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Summary

Turves (in the senseof blocks or sheets of plant material and soil cut from the surface of an area of living vegetation) have been used for a variety of purposes in the past. They are frequently encountered in certain kinds of archaeological deposits, especially major earthworks, but only rather rarely studied from a bioarchaeological point of view.

This study is primarily concerned with the discrimination of turves, or material derived from them, in occupation deposits through the analysis of plant macrofossils. It combines investigations of deposits thought to contain turves, a survey of assemblages where evidence for turves may be present (but has in some cases been overlooked), with some discussion of theoretical aspects of deposit formation and macrofossil taphonomy.

Keywords

Plant Remains
Taphonomy
Turves

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Background to this study

This study is primarily concerned with the recognition—through macrofossil plant remains—of turves, or material derived from them, in archaeological occupation deposits in the British Isles. Whilst turves are frequently recognised (or at least inferred) during excavation of standing earthworks, studies of plant macrofossil remains (or, indeed, of any biological materials) from deposits known or thought to contain turves are very few, perhaps partly because of an unspoken assumption that such analyses will shed very little more light on the question of interpretation—it could be seen as 'gilding the lily' to have an archaeobotanist confirm the nature of deposits which are clearly formed of turves. However, turves naturally become archaeologically invisible as soon as their characteristic stratification is lost through redeposition or decay *in situ*. As Richmond and McIntyre (1939, 113) observed in their description of the rampart of the Roman fort at Fendoch, Scotland, 'it had been built of turf, but its reduced state and the porosity of the soil below it had induced heavy leaching, with the result that the lamination typical of turf-built structures had been reduced in definition'. The invisibility of turves through this kind of 'homogenisation' is, of course, even more problematic where they have been used for purposes other than construction or where an earthwork has decayed beyond the point where it can be observed. So studies of deposits where the interpretation of the nature of the material present is unequivocal can serve as a baseline for investigations where such clear interpretation is not possible in the field. The recognition that certain remains probably had an origin in turves will thus assist in interpretation and understanding at a context and site level, as well as contributing to a fuller appreciation of the processes involved in assemblage and deposit formation. But there are wider issues concerned with the use of turf for making structures for dwelling and other purposes, as well as the question of the exploitation of natural resources (with its corollary of human environmental impact).

Naturally there are regional variations within the British Isles with regard to the exploitation of turves, just as the nature of the raw material varies (and must have varied in the past) with vegetation cover, itself a function of topography, soils, land use history, and so on. Turves are historically very much a resource of the far north and west, areas in which a shortage or absence of timber (but an abundance of moorland and rough pasture) meant that other materials were needed for building and for fuel (the various uses of turves are considered further, below). Outside of the 'Highland Zone', therefore, attention rarely seems to be paid to the possibility that turves were other than a very minor component of daily life in the prehistoric and early historic past. Moreover, outside of this area there seems, too, to have been little or no acknowledgement to date by archaeobotanists concerned with occupation deposits that turves may have been the source of a component of the plant macrofossil assemblages they study; even archaeobotanists working on material from sites in, for example, the Northern Isles of Scotland, seem only rather recently to have begun to consider turves as a source for remains in the assemblages they study (an excellent pioneering study is that by Camilla Dickson, 1998).

But what do we mean by 'turves'? As Evans (1969, 80) remarks, 'in modern usage the words turf and sod, applied to a grassy surface, have become interchangeable', and he follows 'the Irish practice of referring to a slice of grass and earth as a sod (alternatively a scraw) and to accumulated decomposed vegetation (in Scotland peat or moss) as turf.' In areas with no

substantial buried peat resources, the word has probably only ever been applied to strips or thin blocks of soil held together with a mat of plant roots—what Adams (1976, 102-3) defines for *turf* as 'surface vegetation, usually grasses, rooted in the soil and usually associated with well-drained areas'. These are the turves (or divots) of those who care for golf-courses, racecourses and gardens, and are *cut from a surface with a living plant community*.

Elsewhere, as indicated by Evans's comment, turf has (or has had) a quite different meaning: cut blocks of peat from a subterranean source (another word for peat turves widely used in Scotland, especially in connection with building, is *feal*). Thus in the East Anglian Fenland, Porter (1969, 160) describes cut peat as *turf*, noting that the peat cutters who won it made themselves *sod* houses (presumably of surface-cut material). Turf as cut peat seems to be the general meaning of the word through much of northern and western Britain, and in Ireland. In the North York Moors, on the other hand, Hartley and Ingilby (1990) clearly distinguish between the cutting of peat and turf, and here the latter is only applied to surface-cut sods. Naturally in this and some other areas of heathland or moorland the mat of plant roots will be formed largely from ericaceous dwarf shrubs growing on a mor humus soil, but with a gradation to grass-dominated turf locally, even here. It will therefore probably sometimes prove difficult to make a separation within the archaeological record between turves in the sense of 'root-bound sods' and turves in the sense of 'peat blocks'. Evans (1969, 80) emphasises the difficulty of clear definitions by referring to 'turf-sods, i.e. the parings of a turf bog', and many writers seem to use the words sod and turf interchangeably. Unfortunately no clear distinction may necessarily be made for medieval and later documents referring to 'rights of turbary', either, since in some areas both peat and sod might be the resource concerned, though Fenton (1978, 25) notes that 'turbaries' and 'peateries' may be distinguishable at least from the 13th C. in Scottish documents and Edlin (1951, 4) observes that in the New Forest and Dorset, where better peat-forming plants are scarce, rights of turbary are closely associated with heathlands.

The work presented here draws on two principal approaches: original analyses of archaeological deposits and a consideration of published and unpublished data. There is also some discussion of the ethnographic evidence for the use of turves in a variety of ways. In order to complete this report within a reasonable time, much material has been set aside concerning the a variety of related issues, such as the implications of turf cutting for landscape and vegetation change, the manpower requirements (and tools needed) for paring, and examples where evidence for turves has been provided by other biological remains (principally beetles and other insects) in the absence of studies of plant macrofossils. It is hoped that these can be considered in a future report.

Note that plant nomenclature and taxonomy follow Tutin *et al.* (1964-90) for vascular plants and Smith (1978) for mosses, and that identifications of plant material by the author were made with the aid of standard works and the collections of modern material held in the Environmental Archaeology Unit, University of York.

Examples in the archaeological literature of the recognition of turves (Appendix)

As mentioned above, turves are clearly visible and easily recognised in many earthworks, especially major constructions of the prehistoric and Roman periods. They usually appear as rather irregular dark lines of humic-stained sediment within paler material (see, for example, the descriptions by O'Kelly (1987) of material from Newgrange, Ireland, quoted in the Appendix). Turf-built earthworks are mentioned in at least nine of the 140-odd separate citations of excavations and other studies of Roman deposits in England, Wales and Scotland compiled by Wilson (1968) for 1967, and both of the two largest earthworks in the British Isles—Hadrian's Wall and the Antonine Wall—were turf-built (the more northerly wall never being built over in stone). For the far north of Scotland, use of turf (here presumably sods rather than peat) in building has been reported, for example, for excavations at Jarlshof, Shetland (Curle 1934, recounted by Hamilton 1956) and Birsay, Orkney (Cruden 1965)—reflecting a cultural tradition found throughout the Viking-influenced world (see Appendix and brief discussion with regard to ethnographic evidence, below). In other cases, the use of turves is inferred rather than proven by excavation: as Longworth (1985, 11) remarks with regard to British neolithic farm settlements in general, 'where traces of houses have survived these are small and roughly rectangular, timber-framed with walls made of turf or wattle-and-daub, no doubt surmounted by a thatched or turfed roof'.

But few of these excavations have been accompanied by archaeobotanical studies of the turves reported, despite the fact that preservation may sometimes be very good. Indeed, some of the oldest (neolithic Silbury Hill and Newgrange) offer clear archaeobotanical evidence which has regrettably only been rather superficially investigated.

The examples cited in the Appendix for which useful archaeobotanical analyses have been undertaken may be divided into two groups: those yielding *primary evidence* (the turves are identified as, or suspected of being, such during excavation, with studies of plant remains adding 'artistic verisimilitude') and those giving *secondary evidence* (the interpretation of the presence of turves or material derived from them is achieved only through botanical analyses).

In the 'primary' category, we may cite neolithic/Bronze Age examples such as Silbury Hill (with its well-preserved moss flora), Newgrange and Knowth, Roman ones such as Davygate and Crawford (though the analyses were vanishingly small), and for the post-medieval period Kebister (and a standing building: Causeway House). These do not form a comprehensive corpus of records of plant remains from deposits which were clearly turves, however! Good examples of 'secondary' evidence for turves are Fishamble Street, Dublin, and some of the sites from N. Scotland (The Biggings and Howe) examined by the late Camilla Dickson. The Irish material here seems likely to have been structural (in roofs, given the context within houses, the uncharred nature of the remains, and the presence of wooden pegs, cf. Geraghty 1996, 27) whilst that from the Orkney and Shetland sites may well have been used for fuel, at least in the last stages of its life (since it comprises charred macrofossils, though cf. Kebister, where charred material from turves had presumably not been burnt deliberately as fuel).

For reasons discussed above, it is perhaps not surprising that studies at sites in the far north of Britain, primarily on the islands off N. and W. Scotland, have proved most profitable in terms of archaeobotanical evidence for turves. The present study is concerned to extend the

exploration for such evidence into areas where turves as a resource are much less firmly rooted in the consciousness of excavators and archaeological scientists.

Original archaeobotanical studies

The following section summarises results from some studies undertaken by the author in connection with the characterisation and identification of turves and material derived from them. It is presented as a series of case studies, with a summary of information from a variety of sites examined in recent years at the end. Although the emphasis is on occupation deposits (i.e. fills of features and surface-laid accumulations associated with *dwellings* of some kind), some material from earthworks is also considered (although in the event it has not proved very informative).

(i) Appletree, Cumbria ('turf wall')

Sections through the 'turf wall' (part of the Hadrian's Wall monument complex) in the vicinity of Appletree, Cumbria, have been studied for many years since the first proof of its existence was made in this area by Haverfield in 1895 (Haverfield 1897, 187). In this area, a little to the west of Birdoswald, the line of the original turf-built wall of the AD 120s was not subsequently replaced in stone and its course can easily be followed as a bank diverging from the stone wall between Milecastles 49 and 51. With it are associated a series of minor banks and ditches. Turves are easily recognised in the 'wall' as alternating bands of black, brown and grey sediment, though no macroscopic remains of plant material are visible when the deposit is examined in the field. (It should be emphasised that 'turf wall' may be something of a misrepresentation, since it is not constructed entirely of turves throughout, cf. Wilmott (1997, 52) who reminds us that Breeze (1982) has suggested 'earth wall' may be more appropriate.) Previous studies have included analyses of sediments (McHugh 1993) and of pollen (Wiltshire 1992) from the Appletree section, but not of plant macrofossils.

In an attempt to explore the plant macrofossil content of turves at this site, material was collected by the author during excavations by a team from English Heritage's Centre for Archaeology, led by A. J. Wilmott, in summer 1999. Here, a section opened previously for a visit by the decennial Hadrian's Wall Pilgrimage was re-opened and samples were collected from the floor of the trench cutting into the turf wall, from the section itself, and also from some deposits in the deep, steep-sided ditch to the north of the bank in which some turf-like blocks of humic sediment had been observed.

The results of the analysis of the turf wall samples were disappointing: perhaps not surprisingly, in a relatively small upstanding monument (the height of the wall at this point was only about 1.5m), decay had been intense and macrofossil plant remains were very sparse (Tables 1-2).

The sample of ?turves from the ditch was more rewarding, however, with some likely indicators of turf (?tormentil achenes, sedge nutlets, and a heath-grass caryopsis)—and with a strong hint of grassland from the small numbers of insect remains recorded. One feature of the this ditch fill assemblage was the presence of moderate quantities of the moss *Ceratodon purpureus*. This species is common in a variety of unshaded habitats—on bare soil (especially

on heathland, but also on fallow land), walls, and rotten wood; Watson (1968, 155) notes that 'it is a conspicuous plant in its typical state in spring, when patches of bare ground or burnt heathland are often purple with the countless setae [the stalks bearing spore capsules] of fruiting *Ceratodon*.' Certainly it has been noted in the succession following burning on lowland heaths and commons, for example in Middlesex (Richards 1928) and Surrey (Summerhayes and Williams 1926), typically at a stage after the ash left from bonfires has become leached. It seems reasonable to suggest that disturbance to the acid grassland/heathland in the area caused by the builders of the turf wall led to the establishment of such patches of *Ceratodon*, and these were subsequently incorporated into the monument and thereafter fell with turves from the wall in decay into the ditch below.

