Archaeological survey of conifer plantations in Scotland

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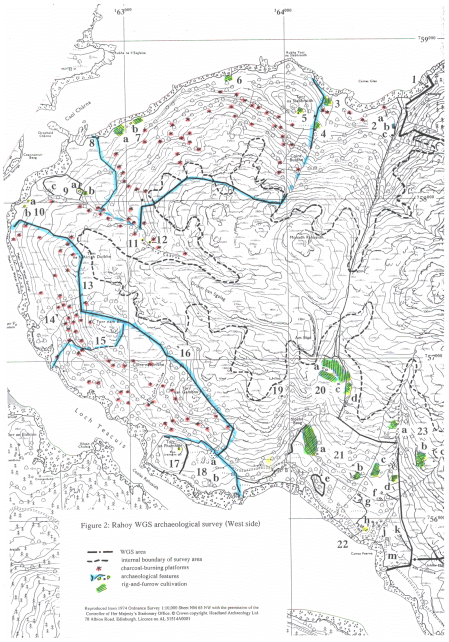
At 1.3 million hectares Scotland has the largest actual and at 17% the highest percentage woodland cover in the UK. As the figure for 1924 was 0.4 million hectares (ha.), it can be seen that there has been a massive expansion in woodland cover in Scotland. Scotland does have a total of 65,000 ha. of Ancient Semi Natural Woodlands (ASNW), and 55,000 ha. of Planted Ancient Woodland Sites (PAWS) but the majority of its woodland resource, some 1.2 million ha., consists of conifer plantations on previously unwooded sites. As the majority of this land had not been subject to archaeological surveys its impact on the historic environment remains unquantified.

Pressures on the archaeological resource through new planting are much reduced due to the decline in the viability of commercial forestry plantations, though there are continuing pressures to expand the native woodland cover for nature conservation reasons. We also have had more robust procedures for dealing with archaeological issues in advance of planting under the Woodland Grant Schemes. This has led, for example, in Highland Region – the area with most new planting in Scotland – to a situation where the majority of forestry companies now commission rapid archaeological surveys as part of the forest plan process.

Survey in existing woodland has also been encouraged by the introduction of the Scottish Forestry Grant Scheme in June 2003. This has placed a greater emphasis on improving existing woodlands rather than establishing new ones, in particular the introduction of new Stewardship Grants where forest owners can get funding of either 65% or 90% to cover the costs of archaeological survey. These grants will be particularly useful in carrying out survey in ASN Woodlands in Scotland where we have c1/5 of the UK total or 1/3 of the amount in England. We are much further behind England in recording woodland history, partly reflecting our poorer documentary sources but also perhaps because archaeologists are more thinly spread across Scotland. For example the National Monuments Record for Scotland has only 3 sawpits and 15 references to coppice in its database and it is historians and ecologists who have led attempts to view trees and woodland as human artefacts or historic objects. The Centre for Environmental Policy based at Stirling and St Andrews Universities and the associated Woodland History Discussion Group (http://www.stir.ac.uk/cehp/swhdg.htm) are particularly important in this respect. This has encouraged the useful report on 'Wood Pasture in Scotland' by Peter Quelch (http://www.forestry.gov.uk/website/pdf.nsf/pdf/ancient.pdf/$FILE/ancient.pdf)

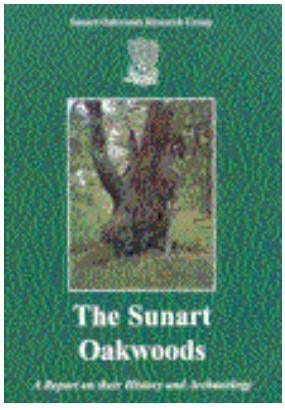
Most of the existing ASNW archaeological survey work has been carried out on the oak woodlands of western Scotland, exploited and indeed preserved by the demands for charcoal from the iron industry.



Rahoy Estate on the south side of Loch Sunart was the subject of a rapid archaeological survey in 1996. Besides the remains of crofts, rig cultivation and possible shieling settlement over 100 charcoal burning platforms were identified and associated plantation boundaries as referred to in estate documents dating back to 1786. Many of the older trees show evidence of coppicing dating back probably to the mid 19th century when there was last a market for charcoal and oak bark.

Charcoal-burning platforms at Rahoy.

The one major study has been the Millennium funded survey of the north side of Loch Sunart which covered some 12.7 square miles identifying 1799 sites for an estimated 1900 survey hours. The survey is important for it also included extensive studies of documentary sources including estate records, census and other government records as well as oral traditions preserved by local residents. The cost of such a survey would have been prohibitive without the input of external funds and the use of voluntary labour but does show the sort of information that can potentially be recovered.



