As a matter of practical convenience it is valuable to have a category of ancient woodland … or medieval woodland … whose status can be proved. It is contrasted with recent secondary woodland and distinguished simply by a threshold date, origin before which qualifies a wood to be ancient. …. The threshold itself can for convenience be placed about 1600, before which time secondary woods were rarely created by planting.*' From Peterken (1977)

The aim at the outset was a quick way to identify those woods, that might be primary (land never completely cleared of trees) or at the least had most likely arisen by natural regeneration in a relatively unimproved landscape. The date chosen was based on English and particularly lowland conditions – the end of the medieval period, the point at which good maps started to become more common, prior to the impetus for new woodland planting from the publication of Evelyn's Sylva and the stability afforded by the restoration and Age of Reason. Other dates could be argued for: 1650 was used to distinguish post-medieval woods in Rockingham Forest, by Peterken and Harding (1974) because of a detailed map for that area from that date; Rackham uses 1700. In practice it did not make much difference whether 1600 or 1700 was used since for most woods there was little if any information prior to the middle of the eighteenth century.

An alternative approach is to use the date of the earliest comprehensive woodland map and this has been adopted in various continental studies (Germany 1780 (Wulf 2004), Denmark c1800 (Lawesson 2004), Sweden 1690-1770 (Brunet 2004), Netherlands 1800 (van Laar and den Ouden 1998), Flanders 1770 (Tack and Hermy 1998)).

Not all ancient woods are primary: Overhall Grove (Cambridgeshire) is ancient but underlain by earthworks suggesting it was open in the 13th century (Peterken 1981). However the implication in the early days of the project was that many, perhaps most, were primary relicts.

Subsequent investigations have revealed a far more complicated picture, for example Barker's (1998) work on the oak woods of Coniston which suggests these developed following clearance of more mixed woods. In Northamptonshire archaeologists have found a wealth of structures in ancient woods from the

Bronze Age onwards (Kevin Stannard personal communication). In France Dupouey and others (2002) have shown how some of the influences of Roman clearance may still be apparent in some ancient woodland soils.

This does not invalidate the values of ancient woods, but it does mean we should not be too absolutist in our approach to separating ancient and recent woods. At the physical and conceptual boundaries they merge, not just in the uplands but in areas of the lowlands as well (Whitbread 1990).

Where does wood end and wood-pasture begin?

Wood-pastures (Harding and Rose 1986), even those with only a thin scatter of trees, were recognised by both Rackham (1976, 1980) and Peterken (1977) as a distinct form of ancient woodland, particularly associated with lowland parks and areas of former common and Royal Forests. However the methods used to produce the inventories meant that many wood-pasture sites were omitted (Spencer & Kirby 1992).

The last fifteen years have seen a remarkable increase in interest in wood-pasture systems, not least because of their importance for veteran trees (Kirby and others 1995; Read 2000; Stiven and Holl 2004). The role of grazing animals in the past has probably been underestimated, both in the former wildwood (cf the discussion on the ideas of Vera (2000)), but also in ancient woods of all types. The distinction between the two 'traditional' management systems was not necessarily clear-cut: coppices might be grazed at some time; wood-pastures might be allowed to scrub up and then be managed as coppice.

Common land, with a scatter of veteran trees, much of which in southern England has developed into dense woodland over the last 100 yrs, may at one and the same time be
(a) really ancient wood-pasture, despite the predominance of young growth and its omission from the inventories, and
(b) suitable for opening up by clearance of most of the (young) trees to restore heath/acid grassland to the point where in many instances it will fall below the Forestry Commission's definition of woodland (20% tree cover).

Wood-pastures comparable to those in the lowlands were and still are common in the uplands, not just in England but in Wales and Scotland as well. A particularly distinctive type are the veteran alders found in Glenamara Park (Cumbria) The Allers (Northumberland) or Glen Finglas (Trossachs).

A separate inventory of wood-pastures is being developed though the Wood-pasture Information System project (WAPIS www.wapis.org.uk) under the auspices of the Joint Nature Conservation Committee and the Wood-pasture Habitat Action Plan.

Degrees of semi-naturalness?

In the original inventories we set out to distinguish semi-natural stands from plantations. While there are many debates as to what is meant by natural or even semi-natural (eg Westphal and others 2004) in most cases it was straightforward. Intermediate or indeterminate examples occurred, but, given the forestry policies of the time, it was generally a sufficient level of discrimination.

Variations within the semi-natural category were recognised in the figure presented at the back of the 1994 semi-natural woodland management guides (Forestry Authority 1994) and, more recently by Forest Enterprise who classified their plantations into three degrees of 'naturalness' (Spencer 2002).

Many stands that did have conifer plantations on them are now being restored to native species (Goldberg 2003; Pryor and Curtis 2002; Pryor and Smith 2002). It is uncertain how far the features within these restored woods can ever be returned to the condition that they were in before, but initial indications are positive. A new category may therefore be needed for restored sites.

Under climate change conditions we may need to rethink what we class as a future semi-natural composition with respect, for example to the limits for Scots pine or beech? How do we value past natural as opposed to future natural structures and compositions?
The simple semi-natural/plantation division has proved useful but often further divisions within it are needed.

How small can an ancient woodland be?

In drawing up the inventories we only considered woods that were above 2ha on the base maps (generally 1:25,000 scale, from the 1930s). This provided a common baseline to the 1979-82 Forestry Census; it avoided the problems of trying to identify consistently smaller woods on the 1st edition 1" maps that were the main historical source used in England and Wales; and it helped to limit the scale of the project.

The work involved in producing an inventory tends to be more closely linked to the number of sites rather than to their size. The number of sites increases almost exponentially below 2 ha, but the increase in total area of ancient woodland captured is much less (typically 10-20% increase in area for a doubling of the number of sites).

There was however also an ecological reason for paying less attention to small woods. Some woods below 2 ha do show classic ancient woodland features such as wood-banks, old coppice stools and ancient woodland indicator plants. However small woods are more subject to edge effects, for example the loss of humidity to adjacent open ground, possible impacts of spray drift. There may be more overlap between the number of indicator species present in small ancient and recent woods and the significance of the flora as a guide to history and conservation value becomes consequently more difficult to interpret.

From one landscape conservation perspective the majority of the species in such tiny fragments may be viewed as having unsustainable populations; is it worth wasting scarce conservation resources on identifying them? The contrary view is that small patches can form the nuclei from which species populations can expand back out into adjacent recent woods or other semi-natural habitats. The former argument was probably more relevant when the inventories were first being produced because the priority then was to secure the most important (generally larger) ancient woods. The second has more relevance now where much effort is going into habitat creation through agri-environment and new native woodland schemes.

Even if the value of small ancient woods is accepted identifying which are ancient may not be the most cost-effective way of promoting their conservation. Broad policy approaches directed towards the conservation of a range of small widespread features (ponds, small woods, veteran trees or hedges) may be more efficient.

At some lower size limit (whether we put it at 2 ha or smaller) the concept of ancient woodland having distinct characteristics may start to break down. The ecological usefulness of trying to define whether or not small woods across a landscape are ancient may be questionable in cost-benefit terms.

Technological changes

The methods used to construct the original inventories – tracing boundaries with coloured pencils, simple data-bases – were crude and naïve compared with what is now available, cf the approaches being used in Northern Ireland. The information for any particular site (interpretation of old maps, field surveys, aerial photographs) had to be combined to enable a judgement to be made by the Inventorer as to where the ancient woodland boundary should lie. The details of that judgement process can usually be reconstructed from information held on the original data-sheets, but may not be apparent from just the published boundary and entry on the data-bases.

The first digitisation of the England ancient woodland data was carried out by the Forestry Commission in the mid-1990s from the 1:50,000 maps at the back of the county reports. This, in itself, lead to mapping discrepancies when the data were compared with other digital data-sets that were captured at

finer resolutions. Errors were also identified when these boundaries were put on the web – sometimes in the original inventory report maps from which the data were taken, others introduced in the various data transfer stages. We have therefore sought to eliminate these and at the same time flag up possible real changes in the composition or area of ancient woods through:

(a) re-digitising the boundaries being linked to Mastermap features where possible;
(b) a process of checking the inventory against the Forestry Commission's National Inventory of Woodland and Trees (NIWT).