The much better state of preservation of plant remains in the ditch fill sample is perhaps merely a function of the greater degree of waterlogging in that feature. For the turves in the turf wall, though retaining some micro-stratigraphic integrity (the humic and bleached layers had seemingly undergone very little mixing over the centuries), their raised position within the bank had led to decay of all but the most resistant materials.

(ii) Milecastle 79, Cumbria

During work on the Appletree Section in 1999, Centre for Archaeology staff were involved in small-scale excavation at Milecastle 79, near Bowness-on-Solway, Cumbria. Deposits thought to contain turves (from the platform on which the turf wall was built) were encountered and samples from two contexts, representing the same platform in different trenches, were submitted to the author for assessment of their plant macrofossil content.

Preservation here was extremely poor (Tables 3-4), the only plant material other than charcoal comprising a very few modern or probably modern seeds, presumably brought by earthworms from above. The *Cenococcum* sclerotia in one of the samples might also fall in this 'intrusive' category. Certainly no remains characteristic of turves were observed.

(iii) Cawthorn Camps, N. Yorkshire

The site of Cawthorn Camps, near Pickering, is unique in Britain for its row of four rectangular earthworks representing Roman military enclosures. Excavations under the direction of Dr Peter Wilson, Centre for Archaeology, took place at the site in 1999 and 2000 and in various places turves, or deposits thought to include turves, were encountered. During the assessment of a series of samples from the 1999 excavations, two samples were investigated specifically for surviving plant macrofossils as evidence of turves, but none was observed (Table 5). Ground conditions here were far from ideal for the survival of remains, however: the site was located on somewhat sloping topography over sharply draining sandstones, and the turves themselves (presumably cut from the surrounding land when the earthworks and other structures were constructed) were very permeable.

(iv) Wellington Row, York

Excavation of a large area in Wellington Row, by York Archaeological Trust (under the direction of Dr P. J. Ottaway), was undertaken in 1989-90. Much of the sequence at this site consisted of well-stratified Roman deposits which, in one area of one of the several trenches opened (Trench 4), included 1st to mid-late 2nd c. AD features thought to have been constructed of turves. A 'Level III' narrative (Ottaway, unpublished) offers the following

interpretation of the sequence (context groups 4.4.1-3): 'A turf bank was [revealed] at the south-eastern end of the trench, and survived as a mass of peaty material interpreted as decayed turves. This [context] group includes at least one context which may represent turves which fell off the main bank [**4181**], as well as several which may belong to a later re-turfing [**4197, 4198**]. It is possible that this turf construction was part of the general preparation of the area for the later road, and equally it may also have been a way of levelling up waterlogged land close to the river's edge.'

An assessment exercise during 1995 revealed that there were well-preserved plant (and insect) macrofossils in the samples from these deposits and Carrott *et al.* (1995, 4-5) averred that 'that these *are* turves is clear from the biological analyses, even at assessment level', though the actual evidence in support of this is not offered in their inadequately brief report. This shortcoming is rectified in Tables 6 and 7, which show results of archaeobotanical assessment of selected samples from deposits thought to contain turves (samples marked '✓' in Table 6) and some others, from both Trenches 4 and 7, in which a 'turf component' was noted. Also presented are the results of analyses of some other samples from the 'turf bank' and associated deposits, undertaken as part of the present project (Tables 6 and 8). Unfortunately most of the samples collected were rather small (presumably reflecting the limited extent of the contexts as defined during excavation), so subsamples were usually only of 1 kg.

Although quite a wide range of plant taxa was seen in the 'turf' samples, and even more in those samples which were not interpreted as containing turves during excavation, the assemblages were actually rather restricted (certainly when compared with occupation deposits with anoxic waterlogging in general), and many were dominated by a few taxa which occurred repeatedly (Table 9). Of these, *Carex* sp(p). *Montia fontana* ssp. *chondrosperma*, *Potentilla* cf. *erecta*, *Ranunculus* Section *Ranunculus* and *Scirpus setaceus* all seem quite likely to have arrived in turves, the second and the last in this list strongly suggesting turf formed in a damp place—they seem to be characteristic in lowland areas of short vegetation developing on wet tracks and pond margins, i.e. the phytosociological alliance Nanocyperion within the class Isoëto-Nanojuncetea, though it should be remarked that *S. setaceus* is generally overlooked in the field—it is unrecorded, for example, in *any* of the relevées listed by Rodwell (1992; 1995; 2000) for grassland, wetland or other plant communities in which the plant might have occurred. In a position such as this not far from the river, flooding (or at any rate a seasonally high water table) might be suspected to have brought in wetland plant remains, but if so the stratigraphic evidence for silt deposition was not observed during excavation, or it had become obscured by reworking into the turf layers.

Of the other more frequently recorded remains, *Chenopodium album* and *Galeopsis* Subgenus *Galeopsis* certainly do not suggest turf communities and are therefore perhaps plants which exploited newly-deposited turves left in an area of disturbed soil for long enough to be colonised by these annual weeds. Leafless moss stems and earthworm egg capsules seem also to be consistently present and are perhaps candidates for turf 'indicators'. One possibility which should be considered is that the indicators of periodically inundated short vegetation (Nanocyperion) mentioned above might, like the annual weeds, be colonisers of areas of freshly laid (and trampled?) turf close to a river—as here—and therefore not primary indicators of imported turves at all. The seed ecology of taxa like *Scirpus setaceus* is clearly important in this connection. Stieperaere and Timmerman (1983) recorded seeds of this plant in soil under

grassland in an area of former heathland in N. Belgium (presumably part of the seed bank from an early stage of succession from bare ground). Herman Stieperaere (pers. comm.) comments that 'It pops up in places where 'improved' grassland is returned to a more semi-natural state by sod cutting or when pools are reopened. Thus, it indicates places which have been disturbed (e.g. after sod cutting, by traffic, etc...). It is in no way, I think, an indicator for turves/sods being brought in to a site.' However, that it evidently forms a persistent seed bank through which it can easily recolonise areas of bare ground after sod cutting, means that sods cut from grassland may well contain its propagules even though it is not represented in the standing vegetation on that sod or in the recently deposited seeds at the surface of the sod. We should not, therefore, assume that all the seeds brought with a sod or turf are contemporaneous with the vegetation on it (see further discussion of seed banks, below).

(v) Deer Park Farms, Co. Antrim, N. Ireland

Studies of plant macrofossil remains from deposits forming on an Early Christian (7^{th}-8^{th} C. AD) rath (circular embanked occupation mound) at the site of Deer Park Farms, Co. Antrim, N. Ireland, have yielded many assemblages in which a 'turf component' is thought to be present. During excavation, only one sampled context was recorded explicitly by the excavator as likely to contain turves (Context 3065, 'stacked turves in space between Structures X, Eta and Zeta'), with two further contexts indicated as have a 'turfy' appearance (Context 398, 'turfy clay over rath bank' and 2435, 'turfy bank material of [structure] Gamma'). Many of the deposits forming this mound were very richly organic with excellent preservation (Kenward *et al.* 2000, and forthcoming), many of the plant macrofossil assemblages being dominated by remains of heather, bracken, woodland and heathland mosses, and twiggy debris including brushwood and decayed wattle.

Results from examination of four samples from the three contexts mentioned above are shown in Table 10. Whilst plant remains were rather sparse in these samples, a number of taxa which might be expected to have arrived in turves are present, and there is a rather modest number of taxa which represent quite other kinds of habitats or vegetation types. Thus the more frequently recorded plants include *Ajuga reptans*, *Carex* sp(p)., *Potentilla* cf. *erecta*, *Prunella vulgaris*, and *Ranunculus flammula*, and it may be no coincidence that clasts of 'peat/mor humus' were noted in three of the samples in moderate amounts. Other taxa suggestive of the presence of turves are *Danthonia* (cleistogenes—see below—were present in one sample in moderate numbers), and (with the exception of *Sphagnum*) the mosses. Unless these were all brought to the site in, for example, animal dung, or by natural dispersal (including traffic by humans and livestock) from grassland in the vicinity, it is difficult to see how else such a group could be achieved than as remains within imported turves.

It is necessary here to comment on the significance of the cleistogenes of *Danthonia*. These structures are cleistogamous (non-opening) spikelets formed in the bases of the culms of this species and resulting in caryopses which are apparently indistinguishable from those formed in 'normal' spikelets. The cleistogenes are rather tough structures and can be identified when well preserved, as here (and, for example, at 16-22 Coppergate, York: see Kenward and Hall 1995, fig. 181(a), p. 653). Their interpretative significance lies in the fact that they are unlikely to arrive in archaeological occupation deposits unless either the culm-bases themselves are present, or—if the cleistogenes have fallen from the culm-bases in the field—some mechanism ensures the released cleistogenes are brought to the site. An origin in

turves seems very much the most likely mechanism, but a more thorough understanding of the dispersal ecology of these structures is desirable.

Looking at the plant remains from the Deer Park Farms site as a whole, many of these probable turf indicators are amongst the more frequently recorded taxa (Table 11) but there are some which are more likely to represent turves cut from heathland or moorland soils (i.e. of a kind merging with peat turves rather than grass sods). In an attempt to define groups of taxa tending to occur together in the samples and provide a more objective basis for such an interpretation, a simple pairwise correlation analysis was performed on selected taxa (all those in Table 11 (a) and (b), plus a few others). The broader implications of the analysis will be discussed elsewhere, but for present purposes reference should be made to Figure 1, in which a group of very tightly correlated taxa is shown. The starting point for this was a group selected *a priori* on ecological grounds as being those most likely to represent grass turf. All strong correlations with other taxa (as defined in the caption to Figure 1) were then used to draw in further taxa. Many of the taxa in the diagram do not have any strong correlations outside the group and may be seen as the core 'turf group': *Ajuga*, *Danthonia* (in its various parts; it is not surprising that these are strongly correlated with each other!), *Leontodon*, *Linum catharticum*, and 'root/rootlet fragments', with *Cenoccum*, *Juncus* cf. *articulatus*, *Potentilla* cf. *erecta*, *Scirpus setaceus* and *Viola* sp(p). very strongly linked to it.

The other taxa, all with rather large numbers of external linkages, may sometimes have arrived with turves although other routes are likely. In one case, *Ranunculus* Section *Ranunculus*, the low level of identification conceals the fact that in some cases the remains concerned could be from weedy or cultivated land (e.g. achenes of *R. repens*) and not surprisingly the taxa to which it is most strongly linked beyond the group shown here include *Galeopsis*, *Polygonum* spp., *Rumex*, *Sonchus asper*, *Stellaria media* and *Urtica dioica*. Other strong linkages are to a large and diffuse group of taxa such as *Calluna*, *Pteridium* and a wide range of woodland/moorland mosses, which are perhaps best interpreted as representing 'litter' at the site—bedding, 'cavity wall fill' (some examples of which were investigated), and perhaps other constructional material such as roofing (the often rather broad context types for the samples included in this analysis, as defined by the excavators, are given in Table 12). Indeed, it may be that one use of the turves at this site was as roofing. Buchanan (1957), for example, discusses a tradition of the use of turves in roofs in N. E. Ireland which may well be a continuation of what we see at Deer Park Farms, although turves have also been used in recent centuries for walls in Ireland, as elsewhere (e.g. Evans 1969).

One unexpected result of this analysis was the number of strong negative correlations between many of the plant taxa (and certainly all the probable 'turf' taxa) and the records for basalt gravel. It had been assumed that layers with much gravel might also be ones where turves had decayed (paralleling the argument put forward by Dickson (1999, 114) for the presence of sand and gravel in certain deposits at The Biggings, Papa Stour, Shetland).

There is clearly more to be done with these data (e.g. by the use of multivariate analysis) to explore further the groups of taxa represented in the rath deposits and their occurrence in deposits of different kinds in relation to the structures recorded.