Copies of the 96 page report are available from john.dye@virgin.net

Scotland is famous for its Caledonian Pine Forests, such as those in Glen Affric and Rothiemurchus but only limited archaeological survey has been done in these. Mature native pinewoods are notoriously difficult to survey due to rank vegetation such as mature heather and moss banks. Only the most substantial buildings or boundary features tend to be visible. Many of the surviving pinewoods such as Rothiemurchus are in fact re-growth or in some places re-planting of

woods that were felled as a timber crop. Pine tends to regenerate best on cleared ground after felling and this can be reflected in even growth of trees around 'granny' pines.

Why survey in Plantations?

The woodlands are virtually impenetrable and the plantations have destroyed all the surviving evidence. Well, yes and no.

Forestry ploughing and tree roots can do damage as can be seen here at Glen Brein on the south side of Loch Ness. Excavation in 1996 of a building abandoned at the beginning of the 19th century, showed that forestry ploughing had done considerable damage to the structure whose position is outlined in red on plan. The tree roots in comparison tended to follow the lines of the furrows and did rather less damage. A neighbouring structure which was missed by the

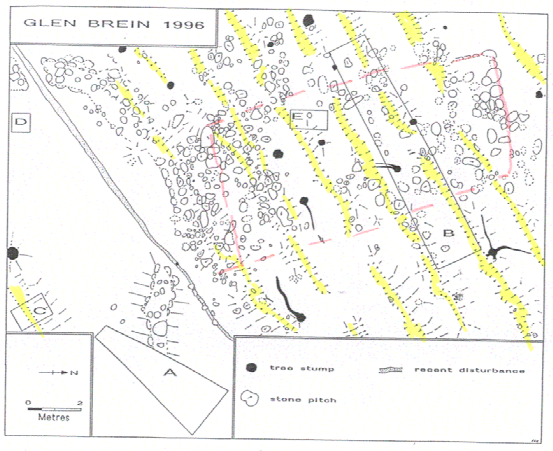
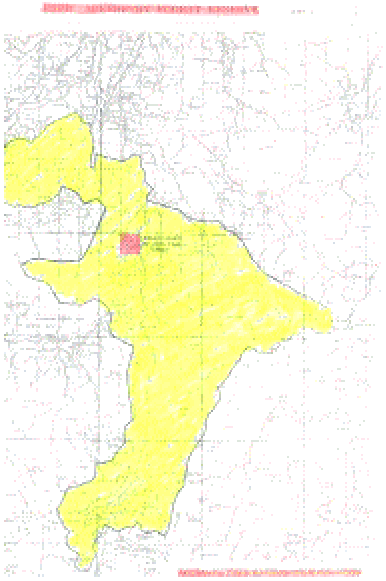


Figure 2
Pre-excavation site plan showing position of trenches

plough has much better preservation.



ABERNETHY FOREST RESERVE

•6 sites were recorded here in 1995 on Highland Council's SMR

•22 were known by local people

An archaeological survey carried out in 1995 identified:-

•173 extra sites from maps and other documentary sources.

A 1 kilometre square was targeted for field survey revealing :-

•20 new sites including 2 chambered cairns, 1 roundhouse and 1 prehistoric enclosure

Where forestry ploughing has taken place the damage to surviving remains can be extremely destructive. A rapid survey of a 3,000 hectare woodland estate at Fassfern on the north side of Loch Eil (close to Fort William) only took the author four days to carry out because the damage to surviving structures was so severe. A previous desktop survey had examined 18th century estate maps, the 1st and 2nd edition Ordnance Survey maps and aerial photographs taken by the RAF in the 1940s prior to the main post-war planting. From this desktop work it was possible to target walkover survey to the most significant archaeological areas. While many of the features recorded on the OS maps and the aerial photographs were not recovered, it was possible to define areas of previous settlement and suggest that elements of these be incorporated in restructuring wood as part of a long term Management Plan for the woodland. This would allow some of the historic landscape features to be retained even if the individual structures themselves may have been damaged. In addition the survey did identify features not recorded from documentary or cartographic sources.

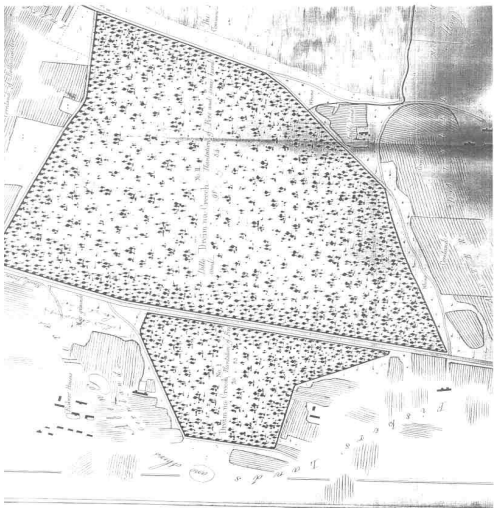
The oldest was a probable roundhouse site, the only evidence for prehistoric settlement in this area so far recorded.