About 8 % of the area of ancient woodland on the inventory was not recorded by the Forestry Commission's inventory. Much of this is as very small discrepancies (92% less than 0.5 ha, ie smaller than the precision with which the original data were collected and hence likely to be mapping differences). Of the larger discrepancies some are differences in interpretation of what counts as woodland or as to when fragmented patches or open patches might be counted as one site: for example Glenamara Park in Cumbria. Even where there are clear losses of ancient woodland these may in some instances have taken place before the inventory was produced. A wood in Northumberland has disappeared in a quarry: although the inventory was dated 1986, the most recent information we had for it was an aerial photograph of 1971.

Ten counties have now had more precise boundaries defined using Mastermap and the Forestry Commission inventory. Some reinterpretation of the semi-natural/plantation classification has also been made where areas classed as semi-natural were shown as conifer on the NIWT. This has however to be done with care since in a few cases mixed or pure conifer stands may be native yew, or be a mistake in the NIWT – we believe that in places dense holly may have been interpreted as conifer. The intention is that the rest of the counties should be redigitised in this way over the next year.

The accuracy of the inventory might be improved through comparison with digitial versions of old maps (particularly those from the 19th century) and small woods (below 2 ha) might be picked up at the same time. English Nature and the Forestry Commission are joint funding a project in the south-east which is looking at his approach.

While it is possible to identify small (and larger) woods present on the 19th C maps that are not currently on the inventory these cannot just be imported into the inventory without any further cross-check. To do so would mean that different standards were being applied to the additions compared to those that were on the original inventories.

The future?

The protection for ancient woodland looks set to reach new levels through the (currently draft) Planning Policy Statement 9 and Forestry Commission ancient woodland policy. At the same time the concept and particularly the notion that it can be defined through a single inventory is becoming less certain! However the issues that we have identified are largely at the boundaries of the ancient woodland, both conceptually and physically. The estimates of the area of ancient woodland in each Natural Area for example are very close to those from the earlier romer grid estimates; while there may be mismatches as to the precise boundary of an ancient wood there is usually clearly an ancient wood present at that site.

The immediate priorities for English Nature are

(a) to link the current boundaries to Ordnance Survey Mastermap and NIWT to improve the scope for linkage to other data-sets. This will help to focus attention on real changes rather than the slivers of mis-matched polygons.
(b) to continue to stress the provisionality of the inventories– they are, in England, a guide to, but not a definition of ancient woodland sites.

In terms of links to conservation priorities we should

(c) keep the basic concept of pre-1600 woods being more valuable for conservation than post-1600 sites, but recognise that this is a robust statistically-based difference, not an absolute one that applies in all cases;

(d) recognise that the semi-natural-plantation division must similarly be seen as graded from stands with a wide range of semi-natural features to others with only a few.

The above suggest the importance of stressing the individuality of sites and their value depending on current state, size and certainty of history. By turning the different elements into separate GIS layers it becomes much easier to record and explore different combinations of data.

GIS approaches also allow the woodland inventories to be linked with those for other habitats – in some cases highlighting potential conflicts where ancient woodland has been highlighted as a priority for heathland restoration. More positively it should make it easier to encourage, for example, the targeting of buffer strips, grassland reversion or wetland creation under agri-environment schemes in relation to ancient woods.

We can and will be using the more precise GIS boundaries as part of the process of monitoring future changes, particularly losses, in ancient woodland cover. The current exercise has shown however that this is not a simple process of overlaying two GIS layers and looking for differences: the 'noise' in the system is too great to distinguish reliably the relatively small individual real losses. Instead a process which uses a combination of consistent reporting of losses where regulators (such a planning authorities) permit it, plus a sampling-based approach (possibly from Countryside Survey 2006).

Conclusion

We have, in part through the inventory projects, met Rackham's challenges to identify the bulk of the ancient woodland resource and largely halt (even partially reverse) the major declines in area of ancient woodland and its conversion to non-native species. However inventories in their current forms provide little information on the condition of the woods and this is where Rackham (2003) sees the major future threats, *"the ancient woods will remain on the map. A very few will be strenuously protected. More will escape through isolation or small size. The rest will have their guts eaten out of them by deer and sheep"*.
We need to concentrate on maintaining and improving the quality of our ancient woodland in the face of these threats (including climate change) as much as improving the inventories.

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AN INVENTORY OF ANCIENT AND LONG-ESTABLISHED WOODLAND FOR NORTHERN IRELAND

SIAN THOMAS

Background

When the inventories of ancient woodland were produced by the Nature Conservancy Council for England, Scotland and Wales, in the 1980s and early 1990s, no equivalent was produced for Northern Ireland. By the time the Woodland Trust began working in Northern Ireland in the mid 1990s, not only was there no record of ancient woodland there, but many people believed there was little or no ancient woodland left, and that it was not worth embarking on a project to look for it.

However, the BAP process, and other commitments at both a UK Government and Northern Ireland level have made it imperative that ancient woodland in Northern Ireland is identified and mapped. In 2002, with funding from the Heritage Lottery Fund and Environment and Heritage Service, the Woodland Trust began what was expected to be a three year project.

Northern Ireland has the lowest woodland cover of any country in Europe, with the exception of Iceland. Of the 6 per cent of the land area that is covered by woods, the majority is recent conifer plantation.

Oliver Rackham, who carried out some research into old woodland in Ireland in the 1990s, calculated that less than 0.2 per cent of the land area was covered by pre-1600 woodland – compared with more than 2 per cent in the rest of the UK. He argued that ancient woods do exist in Ireland, however precariously, and need to be recognised and studied before it is too late.[i]

While a recent conference on native woodland in Galway showed that there is currently a surge of interest in native and ancient woodland, nobody has really matched Oliver Rackham's paper of 1995, and looked comprehensively at historical sources in combination with field study of old woodland. The ancient woodland inventory project will certainly be the most far-reaching work done to date on woodland history and associated ecology in Northern Ireland.

Northern Ireland's woodland history – a succession of disasters?

Why is there so little woodland in Northern Ireland, and in particular, so little ancient woodland compared with the rest of the UK? In the search for Northern Ireland's ancient woods, it helps to have an understanding of the different forces that have helped to shape the landscape. Geographically separate from the British mainland, situated on the outlying fringes of north west Europe, Ireland has a different story to tell, which is reflected in the state of the landscape today. The mild climate, warm and wet, which allows for grazing all year round, encouraging pastoral over arable farming. Waves of invasion from across the waters had less impact in Ireland: the Romans barely reached it, the Vikings and Normans had far less influence than in England, and the Celtic social structures and traditions of land ownership and management persisted more intact for much longer.

In Ireland's woodland history, 1600 is a significant date, not just because it is the date we have used elsewhere to classify ancient woodland, but because it marks a particularly relevant point in NI's history, one which significantly altered both landscape and social structure. Confusingly called the Plantation era (nothing to do with trees!) this is the time when huge numbers of English and Scots settlers were systematically 'planted' throughout the province, displacing the Irish.

It used to be the accepted view that before 1600, Ireland was well wooded, and that the greedy incomers were responsible for massive deforestation. It is now generally agreed that this was not the case, but the Plantation was a time of great social change, leading to complete upheaval of the land ownership system, and it was a time when there was a flurry of map-making and recording as new landowners consolidated their holdings. A bit of potted history helps to put the state of the landscape in NI into context.

In fact, pollen studies have shown that extensive clearance of Ireland's woods began in Neolithic times and went on through the early Christian period. The evidence of over 40,000 ringforts is that Ireland was during these times a densely populated island. Rackham states that by 1600 Ireland was already considerably less well wooded than the British mainland.

The emphasis was on cattle farming, and the social system was decentralised, but close-knit, based on family units. The basic unit of land division was the townland, on average about 60 acres, but varying according to the quality of the land. A townland was the area required to support a certain number of cattle, and the community's wealth was held in the cattle, not in the land.

Throughout the 16th century there were successive attempts to 'plant' English and Scots settlers in Ireland. In all, around 100,000 immigrants were brought over – commensurate with the total number of Spaniards that settled in Latin America. The Plantation of Ulster, which occurred around the turn of the century, was the most dramatic and successful and involved mainly Protestant Scots and English settling in the north of Ireland, most successfully in the eastern parts. Land ownership was passed to the planters, though in many areas the native Irish remained as tenants.