(vi) 16-22 Coppergate, York

Occupation deposits of 9th-11th C. AD date at a site in Coppergate in the heart of York have provided a huge volume of archaeobotanical data (Kenward and Hall 1995), but no clear examples of material formed from grass turves to parallel those described by Geraghty (1996) for the contemporaneous deposits in Viking Dublin. A few contexts seemed to contain material which might have originated in turves from heathland or moorland, however. One of these (**21436**), an external layer from Tenement D dated to Period 5B (*c.* AD 975 - early/mid 11th C.), was noted as containing material thought to be mor humus formed under '*Callunetum*' (heather-dominated vegetation of large tracts of heathland and moorland in the British Isles today), together with remains of some heathland mosses, grass culm-bases, and a distinctive group of heathland/moorland beetles *(op. cit.*, 611). Context **20342** (a 'backfill' deposit of the same date from Tenement A) yielded most of the same mosses with quantities of heather and some of the same beetles as **21463**, along with *Leucobryum glaucum* (*op. cit*, 589 and 724), a cushion-forming moss (and thus unusual amongst the assemblages of moss from urban occupation sites, where weft-forming pleurocarpous or 'hypnoid' forms predominate). Many other contexts yielded remains of *Danthonia* caryopses, with a few, especially from a group of fills from three pits from the latest Anglo-Scandinavian phase (5C, mid-later 11th C.) towards the rear of the site, producing cleistogenes and perhaps indicating imported grass turves.

The huge dataset for the plant remains from this site (over 19,000 records of identifiable plant remains from a little over 400 contexts) is not readily amenable to exploration other than through subsets. Turning first to the group of taxa recorded at Deer Park Farms which formed the core 'turf group' (see above), a number of these were quite frequently recorded at Coppergate, too (Table 13), though even the most abundant of them was present in less than 15% of all the contexts examined. Pairwise correlations of the records for this group gave only two significant positive correlations: between *Danthonia* caryopses and cleistogenes (not unexpectedly) and between *Montia* and *Scirpus setaceus* (both at the $P < 0.05$ level). All other significant correlations were negative ones (between *Potentilla* cf. *erecta* and *Leontodon*, at $P < 0.001$, and between *Scirpus setaceus* and *Danthonia*, and *S. setaceus* and *Leontodon*, all at $P < 0.01$). There is thus no similar grouping of potential turf taxa in the way observed for the Deer Park Farms material.

Considering briefly the *Danthonia* remains from the Period 5C pit fills mentioned above, there were records here for caryopses from five contexts, with cleistogenes present in three cases. Other taxa recorded from the same fills, including those which might indicate the presence of turves, are shown in Table 14. Clearly there are many taxa which *might* have arrived in turves, although most are recorded in only one or two samples and in small amounts.

The third group of samples in which the remains of turves may be discernible are those with remains of heathland plants and, specifically, of two mosses which seem unlikely to have been collected except with turves: *Leucobryum glaucum* and *Polytrichum juniperinum*. Table 15 shows the more frequent taxa recorded from a group of seven samples in which remains of either moss were found, plus some other taxa in the samples which may represent imported turves (with some information about the contexts concerned in Table 16). Here, the bulk of the remains likely to have lived on heathland are mosses, but a number of the vascular plants

recorded are either consistent with an origin in heathland dominated by ericaceous shrubs, or may represent grass-dominated turf either on heathland or some other kind of grassland. It is the '?mor humus' which remains perhaps the most convincing evidence for decayed turves in at least one context (**21463**), though the possibility that it arrived on the roots of dwarf shrubs which had been uprooted cannot be overlooked (cf. the evidence from the contemporaneous deposits at the nearby 6-8 Pavement (Lloyds Bank) site cited in the Appendix). It is noteworthy that one context (**20342**), a layer rich in heathland plants (and with *L. glaucum*), lay immediately beneath an accumulation of willow brushwood and might therefore represent either turves or a heather brushwood under-layer from a former roof (Kenward and Hall 1995, 723-4).

Taken overall, then, the evidence for turves in deposits of Anglo-Scandinavian date at 16-22 Coppergate is rather unsatisfactory. It may be that turves did not form a significant component of the structures at this site—one might expect them to have featured more significantly in the construction of the post-and-wattle structures of Period 4B (*c.* AD 930/5-*c.* 975) than the later oak plank buildings of Period 5B (*c.*975-early/mid 11th C.)—or that, if used in roofing, for example, they were removed when roofs were replaced. In this regard it may be significant that evidence at Coppergate for roofing of any kind was generally very inconclusive, with no deposits being recorded which contained or represented fallen roofing, except perhaps for the layers of willow brushwood in backfills of Tenements A and B in Period 5B, of which one has just been mentioned.

(vii) Layerthorpe Bridge, York

Excavations of Anglo-Scandinavian and later medieval deposits took place during the realignment of Layerthorpe Bridge, on the western bank of the River Foss, just outside the City Walls on the north-eastern side of York in 1996-7. They yielded occupation deposits with good waterlogged preservation (Hall *et al.* 2000), though the restricted nature of the excavation meant that the relationship of the earlier deposits to any structures or features (other than some wattle revetments and a clay bank) could not be clearly established, and dating was often difficult given a general paucity of datable artefacts. Many deposits were rich in small (0.5-2 mm) structures thought to be sclereids (clusters of lignified cells) from decayed tree bark, and these, together with unusually high concentrations of the beetle *Trox scaber*, led to the suggestion that bark residues resulting from tanning accumulated here (*ibid.* and Hall and Kenward, in press). After the Anglo-Scandinavian period, most of the deposits were silts and sands which seemed to have formed in the river Foss.

Some of the earlier deposits gave assemblages of uncharred plant remains in which evidence for heathland turves was thought to be present, whilst more generally there was charred plant material which might represent turves which had been burnt. One of the earliest Anglo-Scandinavian deposits, Context **2178** (the organic fill of a timber-lined ?sluice/overflow), was described in the laboratory as a humic, sandy silt, with fine herbaceous detritus locally. Subsamples from it yielded a characteristic group of mosses with moderate abundance scores ('2' on a four-point scale): *Aulacomnium palustre*, *Dicranum scoparium*, *Hypnum* cf. *cupressiforme*, *Leucobryum glaucum*, and *Pleurozium schreberi*, which, taken together, suggest an origin in peatland, perhaps via imported turves (in the sense of surface material rather than peat from a deeper level, though the latter possibility is not out of the question). There was also a variety of remains of heather, traces of unidentified charred root/rhizome

fragments, traces of charred moss (in the subsample examined during the assessment stage) and also some fragments of what may have been mor humus, all consistent with an origin in turves. Other mosses, such as *Antitrichia curtipendula*, were more typical of tree bark and may well have arrived attached to the bark which was so abundant in the deposit. A possible roof or litter component may be represented by charred and uncharred saw-sedge (*Cladium mariscus*) leaf fragments, and some very well preserved cereal chaff and spikelets, and charred and uncharred grass/cereal culm (stem) fragments; it may be no coincidence that these occurred with the ?turf component—perhaps they together represent partly burnt roofing material?

A further deposit, Context **2022** (a silt laid down within a small channel) was dated to the latest stages of the Anglo-Scandinavian period. As observed in the laboratory, it consisted of 'grey-brown silty sand with patches of 'crisp', fine-grained, black (charred?) plant material, rather like turves'. In view of this, a small subsample of 0.5 kg was soaked and more gently disaggregated than was usual for this group of samples. Sieving produced a residue consisting of sand and some lumps of what appear to be charred (plus a little uncharred) sandy *Callunetum* mor humus, with many loose charred fragments of root/basal twig of ?heather, and also some uncharred roots which might be supposed to have come from unburnt parts of turves, although they might also represent growth of roots from above into the layer after it formed. There seemed little doubt that this deposit contained a considerable quantity of material from partly-burnt turves, presumably dumped into the channel.

The records for these two contexts, and some others from the site noted by Hall *et al.* (2000) as perhaps containing evidence for burnt turves, are compounded in Table 17 (with context information in Table 18). Clearly a wide variety of other remains found their way into the deposits (there are many taxa which have been excluded from the Table 17(b)) but remains which may have originated in turves are consistently present.

(viii) Low Fisher Gate, Doncaster, S. Yorkshire

Excavations took place in 1993-4 at a site a little to the north of the town centre of Doncaster, as part of the North Bridge road improvement scheme. In the absence of a published report to which to refer, the author is grateful to the excavator, Jane McComish (York Archaeological Trust), for an archaeological summary, from which the following description is a condensation.

> A circular area bounded by a cofferdam 37m in diameter was examined, the uppermost 1.5m of deposits, which consisted of Victorian rubble, being cleared by machine before excavation. A further 1.5-2.0m of deposits were excavated by hand, yielding a well-stratified sequence ranging in date from the 11th to the 18th centuries. The earliest deposits, which contained some 11th century pottery, but which could not be excavated fully, were sealed by a 1.0 m-thick deposit of silty clay, interpreted as a flood deposit, the upper surface of which was cut by a small number of early 12th century pits. During the first half of the 12th century the site seems to have been largely open ground. From the mid 12th century onwards there is evidence that the site was more intensively used, primarily for iron working (a number of external working areas, hearths, dumps of ash, charcoal and slag, and rubbish pits were located), but there does not appear to have been any formal division of the area into distinct properties. It is possible that there was one building on the site, but this was so severely truncated by later features that little could be said of its structure. Some time in the first half of the 13th century there was a distinct change of layout across the site: three tenements were defined, with timber buildings

fronting onto Low Fisher Gate, and yards to the rear which continued to the banks of the River Cheswold, located in the northern portion of the site. This pattern of land-use remained until the late 15th century although the tenement boundaries varied through time. There is some evidence that the site was flooded in the late 14th/early 15th century, but that the land use remained largely unaltered as a result of this inundation.

Between the early 13th and late 15th centuries, sixteen timber buildings were constructed in the various tenements on the site. These were generally rectangular in shape with the long axis at right angles to the street frontage. During the first half of the 13th century the buildings were timber-framed, with the verticals set into post holes, or on post pads, or set into horizontal sleeper beams, some of which rested upon low clay banks. From the mid 13th century onwards the dominant method of construction was to place the timber framing on low stone walls designed to carry either horizontal sleeper beams or vertical posts. Evidence for the use of both ceramic roof tiles and (on the basis of some archaeobotanical evidence) probably also thatch was found on site. There was also evidence for heathland turves, which could have been used either for roofing or as fuel. It was often impossible to determine which type of roofing material was used for a building, but at least four seem to have been roofed with turves. The tenements seem to have remained primarily industrial in function. Throughout the early 13th century there was extensive dumping of industrial rake-out from metalworking. The quantity of dumped slag/ash and charcoal decreased from the mid 13th century onwards, but was still significant.

The evidence for thatch and turves referred to in this summary is presented in Table 19, which gives the numbers of records of charred plant remains which may have originated in these kinds of materials. For the most part, deposits other than some fills of the post-medieval Cut **1519** contained only very sparse plant remains, almost always charred, but some types were consistently present. The evidence from remains of *Calluna* for turves is not, on its own, very convincing: all of the relevant plant remains might have arrived with material pulled or cut wholesale for roofing, fuel, or for some other purpose. However, the records for charred herbaceous root/rhizome (probably sedge and/or grass material) and the tentatively identified charred *Juncus squarrosus* seeds suggest that turves from heathland may have been burnt. Whether these were originally brought for roofing and were burnt subsequently either by accident or deliberately, or whether they served as fuel from the first cannot be established. The charred remains of *Cladium* and of grass/cereal remains from the same group of deposits do not help to resolve this question; these plants, too, may equally have served as fuel or have been used in roofing and become burnt later. On the other hand, the records of some taxa much more likely to have originated in a mire (or in acid peat) suggest that peat *sensu stricto* was probably being brought to the site at times as a fuel. The sometimes abundant uncharred remains of *Cladium* and *Ulex* in contexts within the large cut, **1519**, listed under Period 17 in Table 19, seem most likely to represent thatch dumped into the cut; with them were remains of plants from heathland but more particularly some beetles which are very suggestive of imported turves from such a habitat (Kenward *et al.* in prep.).

(ix) Other sites with (predominantly) charred preservation

Small quantities of charred plant material, typically including ?heather root/basal twig fragments and unidentified (probably monocotyledonous) root/rhizome fragments, or uncharred material including a number of the taxa discussed above, such as *Danthonia* or *Potentilla* cf. *erecta*, have been recorded by the author from a wide variety of sites examined over a period of nearly 25 years, mainly from deposits of Roman and later date, and mainly

from urban contexts. Many of the analyses have been of small-scale evaluations undertaken as part of the local government planning and development control processes. In two cases, however, rather larger corpora of samples with remains preserved only by charring have been studied (as part of projects funded by English Heritage), and these will be considered first.

(a) Carr Naze, Filey, N. Yorkshire
Occupation deposits associated with the remains of a 4th C. AD signal station on Filey Brigg, North Yorkshire, were investigated following excavations in 1993-4 by York Archaeological Trust, under the direction of Dr P. J. Ottaway. Dobney *et al.* (2001) describe the results of analyses of plant and animal remains from the site. Plant remains were sparse but, as Table 20 shows, the more abundant of them included ?heather root/twig fragments, charred sedge nutlets and root/rhizome fragments. There were very small numbers of charred cereal grains and some chaff which might as easily have originated in burnt straw as from grain processing waste.