Two shieling-type structures were located by predictive survey on higher ground close to what would have been open grazing land and close to burn sides on ground not planted. In addition examination of surviving oak woodland showed evidence for pollarding, coppicing and probable charcoal-burning platforms pointing to extensive exploitation throughout these woodlands. This was significant for understanding the woodland history of this area.

Archaeological survey of these plantations was never going to recover all the archaeological features that had previously survived in this area but a targeted survey allied with a deskbound survey did identify significant remains that have increased the understanding of woodland settlement in this area.

Pollarded oak as surviving in plantation.

Plantations in Scotland have a long history with large scale planting being introduced in the 18th century on a number of estates such as those of the Duke of Atholl and the Earl of Seafield, contemporary with the more well-known agricultural improvements. One of the earliest Grant of Monymusk had, from starting planting in 1717, by 1754 '*two million well advanced trees*' and in 1768 a sawmill was established. (Shaw J 1984 Water Power in Scotland 1550-1870, Edinburgh)



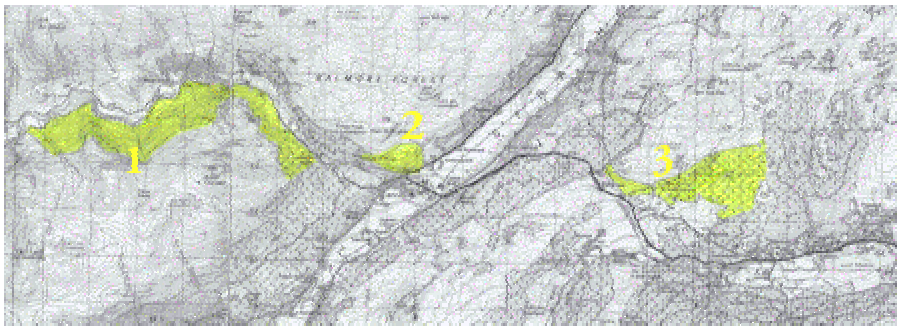
This map of 1779 records a plantation established previously at Dalcross near Inverness. The area is still used as a plantation and given a harvesting period of c60 years must be into its fourth timber crop. However the plantation banks can still be seen and were the subject of a small excavation to examine their structure.

Some plantations are themselves now part of the historic record worthy of recording and retention

as part of the historic landscape. This includes, like the altered trees in ASNWs, some of the planted trees such as the fir on the Atholl Estate that have been identified as specimens probably derived from the original seed sent by Douglas from North America.

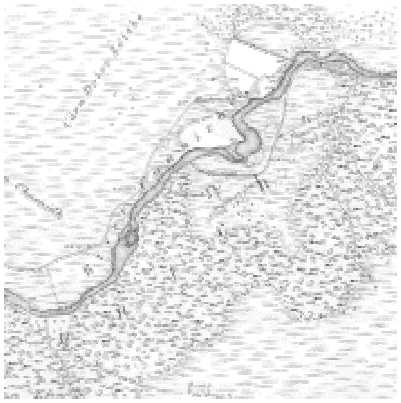
The majority of plantation surveys that I have carried out have been on Forest Enterprise lands and the results have been variable. The following examples will explain the variability of monument survival, the factors affecting monument survival and the techniques required to record features adequately. Conditions in lowland England may well not replicate conditions shown here.

Between 1996 and 2000 three blocks were examined in a strip extending from Glen Cannich to the middle of Glenurquhart. Both glens are narrow running west to east with a significantly wetter climate in the west and correspondingly poorer more acid soils.



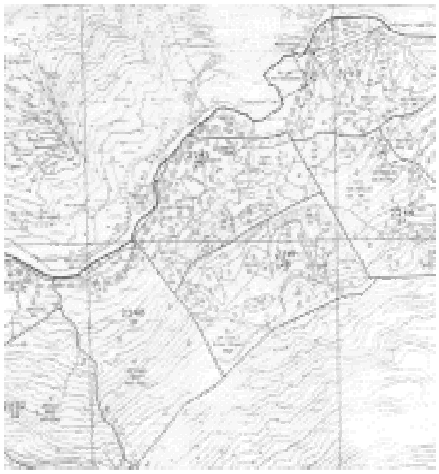
1 Glen Cannich

This block was surveyed in 1999. It covers the north facing slope of a steeply sided glen. In character this is similar to the more famous Glen Affric and remnants of the old native pinewood still survive though most of the woodland shown on the Roy's Military Survey of circa 1750 has been replaced with modern conifers making this a PAWS. Much of the existing conifer plantation is now being removed to 'restore' the native woodland.