The old Irish system of lordships, based on family ties, was shattered by a centralising state and reconstituted as a commercial system of landed estates. The new owners made their mark, building large houses and creating demesnes, often with landscaped parks, around them. This meant both clearance of existing woodland, and planting of new woodland.

Records which date from around this time include the Bodley maps, which show townland boundaries and names, and some of which have tree symbols to show whether there was woodland in a townland. Given the very small size of townlands, these may often be correlated with woodland shown on later maps. More detailed were parish maps by Petty and the Raven maps, superb estate maps showing boundaries of woodland which in some cases match those on the first Ordnance Survey maps in the 1830s. None of these sets of maps are comprehensive, but they can be supplemented by the Civil Survey of 1654, a kind of Domesday Book for Ireland, which did not locate woodland exactly but refers to it by townland and gives acreages and descriptions.

With the native Irish marginalised, a massive population explosion in the 18th century spelt disaster for Northern Ireland's woods, as trees were grubbed up to make way for farming even on the most unsuitable stony soils. It is estimated that only one tenth of the woodland listed in the Civil Survey survived the next 180 years (compared with three-quarters of woodland surviving that period in England). Even the Land Acts of the 19th century, which restored land to the Irish tenants, may have compounded matters. Without rental income, many of the settlers abandoned their big houses and demesnes, and left them to go derelict, and the farmers themselves carried out both further felling and planting.

The final legacy of the English was the introduction of modern forestry techniques, and the planting of many remaining areas of broadleaved woodland with fast growing conifers in the 20th century.

The Ancient Woodland Inventory project

Identifying ancient woodland in Northern Ireland is limited by two factors:

- Availability of historical records – while reasonable records and maps are available for some areas for the Plantation period, other areas are not covered. There is also a "black hole" between the 17th century and 1830, when the first Ordnance Survey maps were produced. Estate records are the most likely source of information for this time, but because so many estates were abandoned records may be lost, or in England or the Republic of Ireland, and tracking them down can be difficult. However, the First Edition Ordnance Survey maps are superbly detailed.
- Lack of information on ancient woodland indicators in the field – very little work has been done on ecological indicators, and it would not be appropriate to simply use indicators that were developed for England or Scotland. Differences in the history of land use also mean we may be

looking for different physical features to characterise ancient woodland – but as little research has been done, we do not know what they are.

Phase 1 of the project, carried out in 2002-03 by Queens University Belfast, aimed to create a baseline dataset of "long-established" (potentially ancient) woodland. This is woodland which has existed continuously since the First Edition OS maps were produced. Woods which appeared on the First Edition maps, the most recent paper maps (mostly 1960s/70s) and intervening series, were traced off, and the boundaries digitised. All woods over 0.5 ha, including wood pasture and parkland, and scrub, are on this dataset.

Around 2,750 long-established woodland areas were found, covering over 11,000 ha, more than twice as many as had been expected, but around two-thirds of them were very small, less than 2 ha in area.

Phase 2, which began in 2004, aims to classify all woods on the dataset as either long-established or ancient, through a combination of desk study and field survey. Both are needed because of the limiting factors mentioned above.

A sample of sites will be selected for which the best historical evidence is available – sites which can be classified as either long-established or ancient from historical evidence alone. The field survey data for these sites will be analysed to provide a provisional list of features and species characteristic of ancient woodland, and this list will be applied to the remaining sites, for which historical evidence is insufficient to give a clear classification.

Historical sources include the 17th century sources mentioned above: Bodley, Petty and Raven maps, Civil Survey, then estate papers, and the OS maps and OS Memoirs, a mine of information which accompanied the original mapping.

Field survey is recording vascular plant species, some bryophytes, and physical features such as ancient trees, old coppice, pollards, boundary banks and ditches, evidence of land use after 1600. It is also recording wood type (semi-natural or plantation, broadleaved, conifer or mixed) and where areas have been lost or cleared since the 1960s/70s.

Some broad findings on woodland type from the first year's survey are shown below.

Condition type	No sites containing condition type	Area covered by condition type	% total survey area covered by cond. type
Lost	170	266	6.8
Semi-natural	140	442	11.3
Plantation	295	2553	65.4
Scrub/parkland		642	16.4
Total	472	3903	99.9

Survey will be completed during 2005 and 2006, and the final inventory will be available via the Internet, and via publications. The Woodland Trust is keen to use the inventory to engage the public, and raise general awareness of Northern Ireland's threatened woodland heritage, and is planning a series of events and publications aimed at this audience. However, it is anticipated that the inventory will also become an invaluable tool in planning and conservation policy.

[i] Rackham O (1995) Looking for Ancient Woodland in Ireland in Pilcher J and Mac an t Saoir S *Woods, Trees and Forests in Ireland* Royal Irish Academy

SNH AND THE ANCIENT WOODLAND INVENTORIES

JEANETTE HALL

SLIDE 1

The Scottish AWI

Keith's earlier talk on England made many points which are likely to be relevant to the Scottish lowlands. In this talk I am concentrating on upland woodland – which forms the majority of Scottish woodland.

I'm going to talk a bit about how Scottish history affects the way the AWI was compiled in Scotland, discuss some of the limitations of the AWI and outline its current uses. Then I'll look at how it is likely to be used in the future and possible developments of the digitised version.

SLIDE 2

History and the AWI in Scotland

Keith earlier described the English AWI and explained why that uses the date of 1600AD to define ancient woodland. The choice of dates to define antiquity will always leave room for discussion but in selecting a date we are trying to define a period before which we can say with some degree of confidence 'if a site has been wooded since that point, we can be fairly sure it is either a relict of the primary woodland or arose naturally on land that had been cleared'.

In Scotland, the history of land use in general and woodland in particular, as well as the availability of map-based evidence, is rather different from that of England, and so our AWI is based on different sources. 1600 is not a particularly significant date in Scottish landuse/ landscape history. 1700 (the act of union was in 1707) or 1750 (a rounder date than 1745) are much more significant. Although there was some planting in the early 1600s, the real planting trend didn't really start in Scotland until the 'Planting Dukes' of Atholl got started around 1740. The first maps of the whole of Scotland, the Roy maps, were produced around 1750; and so for Scottish woods, 1750 is a much more useful reference date and the Roy maps are a valuable starting point.

However, we also know from other sources, that several examples of woodland not shown on the Roy maps were present when the maps were compiled. We can only guess why this may be, perhaps they were not considered to be of strategic importance and so their inclusion on the military maps wasn't felt necessary. The next comprehensive set of maps are the OS 1st edition maps from the mid-1800s, so we used these to give a broader picture of the historic distribution of woodland. The maps used to represent modern woodland coverage are the OS 2nd edition maps. Use of these maps has resulted in the following definitions of woodland in Scotland:

SLIDE 3

Ancient woods of semi-natural origin (ASNO) appear as semi-natural woods on maps from 1750 or the mid-1800s, and have been continuously wooded to the present day.

Long-established woods of plantation origin (LEPO) appear as plantations on maps from 1750 or the mid-1800s. Native species of local provenance were generally used. These sites have been continuously wooded to the present day, and many have developed semi-natural characteristics.

Other woods are sites which appear as woodland on the Roy maps, were not shown on the OS 1st edition but which are currently wooded. Many will have had a short break from woodland cover, but may still retain features of ancient woodland and are of some historic interest.

SLIDE 4

Limitations of the AWI

- The AWI only tells us about the antiquity of woodland cover on the site. It contains no information on the current composition or structure of woodland. We can get this from other datasets or from field-work. The Scottish Semi-Natural Woodland Inventory (SSNWI) is often used to examine the current composition (in terms of broadleaves/ conifers) and naturalness of ancient woodland.

- Likewise, although the AWI is very useful in highlighting sites where woodland cover has been continuously present over the last two centuries or so, it tells us nothing about continuity of specific elements of the woodland. An area may have been clear-felled and replanted, or coppiced, thus breaking the continuity between the canopy layer of past and current woodland on the site. For some sites such information can be obtained by bio-cultural field survey or studying documentary evidence.