(b) Flixborough, N. Lincolnshire
Excavations in 1989 in an extensive area of wind-blown sand banked against a low ridge of Jurassic rocks to the east of the River Trent, close to its confluence with the Humber, near the village of Flixborough, established a sequence of largely mid-late Anglian (7th -11th C.) occupation with abundant and well-preserved assemblages of artefacts and vertebrate remains.

Plant remains were generally very sparse and probably only those preserved by charring were contemporaneous with the occupation of the site. A large number of samples was examined, however, to establish the scale of preservation across a very wide range of combinations of context type and archaeological phase. In those cases where charred plant material other than charcoal was present, there seemed to be indications of the importation of turves, most probably from an area of salt-marsh—as stated by Hall (2000, 7), 'the plant material which was burnt ... is clearly of an unusual kind, with such low concentrations of cereals, an absence of chaff, and a dearth of crop weeds, but a characteristic suite of remains, including charred herbaceous stems (perhaps from grasses and rushes), rush seed capsules, and some saltmarsh plants, of which the most frequent was sea plantain [*Plantago maritima*]'. The plant taxa recorded are listed in Table 21.

A number of explanations for the presence of these remains seem plausible (in no particular order):

(i) they arrived in cut vegetation for roofs or floors, or as hay, or bedding, or as packing for goods or live shellfish;

(ii) they arrived as plant remains brought with turves, or incidentally with or deliberately mixed in what was primarily mineral sediment intended, for example, to make daub;

(iii) they were plant remains within vertebrate guts or in herbivore dung (the dung being collected deliberately for burning or some other purpose, or deposited by livestock at the site);

(iv) they represent plants growing on the site, remains of which were burnt incidentally underneath fires.

These are all considered in more detail by Hall (2000) but no clear conclusion can currently be drawn. The presence in several contexts containing charred salt marsh plant remains of (sometimes burnt) shells of probable salt-marsh snails in the genus *Hydrobia*, especially *H. ulvae* (Pennant) in four of them, identified by John Carrott (2000), greatly reinforces the argument that material was brought from a salt-marsh habitat, but does not help to distinguish the precise way in which the resource was used (and, indeed, more than one kind of route may well have operated!).

(c) Other sites with charred preservation

Table 22 presents some results from an analysis of data for charred remains from a very large number of sites of diverse kinds (though mainly of Roman and later date from urban contexts) examined by the author over a period of 24 years and in which certain remains thought likely to indicate the presence of turves were recorded (see caption to table for list of taxa). As the table shows, these remains are frequently encountered, though usually in small amounts and perhaps representing a 'background rain' on most sites. There is, as might be expected, no particular pattern to the kinds of contexts or sites in which the remains occur other than that these are mainly rural sites (compare data considered in next section)—if they *are* from turves, the routes by which they might pass from the original turf to the archaeological record are many (e.g. turf used in roofing or walling or internal structures and subsequently burnt deliberately or accidentally, or turves used as fuel, the remains becoming incorporated into deposits either through chance or through the deliberate discarding of ash, construction materials or post-conflagration debris).

(x) Diverse sites with mainly 'waterlogged' preservation

Following the same procedures used to compile Table 22, Tables 23 and 24 offer a list of sites and contexts where uncharred plant material was preserved which may have originated in turves. Here the bulk of the 'richer' contexts are urban but there is again no particular pattern with respect to the distribution of remains by context type, although two 'turf' contexts discussed above from the Wellington Row site 'scrape into' the list in Table 24, where contexts with four taxa (but excluding any records for *Leontodon* and *Hypochoeris*, both of which may well arrive typically with hay or stable manure) are listed.

Some theoretical considerations: ethnographic evidence, taphonomy, soil seed banks and vegetative remains

In discussing the recognition of turves (or perhaps more particularly remains from them) in archaeological occupation deposits, it is useful to make some observations concerning the uses to which turves are known to have been used (from ethnographic sources), and the ways in which the remains may have (a) arrived at a site and (b) become incorporated into the deposits in question.

Ethnographic studies: the ways in which turves have been used

Our knowledge of the use of turves from the ethnographic literature clearly extends back only a relatively short time into the past and there are always dangers of extrapolating backwards from the later historical period. The following may be cited as examples, however (note that I

have very deliberately avoided the question of the use of turves in construction work where a finished sward is the final aim):

A. Dwellings and other major structures
(i) Roofing: the use of turves as an 'underthatch' beneath a wide variety of other materials (and sometimes at the surface around the base of another material on the wall head, or on the ridge) is attested by many writers, primarily for the northern and western parts of the British Isles (see, for example, the list of relevant references drawn together by Letts (1999, 3) and some 'archaeological' examples from surviving roofs investigated by Holden (1998). The present author examined material of this kind from the roof of a barn at Durdar, near Cumbria in the early 1980s (unpublished data). The Scandinavian tradition of using living turf roofs may well have been adopted in areas of the British Isles in which there was a Viking influence but most roofs with living plants are simply ones where thatch has decayed sufficiently to provide a roothold for invading species. (Innocent (1916, 215) discusses aspects of the origins and antiquity of the Scandinavian tradition; for discussions of the plant life of turf roofs of this kind, see, for example, Melheim (1953) and Jóhansen (1985, and via Dickson's account of plant remains from The Biggings in the Appendix to this report)).

(ii) Walls: Again, primarily seen in small vernacular buildings in the northern and western parts of the British Isles, sods have been used as wall construction material on their own (Evans 1957; 1969; 1974; Fenton and Walker 1981, 73-4) or with stone. In some cases, turves were simply used as bedding for stone to build walls (e.g. Ó Danachair 1957), or to fill gaps between unmortared stones, but Evans (1974, 60) is at pains to stress that 'the use of sods in association with other building materials may also be explained as a survival rather than a makeshift', and notes that in some parts of Scotland a characteristic alternation of stone and turf courses is observed, a tradition which Fenton (1968) suggests may be traced back at least as far as the Viking period (see also comments regarding the archaeology of structures at Birsay, Orkney, and Jarlshof, Shetland, in the Appendix), and which survived until relatively recently in other areas within the Viking sphere of influence, such as Iceland. Noble (1984) explains how the former use of turves to build walls has been explored experimentally at the Highland Folk Museum in Scotland.

Examples from the Fenland of East Anglia are provided by Porter (1969, 163), who alludes to the sod houses of the turf—i.e. peat—cutters and Hurry (1930, 21ff., pl V), who describes and illustrates the post-medieval 'roller house' for a woad mill at Parson Drove near Wisbech, Cambridgeshire, for which turf blocks 1 ft. (30 cm) deep were laid in a herringbone fashion to a height of 4 ft. (1.2 m) (though it is possible that these turves were peat, rather than sods, especially in view of their thickness). Woad mills were essentially short-lived structures since the cropping of woad soon exhausted the land and woad-men (at least for the period for which accounts survive) led a semi-nomadic life. Innocent (1916, 8-12) mentions two other kinds of countrymen whose peripatetic lifestyle (in this case within woodland) involved the erection of sod-built structures for short-term use: charcoal burners and bark-peelers, and illustrates examples from his own observations, made in South Yorkshire and Furness, Lancashire (*ibid.*, figs. 1-3). A more detailed account of charcoal burners' huts in which turf was often a construction material is given by Walton (1958-9), with examples from several parts of England, including those considered by Innocent, as well as Essex, Sussex and the Forest of Dean (Gloucestershire). Of particular relevance to an archaeological context, he rehearses at

some length Hazzeldine Warren's (1910) observations of charcoal burners' huts in Epping Forest. Hazzeldine Warren 'photographed a charcoal burner's hut after it had fallen into disuse, and he drew attention to the fact that the turf covering had slid down to form a circular ring—in fact, a hut-circle. If such a hut-circle were to be excavated it would reveal in cross-section outer trenches from which the turf had been removed to roof the hut, a raised ring of turf and a central depression'. According to Hazzeldine Warren (1910, 71), these observations were relevant to 'those smaller basin-shaped depressions about ten or twelve feet in diameter which occur, usually in groups, in different parts of the country. In many cases these groups have been found to be the sites of prehistoric villages, and the circular depressions themselves, with their encircling mounds, to be the sites of huts'.

It may be useful here to allude to some of the experimental work at Butser Farm, Hampshire, described by Reynolds (1979, 42-4) in which 'a purely hypothetical structure' of turf walls supporting a ~6 m diameter roof of rafters and woven hazel rods, itself covering in turves, was made. It had a central supporting post with the express intention of proving that a dwelling might be constructed the archaeological evidence for which was a single post-hole. In this case the roof was made with two layers of sods, the first green-side-down, the second with the grass uppermost, and a fire was to be maintained within the building 'to provide sufficient temperature in the roof space to encourage grass growth and therefore rooting of the upper layer'... so that 'the roots thus hold the roof together' (although in the event a fire could not be maintained permanently and the house was allowed to deteriorate quickly, permitting a study of its collapse and decay.

Sods have also been used against the inside or outside of buildings primarily constructed of another material to provide insulation and wind-proofing. Beyond the British Isles, the use of sods in building is well known in many native cultures in areas where suitable materials can be obtained (discussed briefly by Evans 1969, 80). Indeed, the tradition was taken from N W Europe to the New World in the form of 'soddies' (sod houses), sometimes of considerable size (even of two storeys) constructed in the plains of the mid-West of the United States of America (typically in Nebraska) by settlers in the mid-late 19th C., in an area where timber was scarce and grassland formed the major vegetation type (see, for example, the accounts by Wriston (n.d.) and Barnes 1970).

The longevity of buildings of sod obviously varies with the nature of the raw materials and how well a structure was built, as well as prevailing weather conditions. Earth structures, generally, are more long-lived than might be supposed provided they are given good footings, typically a basal course of stone, and a suitable covering by overhanging thatch (to prevent upward and downward movement of water, respectively) and a lifespan in the order of some decades does not seem to be unusual, perhaps up to about 150 years. Bruce Walker (pers. comm.) notes that a two-storey sod house in Nebraska stood from about 1885 to 1972, when the owner, unable to obtain a grant for restoration, bulldozed it from the site.

(iii) Other structures: Field walls (dykes), stock pens and kailyards built wholly or partly of turves are well-known from the Northern Isles (Fenton 1978, chs 10 and 11). An example of the late use of turf in one type of such structure in quite a different context is the recently reconstructed Leanach Dykes on the 18th C. battlefield at Culloden, NE Scotland (Bruce

Walker, pers. comm., and unpublished web pages of National Trust for Scotland). These turf and stone structures are regarded as having played a vital role in the battle.

Turf-built small-scale ephemeral structures for livestock management are not confined to the far north of Scotland, however. Adams (1976, 163), in connection with the term *tathing* (which conveyed the idea of 'the dung, the urine, the trampling, and perhaps the perspiration, and the warmth communicated to the soil by the practice of folding' in the context of sheep-corn husbandry in Norfolk in the 16th and 17th C.), notes that 'the sheep were folded in closes made of sods and kept in one place for eight to ten days before being moved on, usually in the outfield'. Beyond the British Isles, but in an essentially similar topographic and edaphic setting to much of lowland England, Lerche (1970) describes the former use of sods and turves for stock-proof fences in Denmark.

Within buildings, in areas with a turf-building tradition, benches or beds constructed of turf are recorded in the ethnographic literature (Fenton 1978, 191), and seen archaeologically at Fishamble Street, Dublin (Geraghty 1996) and Macewen's Castle, Argyll (Marshall 1983).

B. Clamps and kilns

As well as being used for charcoal-burners' huts (see above), turves have also been recorded as being used for their clamps (e.g. Howkins 1994, 7-8). Henslow (1905, 159) notes that turves were used in clamps for extraction of tar, pitch and turpentine from pine branches in a way analogous to charcoal production and it is likely that turves were generally used for clamps, both heated and unheated, whatever the contents (bricks, pots, lime, root vegetables).

C. Artefacts

Vickery (1995, 235) describes the use of sods from *Nardus stricta*-dominated grassland as doormats in N.W. Yorkshire in the late 19th C.