The area was also shown as heavily wooded on the earlier OS map series. Much of this wood was cut down in the 20th century as a wartime emergency, though there are records of substantial fellings in the woodland from the 18th century.

On the sample area of the plantation map shown are illustrated remnants of the old woodland marked as *SP(Cal) 1850* or *1880 Nat Reg*. This is translated as



Scots Pine (Caledonian) produced by Natural Regeneration. The date is probably an estimate as the woodlands are shown largely unchanged between the two OS map surveys of 1872 and 1901. Elsewhere a more complex pattern of *SS* – Sitka Spruce, *LP* –Lodgepole Pine, *NS* – Norway Spruce, *BI* – Birch and *UP* – Unplanted can be seen. The date of planting is shown to be mostly in the 1960s other than for the birch whose date of planting by natural regeneration has been estimated.

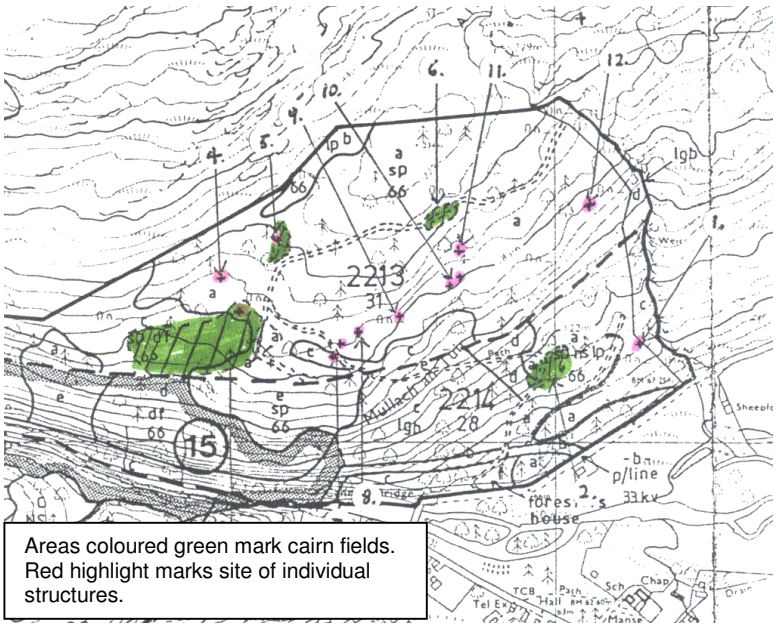
The density of planting and the steepness of the slope prevented more than an abortive sampling of the woodland. Besides the physical problems of surveying this terrain in detail, the likely outcome of such work from analysis of the aspect and terrain allied to previous documentary work did not justify a total survey. Survey effort was concentrated on the known settlements shown on the earlier OS map series and on the upper ground where it was predicted that shieling settlements might lie. A total of 2 days fieldwork was carried out on this. No shieling sites were recorded but most of the 19th century (or earlier settlements) were re-located.

Unmapped features of these settlements such as the illustrated corn-drying kiln were also recorded. Despite theoretically lying within a conifer plantation the majority of these settlements survived either within open areas or within areas of natural birch regeneration. An additional area of settlement was noted in one patch of plantation but had been so truncated by forestry ploughing and planting that its extent could not be plotted.

Though no major sites were discovered the locating and mapping of the post-medieval settlements at a relatively low cost means that their location and future protection can be incorporated into the Forest Management Plan. Other sites may be uncovered during future forestry felling work but the topography, aspect, present density of vegetation cover, the past record of the area as a pine woodland would seem to preclude the finding of significant new archaeological sites.

2 Mullach an Tuirc, Cannich

In 1996 the author was asked to a rapid archaeological survey of a block of woodland at the mouth of Glen Cannich overlooking the more fertile Strath Glass. The plantation lies on ground rising steeply from the valley floor. A survey was initially called for because a forestry surveyor trying to establish a road line for timber extraction had located a massive pile of stones that seemed archaeological. No sites had previously been recorded from the site, nor was there any evidence of sites from a desktop survey. Though superficially a similar terrain to the Glencannich survey area, the more sheltered aspect of the south facing terrace at the top of the plantation and its location adjacent to the more fertile lands in the valley floor has led to a more varied survival of human occupation.