  This can be important when we consider species characteristic of ancient woodland. Whilst the AWI will narrow down the selection of areas where we can expect such species to occur, their actual distribution will depend on other factors. A lichen which requires continuity of canopy cover to persist is unlikely to occur in ASNW which was coppiced during several decades of the 19th century.

- Only woods which were larger than 2ha on the OS 2nd Edition maps are included. As Keith explained, the distinctiveness of ancient woodland breaks down at some (unspecified) lower size limit. Whether ancient or not, it is important not to lose sight of the importance of woodland in general. Many very small woods, especially in urban areas and parts of Scotland with very low woodland cover, are extremely important for local biodiversity, recreation and landscape, regardless of their historical status.

- Records of Long-established plantation origin (LEPO) woods - whether dating from 1750 or 1860 - are incomplete in the Borders area. It is estimated that some 8,000 ha. of this woodland type exist in the Borders, but for reasons of economy during the original paper compilation only 1,500 ha. of LEPOs were recorded.

- Limitations of the source maps. As mentioned previously, the woodland record as shown on the Roy maps, is incomplete. Additionally, the Roy maps were (in Roy's words) 'rather…a magnificent military sketch, than a very accurate map of a country'. Whilst their usefulness requires them to be accurate in what they show, they can't be expected to achieve modern cartographical precision in the fine detail.

SLIDE 5

- Misalignment of digitised polygons. This follows on from the previous point. If we overlay the AWI in a GIS with the SSNWI, we can see that the polygons do not match up exactly. However, whilst it may appear that one polygon (on the AWI) is equivalent to another almost identical polygon (on SSNWI) we cannot be sure that we are justified in making this assumption. There are three possible sources of error:
  - Errors in the original maps due to limitations outlined above
  - Errors in interpretation of the original maps when compiling the paper inventory
  - Errors in digitising the boundaries from the paper inventory

  We also have to consider the possibility that the misalignment is not due to error at all but to changes in woodland cover. The landscape changes, especially in the uplands – woodland cover may advance and retreat - for example, if grazing pressure fluctuates over time. An existing wood may now be similar in shape and size to its ancestral form but not equal to it. This is especially likely in unenclosed upland situations and so it will be impossible to exactly reconcile the historic pattern of woodland with the existing pattern of semi-natural woodland.

The validity of the concept of the AWI in the uplands.

This is a rather different issue. It does not concern limitations of the inventory itself, but of the idea of ancientness. This can, to some extent, be examined by considering ancient woodland indicator species.
The concept of such indicators was largely developed in the lowlands of England, where many ancient woodlands exist as isolated fragments of semi-natural habitat in a matrix of arable land or improved grassland. This environment is very hostile to many species, which cannot easily move between patches. The same is likely to be true of many lowland areas of Scotland.

SLIDE 6

The slide shows two areas of Scotland, with woodland cover laid on top of LCS88 land cover information. I don't expect you to study the detail, but to get an idea of the general pattern of the landscape.

The top-right shows part of the north-east lowlands. The darker yellow represents arable, the creamy colour improved grassland and the pink is buildings. Semi-natural woodland is red and plantations green. The hatched overlay shows ancient woodland. The woods are individually isolated and much of the recent woodland is separated from ancient woodland by an environment hostile to woodland species.

The bottom left shows part of one of the upland straths. Most of the matrix is semi-natural: heather moorland and peatland, with marshes in the valley bottom. In the absence of cultivation, many 'woodland' species are able to survive in such semi-natural areas. If new woodland develops on such open ground, its species composition is likely to acquire a semi-natural character relatively rapidly. Many ancient and recent woods in the uplands are connected by wooded burns and gorges, through which species may spread. The more oceanic micro-climate of most of the uplands may also make colonisation from ancient to more recent woodland easier than in the lowlands.

This doesn't detract from the importance of ancient woodland but gives it a somewhat different value. There are probably species which are so slow to colonise that the ancient core is valuable as a unique relict of previous woodland communities, but it also functions as a centre from which woodland species can colonise suitable new habitat. Recent woodland in the uplands is therefore likely to have a higher diversity index than similarly aged woodland in the lowlands. In both situations the greatest diversity is likely to develop if the new woodland adjoins existing woodland.

This may imply that the need for precise mapping of ancient areas is less in the uplands. Looking again at the map of the uplands, the strip of continuous semi-natural woodland running from the top right to the bottom left is not all ancient. However, because of the nature of woodland in the uplands, the more recent areas may well be of much higher value for conservation as a result of their proximity to ancient woodland. The influence of 'ancientness' thus extends beyond the exact boundary of the individual fragments of ancient woodland.

SLIDE 7

Current use of the AWI

- Planning control. There is a general presumption against granting planning permission for any developments that would result in loss or deterioration to ancient woodland.
- Restoration of Plantations on Ancient Woodland Sites (PAWS). This is a priority in the Scottish Biodiversity Strategy and the Scottish Forestry Strategy, and is highlighted in many local strategies. Individual forest districts have targets for restoring PAWS on the national forest estate and the vision for woodlands and forestry in Loch Lomond and the Trossachs includes "Prioritise restoration of Plantations on Ancient Woodland Sites (PAWS) to native woodland".
- Forest planning. Developing indicative forest strategies and other strategic plans.
- Casework. SNH area officers use the inventories in assessing the appropriateness of management proposals
- Woodland expansion. Models for Forest Habitat Networks often focus on opportunities for restoring PAWS and expanding around ASNW. The Scottish Forestry Grant Scheme (SFGS) awards grants at a higher rate for work to restore PAWS, and expansion grants are available for expanding native woodland around PAWS which are to be restored to native woodland.
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The future of the AWI

None of the discussion of the limitations of the AWI should detract from its importance over the last two decades and into the future. However, as the list of uses suggests, we have come a long way since it was first developed, and our requirements are evolving. Whilst it is still very important that the AWI is used in the planning system, to stop loss through development, native woodland enjoys a much greater degree of recognition and protection than it did in the 1980s. We have, to a large extent, progressed from merely needing to preserve the existence of historic woods.

This can be seen if we consider both the threats to native woodland at present and the exciting potential for the future.

SLIDE 8

Threats

Our main concern for native woodland is no longer the obvious loss of area which occurred up to the mid-1980s, but the more insidious threat of declining condition. SNH's site condition monitoring is flagging this up with regard to SSSIs and it is likely that similar issues relate to woodland in the wider countryside. Very few sites are failing on SCM because of loss of area. The main concerns are:

- lack of tree regeneration, due largely to high levels of stock (mainly sheep) and deer
- threats to the natural character of woodland from invasive species, especially Rhododendron.

Potential

In contrast to the years of merely preserving what remains, our aim is now to restore and expand woodland, developing functional networks of woodland and other semi-natural habitats for the benefit of local communities – of people and of wildlife.

SLIDE 9

Future inventory work

One suggestion that has been made is that it may be possible to adjust digitised boundaries where the AWI polygons are clearly misaligned by re-aligning to polygons from other datasets. Personally, I feel that there would be little benefit in doing this. As I explained earlier, our concerns regarding the accuracy of the boundaries at a large scale cannot easily be resolved, especially in the uplands. Although in the lowlands, where the boundaries of woodlands are more clearly defined on the ground, there is likely to be more scope for this.

I would be very concerned that the suggestion of increased precision would imply that the inventory is spatially accurate.

What would be much more interesting would be to produce digital maps from a series of sources (Roy, OS 1st Edition etc) as GIS overlays. This would, for example, be useful in looking at currently un-wooded Roy sites – of particular interest when looking to expand woodland and create habitat networks. On many of these sites the soil, or pseudo-woodland niches (e.g. the shady side of a rock) may still hold woodland biodiversity. Restoring woodland on these sites would likely give rise to more interesting habitats than on sites which have not held woodland for a much longer period. In addition, the knowledge that a site was historically woodland would give us a stronger argument for restoring it to woodland rather than leaving it as (say) upland heath. It may also give us more confidence that establishment of woodland in the area would not lead to unacceptable fragmentation of an open ground habitat.

As I mentioned above, the predominantly semi-natural matrix of the uplands seems to allow 'woodland' species to survive more easily in open habitats in the uplands than in the lowlands. So currently un-wooded Roy sites in close proximity to ASNO may be our top priority for creation of new woodland.