D. Fuel

The value of cut turves for domestic fuel obviously depends on the organic content and it may be supposed that, at one extreme, peat blocks with little or no mineral content provide the most economical source of heat for unit weight. Sods cut from heathland and moorland represent a less valuable resource, with sods from pasture with no well-developed mor humus layer presumably offering a very small return, if any, for the effort of cutting them. For lowland Britain, at least, away from areas of peatland, it is presumably heathland which was mainly exploited for the cutting of turves for fuel. In the Northern Isles Fenton (1978, 207, 212) records that turf and peats were used together when peat was scarce and this also increased the quantity of ashes for manure.

Hartley and Ingilby (1990, 73) note that in the North York Moors turf was more easily procured than peat, dried more quickly, did not shrink, and (because of the sand in it, they claim) burnt both brighter and hotter. They describe (p. 76ff.) the process of turf cutting, which began with the burning of a *switchen*, *swizzen* or *swidden* in March before the grouse nested, often under the supervision of a gamekeeper (pl. 154). It was usually undertaken the year before cutting, or a swizzen burnt about ten years earlier might be chosen because a two or three years' growth of ling was liked. Burnt to keep the moor in condition, a swizzen might cover ten to forty acres. Areas were marked and claimed by an initial carved out of the sod in

two or three places, the burnt moor looking eventually 'like a quilt that had been worked'. An additional product of the moors resulting from this practice were the burnt heather stems—ling *cowls* or *gowldans* or *gooldens*—which were pulled for a supply of kindling for the year (*op. cit.*, pls 155-6).The implications of this *swidden* technique are discussed further below.

One further, but rather incidental way in which turf has been used as domestic fuel is described by Fenton (1978, 208): in the Orkneys, cow-dung was in the past 'sometimes mixed with turfy earth to form a kind of peat'. Turves also served to cover fires to prevent them from going out (as 'back peats', *ibid.*, 207), and here a sod with a largely mineral composition was presumably more useful than a block of peat.

The use of turves as fuel in a funerary context should also be mentioned, though it does not feature amongst the usual ethnographic sources and is obviously a tradition related to specific periods when cremation rather than inhumation was practised. See the Appendix for some examples from the archaeological literature (Bronze Age Linga Fiold and perhaps Sheeplays Barrows) and the discussion below of archaeological records from Rollright Stones and Barrow Hills.

E. Manure

Within the British Isles, the traditional use of turves for manure is primarily known from the far northern and western areas where turves, as we have seen, are so much a part of the local economy. There are two routes for turves as manure: turves may be cut deliberately to make a litter layer for livestock kept inside longhouses or byres during winter months (and carted into the fields in spring when the animals are in the pastures), or they may be used as manure (in this case enriched with nitrogen-rich soot) when stripped from roofs during rethatching (Uhlig 1961). An extreme form are the 'soot houses' of Achill Island in Western Ireland described by Evans (1957, 119-21) in which small, often turf-built and -roofed huts were allowed to accumulate soot throughout their structure from smoky fires maintained for many months. Fenton (1978, 281) also mentions the use of ashes from the hearth to absorb liquids in the byre, another (indirect) route by which material from turves would contribute to manuring.

The use of sods from within animal housing is a form of the so-called 'plaggen' cultivation (German *Plaggenwirtschaft*), in which soils are intensively manured with imported (largely organic) material. Plaggen has been discussed in the context of post-medieval highland Scotland by Dodgshon (1988) and for Ireland by Conry (1971), and ancient plaggen soils have been investigated via lipid biomarkers in soils from Orkney (Bull *et al.* 1999) and by the same workers in Shetland, and through studies of pollen, cf. Groenman-van Waateringe 1992). The use of turf-based plaggen is not apparently part of the rural economy of other parts of the British Isles. Presumably even in areas where soils were poor and heathland abundant (the two are likely to be the same!), there was no tradition of keeping livestock indoors in the winter since they could be fed through most of, if not all, the year outdoors where pasturage was more reliable or where there were supplies of hay that were lacking at more northerly or easterly latitudes. Moreover, the geology of lowland Britain is such that it was probably usual to import materials such as marl and chalk to improve poor heathland soils (cf. Limbrey 1975, 336-7). By contrast, on the extensive areas of morainic sands of northern Germany and parts of the Netherlands and Belgium, *Plaggenwirtschaft* involving the harvesting of huge areas of heathland sod became an important agricultural technique at least from about AD 1000,

probably in connection with the introduction of rye, *Secale cereale* (Behre 2000). It accounted for the expansion of huge expanses of heathland (*ibid.*). The use of sods in this way may extend as far back as the Bronze Age if a fossil soil horizon under a Middle Bronze Age barrow at Rantum on the German island of Sylt has been correctly interpreted as *plaggen* (Blume *et al.* 1987, cited by Bakels 1997, 443).

Bearing in mind the use of turves for fuel (as described above), ash from a turf-based fire used subsequently as manure is a further, if indirect, way in which turves would contribute under this heading.

Taphonomy

From an archaeobotanical point of view, the nature of the raw material and the routes by which potential fossil remains originating in turves arrive at a site and are preserved in archaeological (or other) deposits are critical to what might be recovered from sediment samples. (Note that I am using 'fossil' here to cover all kinds of remains; the use of 'subfossil' for remains which are not 'fossilised' in the sense understood by pre-Quaternary palaeobotanists seems to me to be a nice distinction and an unnecessary complication.) We can consider the following sequence, argued from a theoretical rather than empirical position:

Plant remains in turves 'in life'

Potential fossils are present in turves essentially as three components:

(a) as above-ground parts of the whole living plants forming the sod (propagules here being largely attached to the parent plants, i.e. 'serotinous');

(b) as fallen debris (including propagules); and

(c) as below-ground vegetative material of the living plants in (a) (essentially roots and rhizomes and storage organs such as tubers and bulbs), together with material incorporated into the soil forming under the plants (probably mostly propagules, once fermentation and soil-fauna activity have reduced vegetative material to a form which would no longer be readily identifiable archaeobotanically; this latter category is discussed further with respect to soil seed-banks, below).

All three components are likely to be conveyed with turves to an occupation site, though continuing decay of the vegetative parts, in particular, will presumably take place unless the turves are quickly sealed in an anoxic environment. For turves used as a 'living roof', existing potential fossils must be lost whilst new ones are added from the living plants.

Obviously the species composition of the sods will determine what taxa may be recruited to the fossil record, but to some extent the physiognomy of the vegetation and the way in which the turves were procured will also have an influence. As Ó Danachair (1957) observes for the Irish tradition, 'first any long grass or heather was cut off, then the sods were dug', but for a close-cropped turf no such trimming might be needed. It might be assumed that, at this stage, most of the potential fossils will be uncharred, but a consideration of *swidden* (burning prior to paring) on the North York Moors (Hartley and Ingilby 1990), and probably in other

heather-dominated moorland areas, suggests that already-charred (and thus decay resistant) plant remains could be introduced to a site, regardless of their later fate.

Turves in use

The suite of fossils which might be formed during the life of the turves in a settlement must also depend very much on the purpose for which the turves were cut. Within buildings, some plant remains must be eroded from turves in walls, or perhaps more so from roof underlays (where these are exposed between rafters and purlins), but the quantities of potential fossils from these sources is probably small and most will probably be deposited in the short-term in floors where conditions for survival may be limited. The collapse of turf-built structures, during or after their life, however, offers an opportunity for the wholesale incorporation of desiccated remains into deposits formed, either *in situ* or at some point where collapsed structural material is subsequently discarded. In the case of roof turves, remains might also be preserved by smoke-blackening (cf. Letts 1999); Bruce Walker (pers. comm.) notes that it was traditional in the construction of the 'black-houses' of the north-west of Scotland for the bottom layer of heather turf in roofs to be 'cooked' by exposure to heat so that 'certain oils' were released which helped to improve watertightness.

The destruction of a dwelling by fire might provide a source for charred remains, especially if (as seems likely) the survival of remains enclosed within mineral sediment is favoured, such remains being charring but not consumed by the fire (in the way that charring is sometimes effected in the laboratory in the pursuit of reference material). The nature of the enclosing sediment may be important here—remains within a sandy matrix might be expected to be more easily released subsequently into accumulating deposits than those within a clay.

In the case of turves used deliberately in a context with fire (either as fuel, or for the construction of kilns and clamps) the prospect for survival of charred plant remains seems relatively good. Those parts of the turves which were not directly exposed to flame should surely provide a sufficiently oxygen-free environment for conversion to carbon without combustion. Once charred, many fossils should have survived subsequent redeposition where, for example, ash from hearths or kilns was discarded into pits or ditches or spread widely by wind into any accumulating deposits. We might expect these processes involving fire to be the ones through which underground vegetative material became charred and thus preserved.

The chances for survival of remains from turves used for manure (other than perhaps as fire ash) are small; decay is strong and dispersal through the soil a prerequisite in manure applied to fields that is not in some way buried quickly and sealed, so we are unlikely to detect turves of this kind through plant macrofossil remains. Sealed deposits within buildings, however, may provide a recognisable signature, especially where turf taxa are intimately mixed with remains of plants likely to have been fed to livestock.

Soil seed banks

In contemplating the theoretical taphonomy of plant remains in turves, the question of the soil seed bank is one which needs to be addressed, since—at least so far as seeds and fruits are concerned—it is likely that the 'sediment' component of a turf or sod will be the part which contains the majority of the potential fossils (though this is something which should perhaps be tested). In fact there is a wider issue here of the importation of propagules to occupation

sites with soil seed banks in earth used for construction, since a variety of techniques exists in which earth has been used for building (cf. Hurd and Gourlay 2000), of which building with turf is perhaps the most extreme form in terms of the organic content of the raw material.

The quantities of 'seeds' in the data for seed banks collated by Thompson *et al.* (1997) show immense variation from study to study, although—since most were concerned with viable seeds estimated through germination experiments—they will be under-estimates for the concentrations of seeds which are *potential* fossils: already dead but undecayed seeds will not germinate but *may* become fossils. (This is the distinction, as 'seed flora' and 'seed bank', adopted by Carruthers and Straker (1996), following other workers, in their analysis of seeds from an experimental earthwork in Dorset, *q.v.*). Studies of seed banks also take no account of vegetative remains as potential fossils.

What studies of seed banks in living soils show is that the nature and composition of the seed bank under any particular type of vegetation varies in the extent to which it mirrors that vegetation. As might be expected, soils supporting annual weeds have seed banks with an abundance of seeds of such plants—and sometimes seeds of taxa characteristic of former periods of cultivation, as shown by the effects of deep-ploughing (or bombing!) in bringing to the surface a buried seed bank of viable *Papaver* (or other) seeds. These are perhaps the soils least likely to contribute directly to accumulating archaeological deposits, of course.

Seed banks under grassland, including pasture are usually rather small and Thompson (1992, 231) notes that the seeds of most of the species which are frequent in this kind of vegetation (in studies in N. America and Europe, at least) appear either to be absent from the seed bank or, if present, then only near the surface and in relatively small numbers. Where large seed banks do occur beneath grassland they are normally relics of previous arable cultivation.

By contrast, Thompson points out, the soil beneath European heathlands usually contains large, persistent seed banks of the dominant heathland species, especially *Calluna*. He reminds us that heaths are, of course, moderately frequently disturbed by fire, of both natural and human origin, and in Scotland recolonisation after fire has been shown to result from a mixture of vegetative regeneration and germination from the seed bank. In well-managed heathland, work cited by Thompson suggests, the seed bank is of secondary importance, but if *Calluna* plants are over 15 years old they do not regenerate vegetatively after fire. Such seed banks may persist for many years (which is fortunate where conservation involves restoration). Thus in a study in Belgium Stieperaere and Timmerman (1983) found viable *Calluna*, *Erica tetralix*, *Potentilla erecta* and *Luzula multiflora* seeds beneath heavily fertilised grassland reclaimed from heath 20 years previously, whilst in the Netherlands it has been shown that heath invaded by grasses can be restored by sod cutting, which removes the shallow grass seed bank but leaves the more deeply buried *Calluna* and *Erica* seeds.

It is studies such as these from which it is clear that the seeds arriving with imported turves as a source of potential plant macrofossil *propagules* in archaeological deposits (especially where the turves are thick blocks rather than thin sheets) may be a mixture which does not represent a single type of vegetation (i.e. that which the sod carried at its surface), though vegetative parts may be more reliable in this respect. Where seed banks are not heterogeneous in this way, we may perhaps expect sods from grassland (other than grass heath) to be much

less easily detectable than sods from heathland, at least so far as uncharred material is concerned. Where charring has occurred, underground (or even aerial) vegetative parts may survive which, though difficult to identify, point to the use (or at least burning!) of turves where 'seeds' are sparse.