Areas coloured green mark cairn fields. Red highlight marks site of individual structures.

Though a much smaller area than the Glen Cannich plantation over two days was spent surveying in these woodlands. This was because a number of sites were found. These included roundhouse prehistoric settlement remains as well as drystone structures of 18th century or earlier date that had not been recorded on the OS map series.

The large cairn, which measured 15 metres diameter by up to 1.5 metres high, could not be interpreted. It may have formed a prehistoric burial feature such as a Clava –style cairn (the nearest lies 5 kilometres to the south east at Corrimony) or be the collapsed remains of a building. It was clear that forestry machinery had driven over this feature for the same flattened structure could be seen in five other stone heaps seen close by. They all appeared structural but whether from collapsed drystone walls of structures or forming cairns could no longer be distinguished.

The two surviving roundhouses had been disturbed by tree planting but are still indicators of the extent of prehistoric settlement in this area. A large area of clearance cairns (shown as (3) on the site plan) appeared to be prehistoric in date. They corresponded almost precisely with the extent of a block of sitka spruce (SS) and it seems the selection of the more demanding tree species was because the previously cultivated soil remained more fertile than the surrounding area.

Though this survey took proportionally longer than that for the more extensive plantation to the west, this was reflected in the more significant archaeology recorded. Survey particularly within the sitka plantation was difficult (and physically uncomfortable) but was justified by the results and it is anticipated that most of the area was covered. Analysis of the features and detailed recording does remain uncertain but should be easier to carry out once harvesting has been completed. Identification of the sites before felling allows them to be protected during the felling process.

3 Buntait

This survey was carried out in 1999 because of known roundhouse and other remains in the plantation area. The Ordnance Survey had recorded 8 roundhouse sites in immediate area prior to the planting of this area in the 1960s and 70s. According to a local informant the forestry ploughman had respected the roundhouse sites and left them unploughed, though subsequent planting had taken place right up to the edge of the known house sites and the associated field systems were also planted over.