In addition, the appeal to the public (who, after all, fund the majority of woodland creation...) of restoring a lost wood, could be much higher than that of creating a new one from nothing. Some of the 'lost woods' have names, the Wood of Bracklach in Atholl was identified on Pont's map as one of the biggest woods on the southern slopes of the Cairngorms - and it is now completely gone.

I don't know how realistic this is, but I would imagine that interest would not be limited to study of past woodland cover and I'd be interested to hear other people's ideas.

PLANTATIONS ON ANCIENT WOODLAND SITES (PAWS) & INVENTORIES

GORDON GRAY STEPHENS

This paper attempts to deal with some of the issues surrounding PAWS restoration, with occasional links to the inventories. It is also mostly concerned with the west highlands, as this is the area that the author knows best.

Before committing pen to paper, thoughts tended to meander around all over the subject that is native woodland restoration. This is, in part, a reflection of how much more complex the subject has become over the last decade, as people gradually come to terms with the idea and practice of managing woodlands specifically for conservation.

However the paper is now hopefully sufficiently focussed on the subject matter, and will concentrate on some of the issues that have to be dealt with before one can start to look at PAWS restoration, look at the policy context, and finally deal with some of the approaches to restoration that we use today, and might use in the future.

Definitions

The Forestry Commission defines a "plantation on an ancient woodland site" as being mostly relating on "ancient woodland sites" (sites that appear as woodland on the earliest available maps) which have been planted predominantly with non-native species since the 1930s. From 1940 to 1990 nearly 40% of ancient semi natural woodlands were converted into plantations. The Woodland Trust would rather we talked about "Planted Ancient Woodland Sites": ancient semi natural woods which "generally consist of trees that have never been planted" and which have now been converted into plantations.

This all seems to hint that somehow no one ever planted trees before 1750, and that ancient woodlands somehow survived unscathed in some state of arcadian bliss into the twentieth century, only to fall victim to a strategic need.

However it's now recognised that life in the woods was not like that, although we are still struggling to find out what it was like.

A brief review of the business of planting trees in Scotland

Pollen records show that the ash tree probably arrived in Scotland long after the arrival of man: some have suggested that it might have been the first introduction, our first "plantation" species around 4,500 years ago?

It is probable that by 1750, the base line for our Ancient Woodland Inventory, trees such as ash formed part of a farmed landscape where trees and agriculture were intimately mixed. Early travellers seem to provide evidence for this:

"We wound through groves of small oaks...Some little corn and grass was now in harvest; but was so short, that the peasants were obliged to kneel to cut it with a sickle. Their industry went so far as to induce them to cut it even among the bushes, and carry it into open places for the benefit of drying it in the free air." (1)

However we also know that the inhabitants relied upon timber from these woods, and we assume that they developed a form of sustainable management to provide this.

Certainly the records tell us that they used a lot of timber. 108 birlinns and longships were present at the marriage of John of Islay, Lord of the Isles to Margaret Stewart, daughter of Robert II in 1350. These boats would have probably been planked in cleft oak: a process demanding quantities of high quality oak

trees. From the same period, Ronald Williams [2] gives us this verse on the bow: the most advanced personal fighting and hunting weapon of the time:
"Bow from yew of Esragin
Eagle feather from Loch Treig
Yellow wax from Galway town
And arrow-head made by MacPhederan"

The verse gives us an insight into a society with the capacity to bring together materials from specific locations around the west of Scotland, with families of specialist craftsmen. At this time the Macintyres (sons of the carpenter) were the traditional foresters to the Lords of Lorne in Glenoe.

The first recorded plantations outside the lowlands that the author is aware of were carried out by the Campbells of Glenorchy in the early 1600s.

Industrial scale utilisation

So there are hints of organised ancient woodland management in the records. By the time of the Roy maps, which form the basis for the ancient woodland inventory, and which were drawn up primarily for military purposes, life was changing rapidly in the highlands. One aspect of this change was the move to a more industrial approach to woodland management, and the promotion of oak as the favoured species for commercial forestry and commercial plantation.

The most obvious physical remains from this period are the iron ore furnaces and associated charcoal sheds which can be found at locations such as Bonawe and Furnace in Argyll. The records show that this iron industry, although relying upon a relatively low tech approach to woodland production, was not small scale in terms of its impact on woods in the west highlands. John Fowler [3] tells us that 600 people were employed in the busy season at Bonawe furnace, and the charcoal sheds remain substantial buildings, holding the charcoal produced from 3,500 tonnes of wood or around 600 tonnes of charcoal at its peak. Fowler puts the area required in coppice production at 10,000 hectares.

However Bonawe and the iron industry are only the most obvious of the industrial uses of the west highland's timber resource. The woodlands were put to many other uses as well.

In 1820s Glengarry in one week three hundred tons of birchwood for barrel staves passed down the glen bound for the east coast fisheries. While after the opening of the Caledonian Canal Haldane tells us that "there was not a birch twig on all of Glengarry Estate and that the family had drawn full £20,000 for their birch wood" [4]

In 1772 Pennant writes about Glasgow:
"There are vast manufacturers of shoes, boots and saddles, and all sorts of horse furniture: also vast tanneries carried on under a company who have £60,000 capital, chiefly for the use of the colonists, whose bark is found unfit for tanning. The magazine of saddles, and other works respecting that business, is an amazing site: all these are destined for America." [5]

The manufacture of gunpowder was another business carried out in the west, and the physical remains of the gunpowder works at sites in Argyll such as Furnace, Melfort, Millhouse and Clachaig give an idea of the scale of the enterprise.

The scale of woodland management works is shown by the number of people involved. Day books reveal that in February 1838 100 people were working in Poltalloch Estate woodlands. In that one month 700 man days were spent cutting wands and hoops and ash timber in Inverlussa, 100 man days on cutting oak and ash in Eredine, 360 days on thinning Shirvan plantation, 160 days at Oibmore cutting wood for hoops. Others were employed in ditching, cutting out unwanted species, planting, filling up vacancies, and cutting rides. [6]

At this stage issues of landscape started to become as important as timber production as an end for forestry, and one gets an inkling that not everyone agreed on the state of a woodland, thus we have two authors writing within two years of each other about the same wood. First JE Bowman:

"On our right was Loch Craignish, spotted with many little green knolls covered with patches of coppice and interspersed with fine trees, while the shores of the loch are rendered highly ornamental by being interspersed with houses and woods on irregular ground. It is not easy to account for the luxuriance and great size of some of these trees, considering the bleak and stormy situation they occupy". (7)

In contrast Mr Robert Monteath's "Report relating to the Woods of Poltalloch and Strone" (8), (which form the majority of the woodlands that Bowman praises):

"The whole of the natural woods on the farms of Poltalloch and Strone are in a sad state of neglect: And from their having being so long neglected, they are for the most part losing both in quantity and quality (as to Bark) every year they are allowed to stand; and should if possible be cut over this season.

It is plain to the eye of the most superficial observer that there is not one Oak stool, on the ground for 25 that might be, or that could easily be reared, Of course it should be worth 25 times more money at the age. I would also aver that the same ground in 24 years if proper care is taken will bring in 25 times its present value, supposing bark keeps up its present price."

It sometimes seems that attempts at commercial forestry in Scotland can be represented as the triumph of hope over experience. Of course the market collapsed, and although we can trace the dykes created as a result of Mr Monteath's report, there is no sign in Poltalloch's woodland records of any reward being reaped 24 years later.

By the 1820s Poltalloch Estate was running six tree nurseries, and importing seed by the cartload. In the 1830s we start to see a decline in the number of acorns being imported, and an increase in larch, chestnut and spruce seed. Oak's predominance was fading as imports and other alternative materials and technologies were developed. Increasingly issues of landscape became as important as timber production in the many woods we find around the houses built in the heyday of the British Empire.

So today in our semi natural woods we see complex layers of changing use, of management which started out to satisfy local needs, but became increasingly influenced by national and then international trade. This management frequently involved planting trees and culminated in the 20th century, with the arrival of large scale afforestation and the wholesale conversion of native woodland sites to plantations largely dominated by Sitka spruce.

Conversion of native woodland to conifer plantations came to an end in the years following the changes to the tax regime in 1988, and there has been an increasing realisation of the importance of PAWS sites and their potential for restoration.