Vegetative remains from turves

As suggested above, turves, particularly perhaps where material has been charred, seem likely to be a major potential source for certain kinds of macrofossils of vegetative plant parts in archaeological deposits. It is difficult to see how else the basal parts of plants such as grasses and sedges should become incorporated into occupation deposits unless the plants were growing *in situ* (and became overwhelmed by sediment), or fell bodily into an accumulating deposit from, for example, the eroding banks of a ditch. The lighting of a bonfire on a patch of grassland or the firing of a heath would presumably result in the formation of charred plant remains, such as the basal twig/root fragments of ?heather recorded in so many archaeological deposits by the present author (cf. Tables 22-4) but a mechanism is then required to redeposit these into the fills of pits and ditches.

A possible reinterpretation of some published plant macrofossil records

In the light of the various considerations discussed above (but also bearing in mind the danger of 'seeing turves everywhere'!) there may be some value in re-examining some published data. Here, I am concerned only with charred plant remains since these form the bulk of the archaeobotanical remains from British and Irish sites, at least in terms of numbers of sites and samples examined, and they offer problems of interpretation which may be rather more difficult than for assemblage of well-preserved uncharred remains where other lines of evidence (typically insects, especially beetles) are often available.

The first group of remains, to continue the thread of the previous section, are the (mainly) below-ground vegetative remains which are increasingly being recognised (although only rather rarely identified more closely) from charred assemblages, perhaps partly because sampling and sieving are being applied more routinely and to a greater proportion of excavated contexts. In this category, I wish to consider first the tubers of lesser celandine (*Ranunculus ficaria*) recently described as being rather frequent in mesolithic occupation deposits at Staosnaig, Colonsay, W. Scotland, in association with very abundant charred hazel nutshell fragments. Mason and Hather (2000) and (to a lesser extent) Mithen *et al.* (2001) go to great lengths in citing ethnographic and other sources to show that these structures could have been eaten (indeed, that they are edible at all) and there is no doubt from their occurrence on so many sites (surveyed by Mason and Hather) that these are more than chance finds. However, very little consideration of explanations for their occurrence at Staosnaig other than that they served as food appears to have been offered by these authors. They are briefly dismissed by Mason and Hather as having been burnt *in situ*, whilst they assert (p. 421) 'if it is therefore assumed that charring of the *in situ* tubers took place elsewhere, in the soil surrounding fire-pits, for instance, and the material is redeposited from these features, it seems unlikely that so many could have been incorporated into the fill.' This takes no account of the density with which *R. ficaria* can grow in grassland and all the remains might perhaps be introduced with a few turves, along with some of the other charred remains recorded

(although not, admittedly, with the hazel nuts). If Mithen *et al.*'s (fig. 11, p. 231) experimental hazelnut roasting oven included turves within its construction (either deliberately or through incidental incorporation during this), it seems very likely that subterranean parts such as *R. ficaria* tubers might be preserved by charring in the resulting pit fills.

Mason and Hather draw attention to some other finds of charred tubers of lesser celandine from some later British sites (p. 423): from Bronze Age cremations at Irthlingborough and from underneath a Neolithic Long Mound (dated *c.* 3000 cal. BC) at West Cotton (both part of the prehistoric monument complex at Raunds, Northamptonshire studied by Gill Campbell) and from near a hearth in the broch at Howe of Howe on the Mainland of Orkney (analysed by Camilla Dickson), as well as from a Late Iron Age pyre pit at Baldock, Hertfordshire.

Of the other kinds of underground (or at any rate basal) vegetative structure identified more closely than, for example, 'rhizome indet.', perhaps the most familiar are the swollen tuber-like structures of onion couch (*Arrhenatherum elatius* ssp. *bulbosus*), whose occurrence in archaeological deposits has provided an archaeobotanical discussion point for many years. Godwin (1975, 404) describes material of this latter plant from a Bronze Age ditch fill at Rockley Down, Wiltshire, remarking that it was associated with barley grain but weed seeds were absent, and suggesting it was not collected for food. Elsewhere (p. 480) he contradicts himself in proposing that they might have served as food, but Robinson (1988) discusses Bronze Age material from Rollright Stones, Oxfordshire, in terms of possible fuel, uprooted for use in cremation pyres. Since the grass is tall growing and eschews grazed land this is perhaps unlikely to be a candidate for an origin in turves. By contrast, Moffett (1991), in her description of material of pignut (*Conopodium majus* (Gouan) Loret or *Bunium bulbocastanum* L.) at Barrow Hills, Radley, Oxfordshire, allows (p. 189) 'it is possible the grassland element in the assemblage is derived from turves although there was no visible archaeological evidence of charred turves'. Intriguingly, charred moss stems (identified as such by Mark Robinson) were reported from the same deposit (cf. the present author's records cited above), along with small-seeded legume seeds and graminaceous culm, together interpreted as tinder.

Turning now to other plant remains, the records in the Archaeobotanical Computer Database (ABCD, Tomlinson and Hall 1996), although in urgent need of updating, provide a starting point for a consideration of other sites and deposits for which evidence of turves may be present but has been overlooked. Tables 25-7 illustrate the point with reference to sites for which two or more of the following have been recovered as charred remains: *Carex* sp(p)., *Danthonia decumbens, Montia fontana* and sspp., and *Potentilla* (cf.) *erecta* (though others might have been chosen). Though of course the sedge remains may represent one or more of a wide variety of taxa representing diverse habitats, these records suggest that material from burnt turves (in this case) may actually be rather widespread through time and space. Tables 26 and 27 show what other taxa may be added to this core group as possible turf indicators. One serious shortcoming of this approach is, of course, that the data for more than one context are often compounded in the ABCD 'lists' (albeit usually for single archaeological phases or periods), and an obvious next step is to check records at the level of individual context or sample where the original published data permit (in the way that was possible for the present author's data discussed in the first part of this report).

One final comment on these data concerns the several late prehistoric sites with charred preservation from north-east England studied by van der Veen (1992) which appear in Table 25. Huntley and Hall (in prep.) discuss the non-crop plants at Thorpe Thewles, for example, which are of some interest since neither of the most abundant taxa in this category, *Danthonia decumbens* and *Montia fontana* ssp. *chondrosperma* (ranked at 1 and 4, respectively, amongst the taxa as a whole) seem likely to be cornfield weeds in a conventional sense—as we have seen, they are plants more likely to grow in pasture than on tilled soils. Van der Veen explains the presence of these and other 'grassland' plants mainly in terms of changing ecology (i.e. that they were previously more likely to be part of the plant community of an arable field where ploughing was less destructive and drainage less effective than in later periods), but also alludes to the possibility that this component of prehistoric plant assemblages might sometimes have originated in hay or animal dung. Whilst this alternative explanation may be true (and criteria for distinguishing remains from burnt turves and those from charred dung may be more difficult than for the uncharred equivalents), one source which she does not seem to have considered is turf. (Of course, it is not unlikely that the fossil material represents a mixture of remains from the same sources (short turf, pasture or weedy arable fields) reaching the site—and thence the site of deposition—via two or more routes.) It is difficult to see how seeds of a short-growing species like *Montia* would be harvested with a cereal crop, though this is less of a problem in the case of *Danthonia*. As a last example of this kind of unchallenged assumption that seeds found with cereal grains and chaff are 'weeds of cultivation', we may cite two further assemblages reported by van der Veen (1996), this time from late Iron Age deposits at Dragonby, near Scunthorpe, N. Lincolnshire. She notes (p. 199) that the samples from features 868 (pit fill) and 1531 (unknown feature) 'were very different in character from the bulk of the samples processed on site, in that they contained large amounts of chaff and small weed seeds such as *Sieglingia [Danthonia] decumbens*, *Carex* spp., *Potentilla* cf. *erecta*, *Montia fontana* and small grasses, and to these she adds (p. 210) *Ranunculus flammula*, *Rumex acetosella* and *Eleocharis* sp.; in the light of the data discussed above, might we not see such assemblages as reflecting the burning of turves (with the chaff perhaps merely an additional fuel) rather than simply being 'weeds'?

Conclusions

The following observations seem pertinent in the light of the material presented here.

(i) Deposits with turves identifiable during excavation are sometimes productive in terms of their content of identifiable plant macrofossil remains—e.g. some published examples, such as Silbury Hill and Newgrange (see Appendix), and one of the sites discussed within this project (Wellington Row, York), but in other cases remains are sparse or non-existent (Appletree turf wall; Cawthorn Camps; Milecastle 79).

(ii) Occasionally, isolated deposits are encountered which, on analysis, reveal their probable nature as turves, either where this was suspected (Appletree turf wall ditchfill) or unexpected (e.g. Context **2022** at Layerthorpe, York).

(iii) Plant macrofossils which are likely to have originated in turves are distributed in occupation deposits of a wide range of periods and site types. At some sites (e.g. Deer Park

Farms), probable evidence for turves is distributed through many deposits (perhaps because of mixing or repeated or long-term use of materials), whilst at others (e.g. 16-22 Coppergate) there may only be a few deposits where strong evidence for turves is recovered (because turves were used rarely, or rarely became incorporated into the archaeological record), despite excellent conditions for preservation and a comprehensive sampling policy.

(iv) The kinds of plant remains originating in turves and their form of preservation will obviously depend on the source of the raw material (cropped grassland of various kinds on a variety of substrates, dwarf-shrub-dominated heathland/moorland, or intermediate forms), as well as on the history of the turves following paring. This means that quite a wide range of possible turf 'indicators' may be encountered. The picture is complicated by the possibility that a buried seed bank within a sod will include taxa representing vegetation other than that growing on the surface at the time of paring, some of which may represent the succession of plant communities towards that forming the surface.

The following plant and other remains are suggested as ones to prompt closer inspection of deposits or assemblages with regard to the interpretation of the presence of turves:

Vegetative remains of vascular plants:
Calluna vulgaris (particularly root/basal twig fragments)
rhizome fragments, roots and rootlets (especially charred)
culm-bases

Mosses such as the following (all may have other origins, however):
Aulacomnium palustre (in absence of bog species)
Calliergon cuspidatum (in absence of marsh species)
Hylocomium splendens
Hypnum cupressiforme
Leucobryum glaucum
Plagiomnium undulatum
Pleurozium schreberi
Polytrichum juniperinum
Pseudoscleropodium purum
Rhytidiadelphus squarrosus
R. triquetrus

Propagules of:
Ajuga reptans
Carex (nutlets, especially charred, and particularly where they can be identified to a species likely to grow in turf, e.g. *C. nigra*)
Danthonia decumbens (especially cleistogenes)
Linum catharticum
Montia fontana (perhaps all subspecies)
Potentilla erecta
Rumex acetosella
Scirpus setaceus

and, where evidence for hay/stable manure, weedy grassland, or arable weed communities is not otherwise indicated, perhaps also:

Hypochoeris
Leontodon
Prunella vulgaris
Ranunculus flammula and *R.* Section *Ranunculus*
Viola

Other biological remains:
Cenococcum sclerotia
earthworm egg capsules
Heterodera cysts
beetles and bugs indicative of, for example, heathland/moorland habitats or grassland, especially larvae of click-beetles (Elateridae)

Other material
clasts of peaty sediment, typically with a mineral component (mor humus, for example, may probably usually be recognised by its high content of Ericales and/or *Calluna* pollen)

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I should like to dedicate this report to the memory of Camilla Dickson with whom I had hoped to be able to discuss the complexities of plant remains from turf.

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Table 1. Samples from a section through the Turf Wall and adjoining ditch at Appletree, Cumbria (site code CAS648), subjected to an assessment of their plant (and invertebrate) macrofossil content. In each case, a 3 kg subsample was examined.

Context	Sample	Context notes	Sediment	Results
53	903	lowermost peaty layer in turf wall (?old ground surface, OGS) sampled from floor of section	mixture primarily of light reddish-brown clay, mid grey-brown humic clay silt and black humic silt or amorphous organic sediment; crumbly (working plastic)	The small to moderate-sized residue of about 400 cm^3, consisted mostly of undisaggregated humic silt/amorphous peat and clay, with about 150 cm^3 of sand with a little gravel. There were some angular pieces of charcoal up to 10 mm, and moderate numbers of *Cenococcum* (soil fungus) sclerotia (resting bodies). After boiling with alkali, a much smaller residue was obtained of which the largest fractions were sand and charcoal. There were a very few poorly preserved insects of no interpretative value (Harry Kenward, pers. comm.).
52+53	906	combined material from basal peaty layer (?OGS) and turves above; from section of turf wall between monoliths TWS1 and TWS2 sampled for pollen analysis by Dr James Wells	palest brown to light brown to dark brown to almost black slightly brittle to crumbly, variably humic sandy silt, sometimes slightly indurated	This sample was soaked for several days prior to the initial disaggregation in water. The small residue, which was mostly of sand, also contained quite a lot of charcoal and some *Cenococcum* sclerotia, but no other remains apart from two rather fresh-looking (presumably modern) grass caryopses.