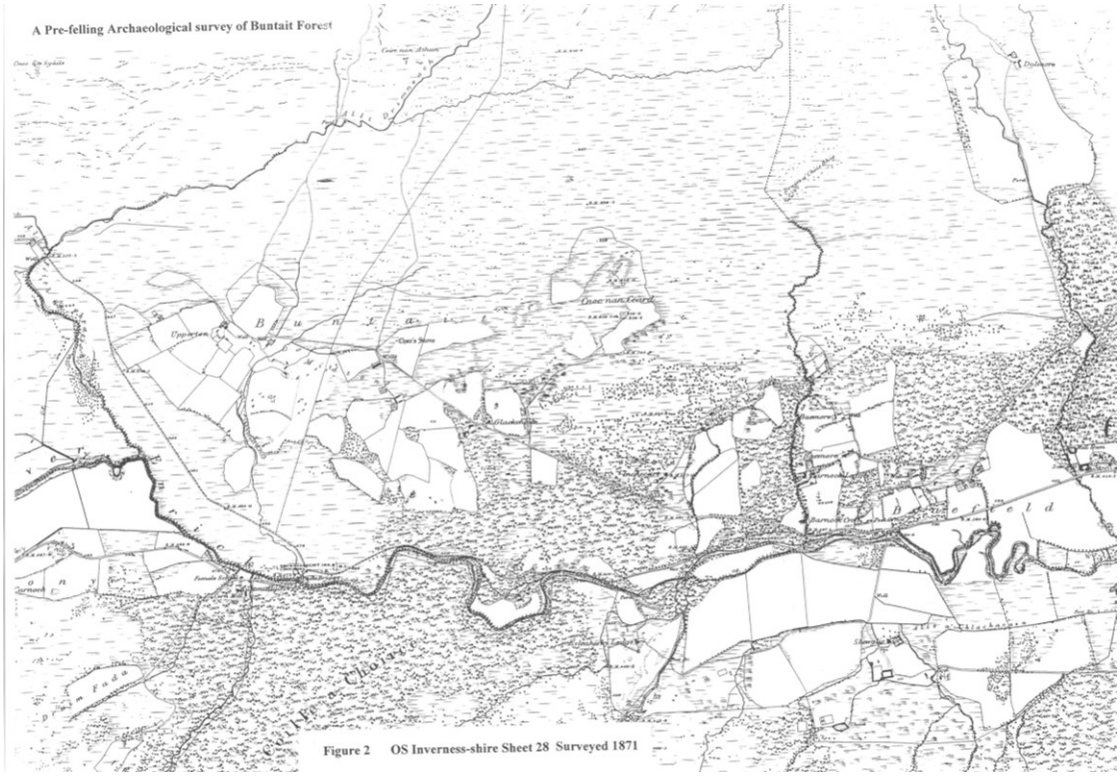
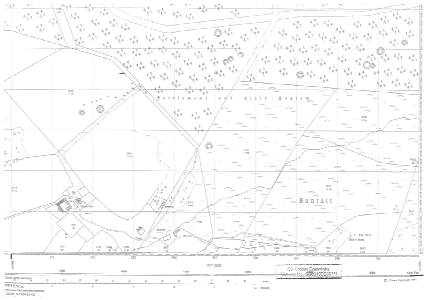
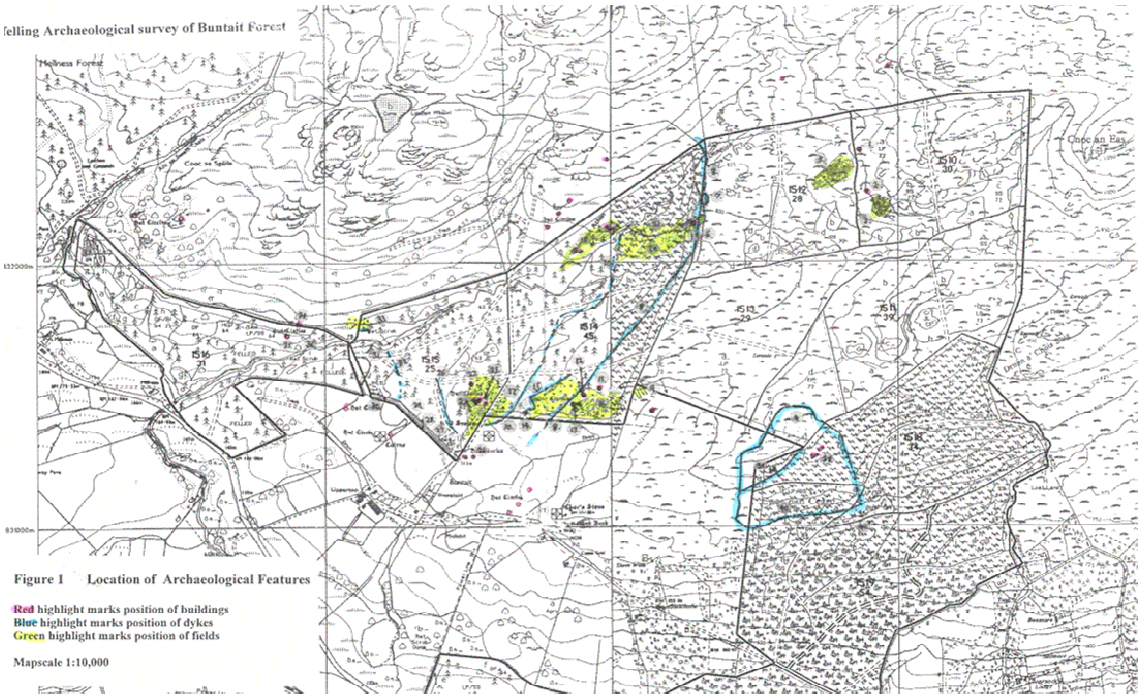


Figure 2 OS Inverness-shire Sheet 28 Surveyed 1871

The north side of Glenurquhart has a substantial number of roundhouse sites and other settlement remains surviving on the edge of the modern agricultural areas. Between the watershed with Strathglass and the shore of Loch Ness to the east, a distance of c10 miles over 50 of these prehistoric roundhouses have been recorded on the south-facing side of the glen. (This is ignoring later settlement including 6 Pitcarnick-style houses near Garbeg, part of a probable pictish settlement of national importance.)
The extent of prehistoric and later settlement in the areas under modern occupation is not known and largely unrecoverable. But the surviving remains are still significant for understanding the nature, date and extent of human settlement history in this area. This includes the area now under forestry plantation.



Survey was carried out on three wet days in November making for uncomfortable survey conditions. The trees had not been brashed (trimmed of their lower branches), though some thinning had occurred in the south east of the area, including over the post-medieval settlement remains recorded here. A fairly high deer population (both red and roe were spotted) did mean that the rides were kept fairly low in vegetation and that a number of slighter features such as clearance cairns and low turf dykes were more prominent here than in the main woodland. Under the trees was relatively dry but breaking through the plantation blocks involved brushing against sodden branches, requiring waterproofs to prevent becoming soaked. The main area of roundhouse settlement at the south west was planted with scots pine, as can be seen on the plantation map.