Policy & PAWS

Policy continues to evolve on the subject of native woodland restoration, and practitioners are indebted to the thoughts of others who have tackled the subject. Practical restoration is helped by the work of the Forestry Commission, Scottish Natural Heritage, The Woodland Trust and Forest Enterprise.

The main policy driver is the international obligations that Britain tries to meet through Biodiversity Action Plans (BAPs). The UK BAP native woodland Habitat Action Plans sets targets for the restoration of between 25 and 30 000 hectares of PAWS back to native woodland by 2015.

In addition sustainable certification schemes such as "UKWAS" and "FSC" promote the restoration of a proportion of planted ancient woodland sites and also require owners to commit to the conservation of all surviving ancient woodland features in PAWS.

Using history to inform restoration

Managers can and should have a knowledge of the history of woodland cover, and should use this knowledge to influence future management. The inventories play a part in the process, but the manager should look for other evidence as well.

Working out what's there when confronted with a woodland is not always straightforward. The inventory is a reasonable starting point as it can tell us something of the origins of the various layers of woodland history. However inventories are not infallible and what you see on the ground is not always what you see in the inventory. So it can be that old pine plantations around archaeological remains are shown as an ancient woodland site, while adjacent broadleaf woodland, with good lower plant communities, can be shown as plantation origin woodland.

The larger the woodland, and the nearer it is to habitation, the more probable that it will have had a history of intensive management at some stage. As woodland increases in size it becomes increasingly important to use other tools to determine history. Aerial photos are one source of information. The 1947 RAF series captures many PAWS before they were coniferised (and after any Second World War fellings). These photos sometimes reveal a mix of woodland and open ground, maybe more akin to wood pasture than anything else.

Any evidence from the inventories needs to be checked by field visits. Frequently individual past (and present) managers will have had a considerable effect upon the processes of woodland management. Individual trees within the same wood may show distinctly different histories. There are plenty of west coast woods where apparently coppice origin trees are found close by open grown veterans and pollarded specimens.

Management decisions are still driven by individuals, whether it be the owner, the agent, the manager or the grant giver. The Scottish Forestry Grant Scheme favours restoration of PAWS woodlands, but where a woodland is not on the Inventory (and a proportion are not), one needs to develop a good case, by using old estate maps or by producing evidence of patches of semi natural habitat within the plantation which indicate that there might have been native woodland on at least part of the site before the plantation arrived.

A brief look at the practicalities of PAWS restoration

Conifer operations are normally carried out on an industrial scale, and PAWS restoration is usually treated in the same way: order up a big machine and it comes in and chews trees. Planning surveys will have identified archaeological remains, or at least will have identified most of the archaeological remains: they can be difficult to find in the middle of a conifer plantation, and they're not always obvious even when you know they are there. It's also important to remember what the archaeologists say about the importance of the context of the remains: these can be just as important as the actual site.

Even on carefully surveyed sites it comes down to the individual operator to act appropriately when they come across something. If the person in the big machine doesn't know what to look for, then archaeological remains can easily be inadvertently destroyed.

There is a need for a gentler approach to woodland restoration than standard industrial forestry, particularly on sites which are known to be of archaeological, conservation or landscape importance. One alternative which could be made more use of, particularly on sites without good access, is to poison standing trees. This chemical treatment allows gradual change and generates a lot of standing deadwood, while also minimising site disturbance.

Another alternative is a more labour intensive approach, where conifers are gradually removed from a site over time, opening up the woodland, donutting (or clearing around) existing broadleaves, exposing woodland archaeology, and making some use of the timber by on site milling and small scale extraction.

Focus for the future

Two changes in approach should be considered to PAWS restoration.

The first is that no public money should normally be paid for restock of PAWS sites with exotic conifers. Greater public benefit normally results from restoration: if the private owner wants to continue with what he or she perceives to be a commercial crop of exotic conifers, then they should be allowed to do so under normal forestry regulations, but without grant assistance.

The second is at a rather early stage of development, and it centres around the idea of providing timber for local use, while also getting around the impact of industrial forestry operations on PAWS. Serious consideration should be given to passing control over state owned PAWS to local community groups. The groups could work the woods over time to satisfy local demand for conifer timber. This would encourage the development of the type of small scale operations which are sympathetic to these woodlands. Any extra level of support that might be required can be justified by the additional benefits delivered at a local and national level.

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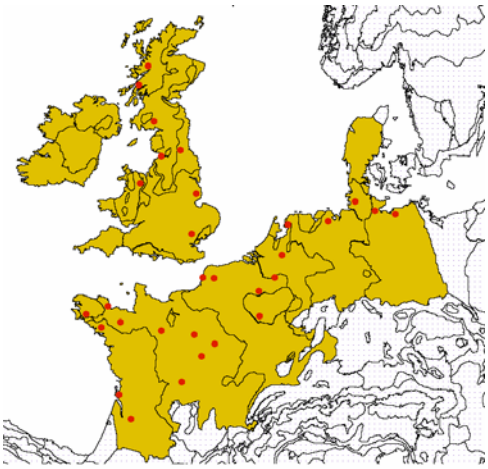
VETERAN TREES AND THEIR ORIGINS

MIKE SMITH

This paper looks at veteran trees and how and where they may have survived to become important features of our modern landscape. It is based on some work for English Nature that is assessing the distribution and abundance of veteran trees in North West Europe and some personal investigation into two ancient landscapes in Scotland.

There will always be some debate about what constitutes a veteran tree, as there is no precise definition. It is a term, which can encompass a wide range of attributes, often associated with the ageing process. Veteran trees are found, albeit in varying abundances from Scandinavia to the Mediterranean countries. For the English Nature project a small survey, of those parts of the continent close to Britain and with a similar environmental character, was undertaken. The area of search and location of samples is shown in Figure 1 below.



The project only had the scope for limited sampling. Veteran tree numbers and their distribution were investigated across 31 sites, 8 in the UK, 23 on the continent. At each site three 1-kilometre squares were searched and trees recorded that were either above minimum size diameters (75-150cm depending on the species) or showed at least three 'veteran tree characteristics' (rot holes, hollowing, dead wood etc). The location and surrounding land-use type were noted. 409 veteran trees were surveyed in detail out of a total of 3,867 recorded that showed some 'veteran' characteristics.

Distribution of veteran trees

The habitats or features associated with all the veteran trees recorded were noted in order to build a picture of where the veteran trees were found across the survey area. The distribution of the trees is summarised in Figure 2 below.

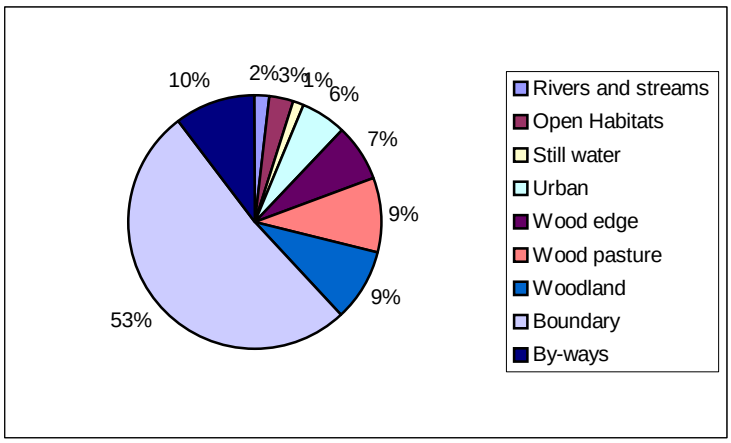


Figure 2. Distribution of veteran trees recorded

Boundary trees were by far the most common encountered across the sample area with over 50% of trees recorded from hedgerows, banks and ditches. Veteran trees associated with wooded habitats accounted for 25% of the recorded trees and a third of these were from wood-pastures. Although 10% were found associated with roads, tracks and avenues, these function in the same way as boundary trees. The 'open habitats' class is the amalgamation of these habitats (e.g., grassland types) and can be regarded as scattered veteran trees and made up only 3% of the trees recorded.