Context	Sample	Context notes	Sediment	Results
45	902	basal peaty fill of ditch N of turf wall	as 906	Some lumps of peaty material were examined prior to disaggregation; they were found to comprise slightly silty/sandy, but basically very well humified organic material with ?ancient rootlets and some other vegetative fragments. The initial disaggregation resulted in a large residue mainly of pellets of amorphous organic sediment, with sand and some clasts of clay and a little gravel; also noted were some woody roots which might be penecontemporaneous, e.g. roots growing into peaty deposit from above before being deposited *en bloc* into the ditch. Some plant material appeared to have become dry and not to have fully wetted during processing (this is unlikely to be a function of the long period of sample storage of nearly one year, however). There was a modest range of identifiable plant remains of which the more abundant were nutlets of sedges (of more than two kinds), and of ?tormentil (mostly rather well preserved), as well as shoots of the moss *Ceratodon purpureus* (again, usually well preserved, with rhizoids—root-like structures—attached, and in some cases the remains of perichaetial leaves indicating material which had been fruiting). Most of the plant material, however, was somewhat worn, especially the mosses (other than *C. purpureus*). With regard to insect remains, Harry Kenward reports (pers. comm.) that the rather large assemblage of beetles was typical of what might be found in poor rough grazing land. It included *Geotrupes* and *Aphodius* dung beetles, some ground beetles and larval apices of click beetles ('wireworms'). The state of preservation of the remains varied, consistent with an origin in turves (where there is typically a mixture of old, partly decayed, specimens and fresh corpses). Disaggregation following treatment with dilute sodium carbonate produced a much smaller residue in which the coarser (>2 mm) material consisted of woody root fragments. A single caryopsis of the heath grass, *Danthonia* and a pinnule (frond) fragment of bracken, *Pteridium*, were the only additions to the list, though a modest number of beetle remains were also released by this additional processing.

Table 2. Plant remains and other components in the samples from the Appletree Section. All material was uncharred unless otherwise indicated. Key: Ab.—abundance score (on a semi-quantitative scale from 1—one for a few remains, up to 5 items per kg for discrete, countable structures, to 4—abundant, a major component of the sample, probably hundreds or even thousands of individuals per kg).

Context 45, Sample 902

Taxon	Parts	Ab.	Notes
Pteridium aquilinum (L.) Kuhn (bracken)	pinnule fragment(s)	1	very decayed
cf. *Alnus glutinosa* (L.) Gaertner (?alder)	charcoal	1	max size 10 mm
cf. *Quercus* sp(p). (?oaks)	charcoal	1	max size 10 mm
Rumex sp(p). (docks)	perianth(s)/perianth segment(s)	1	
Caltha palustris L. (marsh marigold)	seed(s)	1	
Ranunculus Section *Ranunculus* (meadow/creeping/bulbous buttercup)	achene(s)	1	rather worn
R. flammula L. (lesser spearwort)	achene(s)	1	
Rubus cf. *idaeus* L. (?raspberry)	seed(s)	1	a single fragment
Potentilla cf. *erecta* (L.) Räuschel (?tormentil)	achene(s)	2	
Viola sp(p). (violets/pansies, etc.)	seed(s)	1	a single fragment
Erica tetralix L. (cross-leaved heath)	charred leaf/leaves	1	a single specimen
Calluna vulgaris (L.) Hull (heather, ling)	flower(s)	1	very worn
	shoot tip(s)	1	
cf. *Calluna vulgaris*	charred root and/or basal twig fragment(s)	1	
cf. *Veronica* sp(p). (?speedwells, etc.)	seed(s)	1	
Juncus bufonius L. (toad rush)	seed(s)	1	rather worn
cf. *Luzula* sp(p). (?woodrushes)	seed(s)	1	very decayed
Danthonia decumbens (L.) DC. in Lam. & DC. (heath grass)	caryopsis/es	1	
Gramineae (grasses)	leaf fragment(s)	1	modern
	uncharred caryopsis/es	1	
	uncharred culm fragment(s)	1	?modern
Scirpus setaceus L. (bristle club-rush)	nutlet(s)	1	fragment(s) only
cf. *Eleocharis* sp(p). (?spike-rushes)	nutlet(s)	1	very decayed
Carex sp(p). (sedges)	nutlet(s)	3	
Mosses			
Polytrichum sp(p).	leaves/leaf-bases and/or shoot fragment(s)	1	
Ceratodon purpureus (Hedw.) Brid.	leaves and/or shoot fragment(s)	2	
Aulacomnium palustre (Hedw.) Schwaegr.	leaves and/or shoot fragment(s)	1	
Thuidium tamariscinum (Hedw.) Br. Eur.	leaves and/or shoot fragment(s)	1	
Hylocomium splendens (Hedw.) Br. Eur.	leaves and/or shoot fragment(s)	1	

Context 53, Sample 903

Taxon	Parts	Ab.	Notes
cf. *Corylus avellana* L. (?hazel)	charcoal	1	max size 10 mm
cf. *Calluna vulgaris* (?heather, ling)	charred root and/or basal twig fragment(s)	1	max size 5 mm
Juncus bufonius (toad rush)	seed(s)	1	very worn

Gramineae (grasses)	uncharred caryopsis/es	1	?modern
Carex sp(p). (sedges)	charred nutlet(s)	1	a single fragment

Context 53+52, Sample 906

Taxon	**Parts**	**Ab.**	**Notes**
cf. *Alnus glutinosa* (L.) Gaertner (?alder)	charcoal	1	max size 10 mm
Quercus sp(p). (oak)	charcoal	1	max size 10 mm
cf. Pomoideae (*?Crataegus/Malus/ Pyrus/Sorbus*)	charcoal	1	max size 10 mm
Gramineae (grasses)	waterlogged caryopsis/es	1	modern

Other remains recorded in the samples:

Sample	*902*		*903*		*906*	
Item	**Ab.**	**Notes**	**Ab.**	**Notes**	**Ab.**	**Notes**
Cenococcum (sclerotia)	1		2	mostly <1 mm	2	
Pre-Quaternary megaspores	1		-		-	
beetles	2		1		-	
charcoal	1	max size 10 mm	2	max size 10 mm	2	max size 15 mm
charred moss	1		1		1	
coal	1	max size 10 mm	1	max size 10 mm	-	
earthworm egg capsules	1		-		1	
?earthworm egg capsules	-		2		2	
fly puparia	1		1		-	
gravel	1	max size 25 mm	1	max size 5 mm	-	
herbaceous detritus	1		-		-	
mites	-		1		-	
moss (leafless stems)	1		-		-	
part-burnt wood	-		1	max size 5 mm	-	
root bark/epidermis fragments	1		-		-	
root moulds (min)	-		1		1	
root/rhizome fragments	1		-		-	
root/rootlet fragments	2		1		1	?modern
sand	2		2		2	
twig fragments (charred)	1	max size 5 mm	-		-	
woody root fragments	2	max size 30 mm	1		-	

Table 3. Samples from Milecastle 79, near Bowness, Cumbria (site code CAS653), subjected to an assessment of their plant macrofossil content. In both cases, a 2.5 kg subsample was examined.

Context	Sample	Context notes	Sediment	Results
304	390	platform on which turf wall built, reported by Richmond and Gillam (1953, 27) to have been 'an artificial platform built of alternate layers of gravel and turf'	patchily varicoloured (light greyish-brown to mid to dark grey-brown), brittle (working unconsolidated when wet), sandy silt, perhaps locally sandy clay silt, with traces of stones 2-6 mm	The subsample disaggregated easily in water, except for the paler and more clay-rich parts which were treated by soaking in sodium pyrophosphate solution. There was a small residue of about 100 cm^3 of sand and gravel and a very small washover of a few grammes of charcoal.
312	391		mid to dark grey-brown (locally paler brown and darker grey), crumbly to soft (working slightly plastic when wet), sandy silt with traces of stones 6-60 mm	Some of the sediment would not disaggregate easily; it appeared to be humic silt. There was a very large residue of about 800 cm^3 of gravel and undisaggregated silty sediment; the washover taken from this consisted of little charcoal, apparently mostly/all oak (*Quercus*), in fragments whose maximum dimension was 10 mm.

Table 4. Plant remains and other components in the samples from Milecastle 79. All material was uncharred unless otherwise indicated. Lists are sorted by abundance and then alphabetically. Key: Ab.—abundance score (on the four-point semi-quantitative scale explained in the caption to Table 2).

Context 304, Sample 390

Taxon	Parts	Ab.	Notes
Cenococcum	sclerotia	2	
gravel		2	max size 35 mm
sand		2	
Chenopodium album	seed(s)	1	?modern
Gramineae	caryopses	1	modern
bark fragments (charred)		1	max size 5 mm
beetles		1	very decayed
charcoal		1	max size 10 mm

Context 312, Sample 391

Taxon	Parts	Ab.	Notes
gravel		4	max size 40 mm
unwashed sediment		3	max size 5 mm
grit		2	
sand		2	
Chenopodiaceae	charred seed(s)	1	a single specimen
Chenopodium album	seed(s)	1	?modern
Quercus	charcoal	1	max size 10 mm
charcoal		1	max size 10 mm

Table 5. Results of assessment of plant remains in samples thought to contain turves, from excavations at Cawthorn Camps, N. Yorkshire (CAS654) in 1999 (from Hall and Kenward, 2000).

Trench 1

Context 117 (upcast S. bank material from turf-built structure within Camp B, well-defined turves)

Sample 605/T (5 kg): The sample was described in the laboratory as a dark, slightly greyish-brown, brittle (working crumbly), humic, slightly silty sand with stones 6-20 mm and modern roots. On sieving it became clear that the sediment had a large content of stones.

This subsample yielded a moderate-sized to large residue of about 1225 cm^3 of angular to subangular chocolate brown (presumably humic-stained) sandstone (about 850 cm^3) plus a washover of roots and fine amorphous organic sediment (about 200 cm^3), and a further component of about 175 cm^3 of small (<2 mm) pellets of undisaggregated humic silty material which was intermediate in density.

Amongst the modern roots were fragments of shoots of heather (*Calluna vulgaris* (L.) Hull) together with a few flowers and capsules of this plant and, in the finest fraction, also some seeds. The material was variable in its state of preservation with some leafy shoots appearing to be intact except that they were strongly decolorised, whilst others had begun to lose tissue from the stems. The flowers and capsules often contained air which caused them to float. The only other identifiable remains were traces of rather fresh-looking moss (*Hypnum* cf. *cupressiforme* Hedw.). There was also a little charcoal (in fragments up to 5 mm).

Insect remains from Sample 605/T were sparse: a few larval apices of elaterid beetles, a pronotum probably of *Strophosomus sus* Stephens and two elytra of *Lochmaea suturalis* (Thomson), with a few remains of ants. The remains, whilst not especially well preserved, had an appearance which suggested they were not ancient—perhaps only decades rather than centuries old.

The question of the age and mechanisms of incorporation into Context 117 of the plant and invertebrate remains is clearly of some importance. If they are post-depositional intrusions they add nothing to the interpretation or understanding of the layer (which is thus barren of ancient remains other than charcoal); if they are contemporaneous with it, they indicate that the dark material probably was largely derived from turves and that these were cut from an area of vegetation not dissimilar to that obtaining today, with heather dominant.

Trench 2

Context 269 (dump of mineralised turves in rampart)

Sample 620/T (5 kg)

In the laboratory, this sediment was described as a light yellowish-grey-brown to light gingery-brown, brittle (working crumbly), slightly silty sand, with stones 20-60 mm and modern rootlets. There were occasional tiny dark flecks which might have been charcoal. The presence of large numbers of stones in the range 2-20 mm became apparent on disaggregation.

There was a moderately large residue of about 700 cm^3 of angular sandstone gravel with a small washover of about 50 cm^3 of roots, presumably all modern (some with what appear to be characteristic coarse rhizoid-like hairs normal to the axis of the roots). Identifiable remains were limited to two very decayed toad-rush (*Juncus bufonius* L.) seeds and there were traces of very decayed earthworm egg capsules and at least one ?modern mite.