Visibility here was reasonable and many of the trees were in poor condition, though this had led to collapse and windthrow in places handicapping both site identification and access. Locating the known roundhouse sites was relatively easy but mapping the extent of clearance cairns and field walls was more difficult. The survival and visibility of the later depended on the line of ploughing. Where the wall line mirrored the plough line it survived well but where it ran at right angles to this it was difficult to follow, being distinguished mostly by stone spreads (this is shown as a dotted line on the survey plan).

It was not feasible to walk the whole woodland and initial work was concentrated on the rides and other open spaces and on areas of less dense woodland, particularly of birch scrub. Where features were noted such as clearance cairns the neighbouring blocks were examined extensively and this was feasible even in stands of dense sitka. Where the ground was boggy survey was more difficult and less fruitful due to the difficulty of crossing this terrain and the general depth of plough furrows in this softer ground. Tree species and density of planting seriously affected visibility of features. The best was stands of mature birch followed by scots pine and then the spruces and firs with sitka being the hardest to penetrate. Once through the outer fringe of branches walking was easier, though the surviving branches did make walking hard. Ideally goggles should be worn to protect the eyes from damage but these make visibility in an already dark woodland even worse.

3 extra roundhouses were found, two that had been left unplanted and one ploughed and planted with sitka (shown below beyond the fence). Previously recorded house sites within an area already harvested of its timber crop were almost impossible to identify due to obscuring brash and other vegetation including bracken. Clearance cairn areas and stone and turf dyke lines were mapped as well as post-medieval remains (including elements not marked on the 1878 OS survey). Recording was mostly by compass bearing and measured pacing in

relation to plantation blocks and features such as rides or natural features like burns. As the forestry plans have been mostly drawn from detailed aerial photographs, these boundaries are likely to be pretty accurate – though now such survey would be best done with GPS readings where feasible. Photography was rarely useful as a means of recording because of the limited depth of field and poor lighting. Some of the key areas were marked with tape fixed to trees but as some of the areas are only now being felled, some five years later, it would have been better if the marking of sites had been done as a separate operation, ideally in the presence of the forest managers and harvesting contractors.

Buntait After an earlier phase of harvesting

(there's meant to be a roundhouse in here somewhere!)

Conclusions

The prehistoric and to a lesser extent the post-medieval settlements found at Buntait, Strathglass and Glen Cannich are significant for understanding the extent of previous human settlement in this area. Though individually they may be less well-preserved than features outside the plantation area, they are part of a historic landscape that is significant. Until the rest of this area both within the plantations and without it has been fully surveyed it is difficult to place these in context. In terms of the input of resources and the return of information that can inform future management, thus allowing the preservation of the significant remains that do survive, these low cost archaeological surveys were valuable in identifying significant new archaeology. Where the archaeological record is more complex and comprehensive (such as, for example, in some English PAWS) not to survey in these areas is a major loss of potential information. Where the information does not survive or is too badly damaged to record properly then this can be readily identified without major costs. Using deskbound research, topography, location and aspect allied with known planting history the most promising areas can be identified where survey would be most fruitful.

Survey techniques

It is not easy to produce standard approaches to survey in conifer plantations as conditions can be so variable. The following comments may be helpful.

- *Initial deskbound survey* - One of the most fundamental points, which should be standard procedure, is to carry out a documentary, cartographic and aerial photographic search before the fieldwork. This allows effort to be concentrated on the most promising areas. A rapid search of secondary sources may be useful as long as it is targeted.
- *Sample* – Different plantation blocks may well have been planted in different ways (ploughing, spacing etc.) and almost certainly at different times. Planting method may vary within individual woods and where some trees are planted in furrows others may have been planted in individual spade holes (machine made mounds are increasingly popular but these are unlikely to be found in older plantations). This will affect the visibility and survival of archaeological features.
- *Open ground* - Take advantage of rides, corridors for power lines and other unplanted areas for a sample of where archaeological interest might lie. They may well not have been ploughed unlike the rest of the woodland, allowing correspondingly more archaeological detail to survive.
- *Topography* - this is critical, particularly in highland areas. Settlement is unlikely on steep exposed, north facing slopes but there may have been other economic or social drivers in the past, such as the need for security or mineral outcrops which may have encouraged people to exploit certain areas.
- *Transect survey* - In principle this should be carried out at c30 metre intervals, but in practice ploughing and planting lines may constrain the direction of survey. Also if the level of planting damage, brash, wind throw and understorey is high there is no point wasting effort on discomforting and fruitless survey work.
- *Woodland block* - Distinguishing different woodland blocks (the age and species type are usually marked on modern plantation maps) can be significant because species type may reflect underlying soils which in turn may reflect the presence or absence of human interest in an area. (Foresters target species according to soil type and aspect.) There may well be a break between different plantation blocks.
- *Plantation density* - Remember that foliage will be densest where trees have the most space and light to grow. Visibility and walking may well be easier once you have got past the edge of a woodland block. There is also likely to be less understorey in dense woodlands.
- *Brashing & Thinning* - Brashing to remove lower branches and secondary or guide trees and thinning can be useful in opening up woodland, though in general this is followed by the dumping of brash, making surface features more difficult to spot. A well-thinned mature woodland may also have a significant understorey of scrub woodland and other coarse vegetation.
- *Unbrashed woodland* - Walking through these areas is both uncomfortable and time-consuming,. There are also health & safety issues to be considered and it may be necessary to consider eye protection if you are asking other