Habitats and Land use

Veteran trees were observed in a wide range of habitats and land-uses reflecting the cultural history of a particular region. In the wine growing regions of the Gironde in France there is a multifunctional intimate landscape where remaining veteran trees were often associated with the growing of vines. Willows were important for making trellis and the attaching of vines to them. This is contrasted with the very open Soviet era collective farming landscape where veteran trees persisted in the unmanaged hedgerows. Tree lined roads are a common site in Northern Germany and this dates back to medieval times where trees were planted for shade to stop fish rotting on the way to market. The oldest growth in polder land, reclaimed in the 19th century, are the willow pollards planted around the first farmsteads: they now have deadwood and rot sites and are as old as the land itself.

Every region that was sampled had its own examples of veteran trees and reasons for their existence whether by design or chance. Working trees were observed in nearly every site with a wide range of regional variations. The hedged field systems of the Bocage landscape are found throughout much of Europe. In Brittany this ancient landscape dates back to the 9th century and in many ways can be seen as a form of cultural old growth. The veteran trees on the boundary banks are cut every five to seven years and the foliage used as leaf hay. Cutting back trees to harvest products from them can help to prolong the life of a tree by promoting new growth on very old trunks and root stocks. This allows different niches to develop on the tree in a range of different ways.

Wood pastures

Wood pastures are known to be particularly important for their veteran trees and the high biodiversity that is associated with them. There are examples of this habitat across Europe. Wood pasture origins in Scotland can be summarised as follows

- Ancient hunting forests
- Parks and designed landscapes
- Old working farms within the cultural landscape
- Heavily grazed natural-origin native woodlands

Wood pastures in more marginal areas are gaining prominence as habitats of high biodiversity value across Europe. Two sites Glenmore in the Cairngorms and Tinnis Burn in Liddisdale have been looked at in detail

Caledonian pinewoods of Glenmore in the Cairngorms of Scotland formed part of the medieval earldom and diocese of Moray and were thought to have been carefully exploited as summer pasture, as part of a transhumance of livestock that occurred up until the 1750s, and were in essence a pinewood–pasture. The entire landscape of Moray had been carefully divided into *dabhaichean*. This was done in such a way as to ensure the fair allocation of natural resources. The low-lying east coast of the province, however, lacked the high mountain grazing. The forests of Stratha'an and Glenmore were used for this grazing and the forest of Glenmore had 17 known shielings. The Royal Commission on the Ancient and Historic Monuments of Scotland (RCAHMS) historic land use map has identified six of these areas but the remainder have not been identified and are presumably within the area of existing woodland. Records show that between 1750 and 1753 a total of 3,098 animals were taken to the forest of Stratha'an for summer grazing and it is thought that this was low compared to earlier times where the pasturing of animals was a very profitable business (Alistair Ross pers comm.).

The Caledonian pine forests of Scotland support a wide range of well-recorded species often restricted to isolated populations in remote locations. This includes those associated with deadwood and mature timber habitats including records for the Glenmore awl fly (*Xylophagus junki*), found only once in 1913, which is one of the many that requires veteran Scots pine. The maintenance of the veteran tree

populations that are remnants of this ancient landscape is essential for these saproxylic species as is the connectivity between them.

This is an example of how historical and ecological research can be linked to create a greater understanding of our present day landscape and how veteran trees can be used as an indicator and a link to these ancient landscapes. There is currently research into the environmental history of Liddisdale of which the wood pasture at Tinnis Burn forms part. Further investigations into a range of wood pasture sites that are representative of the different types found across Scotland linking field evidence with historical research help increase our understanding of the resource, its management, distribution and extent.

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NATURAL EARTHWORKS IN NATURAL WOODLANDS - 'PIT AND MOUND FORMATIONS' AS EVIDENCE OF ANTIQUITY

PETER QUELCH

Introduction:

I want to bring to your attention a natural phenomenon which leaves more or less permanent earthworks in woodlands and ex-woodlands, and can be used as evidence in historic landscape interpretation. Pit and mound formations can be seen in some of the most natural origin forests in Europe, and I will explore these first to explain the feature. Then we will look at a range of examples in Britain, and speculate where these features might be found in Scottish woodlands.

Pit and mound formations and their ecology.

George Peterken in his book *Natural Woodland* (CUP, 1996), gives a quite extensive treatment of this formation, especially in the seminatural forests of North America. They are of course the result of windthrown mature trees, especially after the trunks are allowed to decay naturally with no logging or other disturbance. The feature consists of a pit formed by the pulling out of the rootball, with the adjacent mound of earth and stones formed when the tree roots decay and drop their soil burden, not back in the same hole but alongside it. On a steep slope the mound can fall well clear of the pit on the downhill slope.

Because of the quite different micro-topography of the pit and mound, the two features develop different ecosystems in miniature. The pit naturally becomes wetter, perhaps even with seasonally standing water, and also collects organic matter. The mound by contrast is freely drained and can become slightly leached and more acidic in time. Thus differing trees, shrubs and field vegetation will colonise old pits and mounds, and these can be seen many years later. For example in the NE States, birch and cherry would tend to colonise the drier acid mounds, whereas maple and spruce would colonise the original upper surface, but few trees would colonise the wet pits.

The formations tend either to be 'hinge', with shallow rooting trees, especially in poorly drained soils, or 'ball and socket', with deeper and narrower pits of 30cm plus and with very large mounds. Decay and erosion of these larger mounds is slow, so that even centuries later, after the tree has decayed, its demise is marked by a shallow pit and mound.

Pit and mound formations as evidence of ancient woodland

All woodlands have differing histories and circumstances, yet if large mature trees continue to fall and rot in an ancient woodland, the effect is cumulative. Pit and mounds can build up until they cover a large part of the land surface. Peterken quotes an example in New Brunswick, where up to 48% of the forest floor is covered by the formation, of which 12% is pit and 36% mound. Pit and mound topography is highly characteristic of natural woodland. By contrast, secondary woods can be distinguished from old growth stands by the absence of pit and mound topography, even if all old-growth species have colonised (Peterken, 1996, page 243). So pit and mound formations can be used as powerful evidence for ancient woodland.

Pit and mound formation in archaeology

The pit and mound micro-topography can persist long after a particular woodland has been cleared of trees, and they do show up as archaeological earthworks on open land. Along with charcoal burning hearths, hollow-way tracks, and defunct woodbanks, they are pointing to a previous land-use history of ancient woodland, now cleared.

Examples were shown from N Wales (Coed Mawr, in the Dovey valley) submitted to the author by Ritchie Tassell of Coed Cymru in 2004. Four slides show exactly these features on open hillside, and the

locations of these features correlated well with old and named woodlands shown on the first edition OS maps as surviving at that time and cleared perhaps in the late 19thC or during the first world war.

After this talk was given, Prof C Smout sent me a photo of a similar bare hill beside an ancient monument. RCAHMS describe the site thus: "Longcroft fort, Scottish Borders, on the crest of a ridge are the tree-throws of a prehistoric wood, 1983, BW/5309." As with the Welsh examples the pits show up strongly here in a grazed very short grass sward.

European examples in natural forests

Pit and mounds are well represented in the primeval forest remnants in Slovakia and Poland. They are particularly pronounced in old-growth forests with huge fallen and decayed oak, beech and silver firs on well drained soils. Other features of these 'primeval' forests are the enormous volumes of fallen and standing deadwood, and the characteristic 3 or 4m high snags of broken hollow trees, especially beech.

Similar examples were seen by the author during an SNH woodland advisers' visit in May 2003 in the apparently un-logged high altitude beech forests in the western Pyrenees, at Aztapareta reserve, near Roncal, Navarra. In this case the presence of extensive pit and mound formations, high volumes of standing and fallen deadwood, profuse and rich epiphytic lichen communities (Lobarion community on beech), snags, and lack of stumps or any tracks in the higher altitude forest, were all evidence of primary forest of great antiquity. In all respects these stands were as apparently natural in features as the best 'primeval' remnants preserved in Slovakia.

Scottish examples – where to find them?