staff to carry out this work (bearing in mind that this will reduce visibility in already dark conditions). Certain species such as sitka have more awkward branches to walk through than others, such as scots pine.

- *Tree age* – Young conifer plantations, up to about 15 years old, are virtually impossible to do survey work in, due to the density of the vegetation. Until the trees have reached a reasonable size, it may be better to sample more promising areas. Mature unbrashed trees will of course have larger branches but these may be shortened either by brashing or close planting. Long term plans may be necessary to return to these areas in the future rather than dismissing them as featureless.
- *Survey timing* – conifer plantations, especially if densely planted can be surveyed in summer. However rides and more open woodland may well have a more vigorous understorey of grasses, bracken and other species making these areas better examined in the winter or early spring. Some work has been done using woodland flora as indicators of human disturbance in the past but this requires specialist botanical skills.
- *Recording sites* - This can be hard, as GPS may not work and photography rarely does – what is apparent to you may well not show under flash photography. Compass bearings to known points (such as the edge of planting blocks) and pacing may be as accurate as can be hoped for in some plantations, though in less dense woodland it is possible to survey using GPS or EDM.
- *Marking sites* - Tapes and canes can be used but tends to be time-consuming and may be vulnerable to disturbance by deer or other large animals. Use plantation boundaries and rides as location points as most of them are now drawn fairly accurately from aerial photographs – though rides, in particular, may be shown in only approximate positions. Remember locating sites for foresters and other forestry contractors may be more important than producing a detailed plan, especially if the survey is being carried out in advance of felling.
- *Archaeological features* - Only certain kinds of robust sites such as banks, buildings, cairns, dykes, ditches and large pits or ponds generally survive in plantations. Do not expect subtle features to survive and beware of over interpreting features found in woodland.
- *Trees as features* – do not forget to record trees that have been pollarded or coppiced or have other human interest (such as Wallace's Oak or Gallows Trees). These are equally valid sites and are inadequately covered in current records.
- *Keep looking* - significant remains can survive and they may be important for understanding not only the areas under plantation but also adjoining land.
- *Be pragmatic* - if you are not finding anything then don't struggle vainly over forestry furrows. It is not in your interests or that of the sponsor of the survey to persist.
- *Survey detail* – all the surveys detailed here were rapid low cost surveys. Where significant or unusual features are noted then more detailed recording may be necessary. This may require better searching of primary as well as

secondary documentary sources, but can best be justified after an initial walk through survey. It is much easier to survey after the timber has been felled, though clearly the position of sites needs to be accurately marked to prevent damage during felling operations. This may well require liaising with forestry contractors as well as forest managers.

- *Finally remember that unless the feature is very robust you need to identify it before harvesting. It is usually too late to do so afterwards.*

Acknowledgements
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100041268. Thanks are given to the Forestry Commission for permission to copy from their stock maps used as the basis for the archaeological surveys in Glen Cannich, Strath Glass and Buntait. The 1779 map of the woodland plantation near Dalcross Inverness is reproduced courtesy of Moray Estates and the portion of the 1871 OS survey of Buntait is reproduced courtesy of Highland Council Archive Service.
See also the CSA draft guidelines for the **Identification and Management of Archaeological Sites in Woodland**. These can be accessed through the CSA rural land use web link
(www.britarch.ac.uk/csa/agric.html *)*
at www.britarch.ac.uk/csa/rural_land_man/woodland.pdf

Questions

Can biodiversity be used to identify buried archaeology in conifer plantations?
Vegetation in conifer plantations is not very indicative of underlying archaeology; it is more so in ancient woodland.

As spruce are not very deep rooted, do archaeological sites suffer from tree root damage in these areas?
Because the soil is very thin, spruce roots *are* destructive.

Are conifer plantations generally more open that deciduous woodland?
Although not subject to quite the same seasonal changes in undergrowth some types of conifer, particularly sitka, are impenetrable. Also young conifers can be too dense for walkover survey to be possible.