I have not heard of many Scottish examples but in future will look for them more closely. The tip up mounds of large old pine trees are obvious in certain ancient pinewoods (example shown on FE land in Glen Moriston), but deep heather tends to mask them. They are not going to be found in old agricultural soils and other improved grasslands, nor generally in the cultural or agricultural landscapes. They might well be found in heather moorland which once carried ancient pinewoods. They will not be noticeable in very wet land either, for example in wet birchwoods or other wet woodlands. Neither will they be formed in regularly coppiced stands or in pollarded wood pastures, neither of which woodland structures are prone to much windthrow. They are very much a feature of previous natural high forest which has grown to tall and mature stature before blowing over.

Notes from SWHDG field visit to Darnaway, Moray, Tuesday 17 June, 2003
ANNE ELLIOTT

The group assembled outside the imposing Darnaway Castle. We were met by Lord Doune and his Head Forester, Gareth Whymant, and Mike Phillips, a retired Forestry Commission Forester. We were privileged to be invited into the Darnaway Great Hall, a large and imposing room with the famous hammerbeam roof. Its oak timbers are nearly black, approximately a foot in diameter, and constitute a frame which supports the roof. Some of the timbers are carved with heraldic symbols, others with designs such as a face, a man shooting a bear with an arrow. The timbers are remnants of the mediaeval castle. The castle became ruinous, but the 9th Lord Moray chose to reuse the existing roof when the castle was rebuilt in 1802.

We were told that Prof. Bailey of Belfast's Queens University took timber samples. By examination of the tree ring sequences, he showed that the trees were felled in late summer of 1387. The oldest oak was 420 years old when felled, so some of the timber is over 1000 years old. The wood is semi ossified, and is in very good condition. It is the oldest extant roof of its type in the country. Even the roof of Westminster Hall is younger (built in 1396).

Lord Doune and Gareth then gave us a talk on the history of Darnaway's woods. A Royal Hunting Forest, it was used by the family and on many occasions, visiting royalty, for hunting deer, boar, and wolves. It was used for hunting between the 1400s and the 1700s.

In the 1450s, the forest was completely enclosed by a wall, the remains of which are still visible and which we were shown later in the day. The wall was built to keep wild animals in, and domestic stock and people out.

Prior to 1767, the area outwith the Forest was thought to support whins, gorse, and birch. Scots pine was thought to be uncommon. Within the forest, oak, ash, elm and cherry grew on the better ground, and birch, juniper and some pine on the heathy ground. Around 1796 saw the start of commercial woodland management. We were shown a forest map of this date. From 1767 onwards, there was extensive planting, both within and outwith the Forest, largely of oak, Scots pine, and latterly, European larch.

A second map, showing proposed planting, was produced in 1926. The management aimed to make the woods more economically viable, by replacing oak with pine, because the tanning market had become poor, and oak timber was no longer needed for shipping. Scots pine was on an 80 year commercial cycle, and it was planned to set out the wood in 80 annual felling coupes. They chose to retain 600 acres of hardwoods.

In the Great War, a large area was felled and in WW2, a further 800 hectares were felled. The areas felled in WWI were replanted with Scots pine and European larch, while the areas felled in WW2 were replanted with Scots pine and latterly Douglas fir on the old larch sites with better soils. Sitka was planted on soils with sufficient moisture.

1945 to 1950 and post 1990 were times of change in forest management at Darnaway. The 600 acres of hardwoods retained in 1926 have shrunk to 200 acres since WW2, which remains due to the interest and concern of the current Lord and his father, since a purely commercial decision would have been to fell them and replant with other species.

In one very inaccessible area, the wood is a mix of oak, pine, hazel, and juniper, which SNH has suggested is a natural mix for the area and has not been grazed or managed. The oak wood has beech regeneration which is out competing oak regeneration, and in places supports a thick mat of *Luzula sylvatica* (Greater woodrush).

The first capercailzie was seen here in 1888. The wood is now one of the best remaining areas for capercailzie and is proposed as a Special Protection Area, which has implications for future woodland management.

The group were then taken out to the Estate. The first stop was to see an oak tree with an outstandingly straight trunk. The tree is 101 feet high, and the lowest branch is 80 feet high. It is one of a planted group of oak, which were nursed by beech. The other straight oaks were felled, leaving only poor form oaks.

The next stop was to see the veteran oaks of Darnaway. There are 100 large oaks growing in a thin belt of woodland next to the River Findhorn, and bordered by agricultural land. The largest of these trees is very impressive, being 32 feet in girth. It appears to be a coppice, and one of the trunks has been cored by Mike Phillips, giving an age of at least 727 years. Mike speculated that the stump may be 1500 years old. If so, this

would mean that the trees are native oak, since trees from elsewhere were not planted at that time. Is this the most intact remnant of the ancient oak forest of Darnaway? Lord Doune commented that these oaks are sessile but most of the large old oak on the estate are pedunculate. Mike Phillips added that from his research, all the pedunculate oaks were planted. He considers that the old original oak forest would have been sessile. Samples of timber have been taken from these trees by Dr A Crone and Dr C Mills for carbon dating.

Mike said that there are historical records of Darnaway oak being sold. When the Comyns were keepers of Darnaway Forest, 40 oaks were delivered to the Bishop of Caithness for building the roof of Dornoch Cathedral in 1291, and planks were sent for repair of houses at Inverness Castle in 1457. There was much felling of Darnaway oak during the 15th and 16th centuries, for building the King's ships and possibly for the roofs of Stirling and Edinburgh Castles. More recently Darnaway oak was used in the reroofing of York Minister, in the restoration of the Great Hall at Stirling Castle and in the new Scottish Parliament.

There was a discussion on tree form. Peter Quelch pointed out that the coppice form could result from coppicing, felling, or from past grazing damage. There was a Victorian practice in parkland landscapes, especially with beech, to plant trees in a bundle, eventually resulting in a fused trunk and a form similar to coppice or pollard.

It was pointed out that the tree's base as seen from the river side appears to be roots, and the past ground level is now approximately 9 feet high. Lord Doune confirmed that the river could have washed away the bank in past floods. He showed the group the bank reinforcement which Gareth Whymant has carried out to protect the roots of the oak.

Mairi Stewart commented that seeing large trees is not the same thing as seeing old ones, since the rich soil of the agricultural land would encourage rapid growth. It was noted that the agricultural land is an old river terrace. Lord Doune said that the agricultural land is shown as such on the 1760 map. It is known as Meads of St John and also as Haugh of Logie. Mike added that medieval tournaments were said to have taken place here. He has shown that there are remains of an ecclesiastical building on the opposite bank of the river, and the St John name may have originated from this building.

Mairi commented that we now know more about commercial coppice management from the 1770s onwards, but very little about forestry practice prior to the 1750s. It is reasonable to assume that there would have been small scale iron working and tanning prior to 1750, to satisfy local needs. There are also old lime kilns nearby.

Lord Doune said that some bark stripping for tanning was carried out at Darnaway until 100 years ago, because a market existed for tannin to use on nets and ropes, as well as leather. The women, old men and children would work in the woods. From 1 May onwards, the bark was peeled to about 18 inches above the ground. Then the trees were felled. Any lichen was scraped off the bark with a tool like a combined axe and scraper. The bark was chipped, bagged, and sent off to tanneries in Leith and Elgin. The timber would be sold and as much was crooked, was valued for boat building, and people came from as far away as Wick to buy it. At the end of the season, Lord Moray would hold a 'barker's ball', with food and dancing for all those who had worked in the woods that season.

There was also a bobbin mill at Forres. A comment was made that birch was often used for bobbins on Deeside, and that silver birch was planted for this purpose.

After enjoying our lunch next to the River Findhorn opposite a spectacular cream sandstone cliff, we were taken to see the remains of the wall built to enclose the Royal Hunting Forest. The wall was built using rough and unfinished stone, and it was suggested that it would have been topped with a timber pailing. Much of the wall has collapsed, but most of the section we saw was still standing.

We looked at another very large oak which some thought was two trees growing together. Mike Phillips considers that the large sessile oaks such as those by the River Findhorn are native, but the group did not reach a consensus. Is it possible to conclude whether such trees are native, or will there always be doubt that even the largest trees could have been planted?

On behalf of the group, Peter Quelch thanked Lord Doune, Gareth Whymant and Mike Phillips for leading the visit and Mairi Stewart for organising such a very interesting field meeting. I add my thanks to Gareth Whymant and Mike Phillips for checking the draft of this text, although I take full responsibility for any remaining mistakes or misquotes.