*Table 6. Samples from Wellington Row, York (YAT site code 1989-90.24), including material subjected to assessment of its plant macrofossil (in 1995) plus material examined during the present project (marked *), in context group and context order. Sediment descriptions for the samples examined previously could not be located. Dating codes: C1-EC2 = 1st-early 2nd C AD; M-LC2: mid to late 2nd C AD.*

Context group, phase, date	Context	Sample	Weight (kg)	Context notes	Sediment	Results
4.4.2 1-1 C1-EC2	4199	2680	1.0	part of turf bank		There was a very small residue (with a more pronounced component of grit and a lower organic content than many of the subsamples in this series). The small to moderate-sized flot consisted of fine plant detritus. There was a distinctive 'turf' component consisting of moderate numbers of achenes of *Potentilla* cf. *erecta* with traces of *Montia fontana* ssp. *chondrosperma* and *Ranunculus* Section *Ranunculus* with the mosses *Eurhynchium praelongum*, *Hylocomium splendens*, *Hypnum* cf. *cupressiforme* and cf. *Plagiomnium undulatum*. The only other identifiable taxa recorded were *Galeopsis* Subgenus *Galeopsis* and *Polygonum persicaria*, both of which may have grown as weeds in an area where soil was disturbed (as where turves were heaped and left for at least a season). Some of the other items noted might also indicate turf material: charred rhizome/root fragments (if, for example, turf was cut from an area underneath a bonfire), earthworm egg caps, and leafless moss stems.

Context group, phase, date	Context	Sample	Weight (kg)	Context notes	Sediment	Results
	4200	2681	1.0			The residue and flot were both very small, the latter containing some herbaceous detritus. There were abundant seeds of *Montia fontana* ssp. *chondrosperma* and moderate numbers of *Carex* sp(p)., *Juncus bufonius*, *Potentilla* cf. *reptans* and *Scirpus setaceus* as well as of leafless moss stems. Other taxa which may have arrived with this probable turf flora included the mosses *Hylocomium splendens*, *Polytrichum* sp(p). and *Rhytidiadelphus* cf. *squarrosus*.
	4211	2771	1.0			The small residue and moderate-sized to large flot of plant detritus were not examined in great detail. However, possible turf indicators amongst the taxa recorded at an abundance of '2' were *Hypochoeris* sp(p)., *Ranunculus* Section *Ranunculus* and *Rumex acetosella* agg. and there were also moderate amounts of leafless moss stem; amongst the rarer taxa, several might well have arrived from grassland of one kind or another. However, other origins for the flora in the sample are evident from the records of moderate amounts of *Chenopodium album*, *Eurhynchium praelongum* and *Galeopsis* Subgenus *Galeopsis* and an equivalent series of taxa of disturbed habitats and waste places present at trace levels.

Context group, phase, date	Context	Sample	Weight (kg)	Context notes	Sediment	Results
	4211	2771*	1.0		mid-dark brown, crumbly to soft working more or less plastic), slightly clay sandy silt, locally more clay-rich	There was a small to moderate-sized residue of about 150 cm^3 before final breakdown of the persistent silty clasts, comprising roughly equal volumes of plant detritus and undisaggregated sediment. As with the subsample examined previously, the more abundant taxa included *Chenopodium album*, *Eurhynchium praelongum*, *Galeopsis* Subgenus *Galeopsis*, and *Ranunculus* Section *Ranunculus*, but there were also moderate amounts of *Rumex acetosella* agg. nutlets (and also earthworm egg capsules). Quite a wide range of other taxa were present in small amounts, some of them possible turf indicators, e.g. *Hypochoeris* sp(p)., *Luzula* sp(p)., *Montia fontana* ssp. *chondrosperma*, and leafless moss stems, charred root/rhizome fragments and root/rootlet fragments were also all present.
	4212	2772*	1.0		light-mid grey-brown, crumbly and brittle, to soft, working slightly plastic, slightly clay sandy silt with traces of fine to coarse herbaceous detritus and iron-rich ?concretions	This subsample yielded a small residue of about 175 cm^3 of which about 50 cm^3 formed a washover of strongly silt encrusted organic detritus, the rest being sand and gravel; the plant material was all rather decayed, especially the leafless moss stems which formed a fairly large proportion of the coarser plant material., The more abundant identifiable plant taxa were *Chenopodium album*, *Hypochoeris* sp(p)., *Montia fontana* ssp. *chondrosperma*, *Ranunculus* Section *Ranunculus*, *Rumex acetosella* agg. and *Spergula arvensis*, i.e. a mixture of annual weeds and probable grassland plants, reflected in the range of taxa present in small amounts. The records for traces of various charred items: herbaceous detritus, root/rhizome fragments, Gramineae caryopses and *Plantago lanceolata* seeds perhaps indicate turf which had been burnt, e.g. by being under a fire.

Context group, phase, date	Context	Sample	Weight (kg)	Context notes	Sediment	Results
	4214	2799*	1.0		dark grey-brown to dark brown (locally a little lighter), crumbly to unconsolidated, moderately humic sandy silt with traces of fine to coarse herbaceous detritus (with the appearance of 'potting compost')	The subsample disaggregated very readily though with some slightly peaty lumps remaining at first. A small residue of about 175 cm^3 of sand and plant detritus was left, the latter making up about 25-40 cm^3 and including in coarser fraction mainly of moss; some lumps of sediment which were quite cohesive appeared to be sandy silt containing plant detritus, perhaps from soil (but not peat in the strict sense). The presence of abundant seeds of *Montia fontana* ssp. *chondrosperma* with moderate amounts of remains of *Scirpus setaceus*, *Potentilla* cf. *erecta* and *Thuidium tamariscinum* are very strong evidence for the presence of decayed turves and to this group may be added the rarer remains of *Calliergon cuspidatum*, *Carex* sp(p)., *Danthonia decumbens* (caryopses and cleistogenes), *Hylocomium splendens*, *Leontodon* sp(p)., *Plagiomnium undulatum*, and *Rumex acetosella* agg., though taxa with quite other origins were also present. As in the sample from 4212, some charred remains were noted: grass caryopses, herbaceous detritus, and root/rhizome fragments and other uncharred material likely to be additional indicators of turves included earthworm egg caps and leafless moss stems.

Context group, phase, date	Context	Sample	Weight (kg)	Context notes	Sediment	Results
	4215	2785*	1.0		dark grey-brown, locally paler, crumbly and slightly layered, slightly humic sandy silt with some fibrous herbaceous detritus	The moderate-sized residue of about 250 cm^3 consisted of undisaggregated sediment and herbaceous detritus (mainly moss); the larger clasts left after initial disaggregation were mainly sandy silt, with moss and some rootlets: all the organic material was rather strongly oxidised and silt encrusted, sometimes with an orange coloration. Amongst the material present in moderate amounts were cleistogenes of *Danthonia decumbens*, seeds of *Juncus bufonius*, *Montia fontana* ssp. *chondrosperma*, *Potentilla* cf. *erecta*, and *Scirpus setaceus* and stems of the moss *Hylocomium splendens*; also present at an abundance of '2' were earthworm egg caps and leafless moss stems. Traces of *Danthonia* caryopses, *Plagiomnium undulatum* and *Rhytidiadelphus squarrosus* stems and charred root/rhizome fragments add to the evidence which probably indicates that turves formed te bulk of this material, though traces of charred ?spelt wheat (*Triticum* cf. *spelta*) glume-bases and ?cereal grains show that other kinds of material found there way into the deposit.
	4181	2648*	1.0	?tumbled turf at the south-east side of the turf bank	dark greyish-brown (locally light-mid brown), crumbly (working soft), humic sandy silt (with some small - 20-30 mm - lumps of light brown, ?natural, clay) and traces of ?Equisetum rhizome	The subsample disaggregated very easily to leave a moderate-sized residue of about 150 cm^3 of sand with a little gravel and traces of plant detritus. Taxa present in moderate amounts were *Chenopodium album*, *Galeopsis* Subgenus *Galeopsis*, *Montia fontana* ssp. *chondrosperma*, *Potentilla* cf. *erecta*, i.e. a mix of annual weeds and probable turf taxa, the rare plant including several which might also have come from short grassland habitats.

Context group, phase, date	Context	Sample	Weight (kg)	Context notes	Sediment	Results
4.4.3 1-3 C1-EC2	4197	2678	1.0	turves, ?representing returfing of bank		There was a very small residue and a large flot, the latter mostly comprising plant detritus (and not examined in detail). Moderate numbers of the following taxa were noted: *Carex* sp(p)., *Danthonia decumbens* (both spikelets/cleistogenes and isolated caryopses), *Hydrocotyle vulgaris*, *Montia fontana* ssp. *chondrosperma* and *Potentilla* cf. *erecta*, which with some of the other taxa present (*Hylocomium splendens*, *Luzula*, *Polytrichum*, *Prunella vulgaris* and *Ranunculus* Section *Ranunculus*) point to turf, perhaps from areas of both wetter and drier land. The records of leafless moss stems and root/rootlet fragments seem likely to be consistent with the presence of decayed turves.
	4198	2679	0.18			The very small residue and small to moderate-sized flot from this very small subsample consisted of fine plant detritus. The residue was only scanned very briefly but included a possible turf component: the only taxa noted were cf. *Danthonia decumbens* (spikelets/spikelet fragments), *Hydrocotyle vulgaris*, *Montia fontana* ssp. *chondrosperma*, *Potentilla* cf. *erecta* and *Scirpus setaceus*; also recorded were leafless moss stems and root/rootlet fragments, which together suggest the presence of very decayed turves.

Context group, phase, date	Context	Sample	Weight (kg)	Context notes	Sediment	Results
4.5.1 1-3 C1-EC2	4206	2712	1.0	deposits containing decayed turves		There was a very small residue and small flot, the latter with some herbaceous detritus. The only abundant plant taxon was (again), *Montia fontana* ssp. *chondrosperma*, together with moderate amounts of *Leontodon* sp(p). and *Ranunculus* Section *Ranunculus* (both perhaps indicating grassland turf?) as well as of earthworm egg capsules and leafless moss stems. Taxa present in trace amounts which may also indicate grassland of various kinds were *Danthonia decumbens*, *Luzula* sp(p)., *Plantago* cf. *media*, *P. lanceolata*, *Potentilla* cf. *erecta*, *Prunella vulgaris*, *Ranunculus flammula*, and *Rhinanthus* sp(p).
	4208	2727	1.0			The very small residue and flot (the latter containing some herbaceous detritus) yielded a small range of taxa of which only *Carex* sp(p). and *Ranunculus* Section *Ranunculus* were present at more than trace levels; many of the other taxa recorded suggested an origin in grassland though other habitats were also indicated.
	4209	2758*	2.0		light-mid slightly greyish-brown, crumbly, brittle and somewhat indurated (working soft and locally a little plastic and sticky), slightly sandy silt or silty sand	There was a small to moderate-sized residue of no more than about 80 cm^3 of fine sand and undisaggregated sediment with a little plant detritus (mainly, if not all roots, some with characteristic fine rootlets and probably including material of *Carex*) with moderate numbers of snails and vegetative material (fragments of nodal sheaths, rhizome and stem epidermis) of *Equisetum*. This (and the evidence for *Equisetum* from two other assemblages in this group of samples examined latterly) indicates colonisation of the turves after deposition rather than material brought with the turves from elsewhere.

Context group, phase, date	Context	Sample	Weight (kg)	Context notes	Sediment	Results
4.9.1 2-5 M-LC2	4159	2420	1.0	?flood deposits overlying Roman road		There was a very small residue and flot. The only taxa present in more than trace amounts were *Arenaria* cf. *serpyllifolia*, *Chenopodium album*, *Ranunculus* Section *Ranunculus*, *Sambucus nigra* and *Viola* sp(p). (as well as earthworm egg capsules), of which the first, at least, is suggestive of bare soil, perhaps trampled. Other taxa present which might indicate turves were *Linum catharticum* and *Montia fontana* ssp. *chondrosperma* but the turf component was small.
	4160	2419	1.0			The very small residue and flot included plant remains giving an appearance of natural silt with a ?turf flora: Seeds of *Montia fontana* ssp. *chondrosperma* and *Scirpus setaceus* were abundant, with moderate numbers of *Carex* sp(p)., *Hydrocotyle vulgaris*, and *Potentilla* (both *P.* cf. *erecta* and *P. reptans*), as well as earthworm egg capsules. Most of the seeds were generally well preserved, though the *Potentilla* achenes and seeds of *Rubus idaeus* were worn or present as halves, suggesting separate origins. The first four taxa mentioned perhaps point to damp alluvium as the most likely location for the turf to have been growing if the remains did indeed arrive in turf rather than being incorporated after it was deposited at this riverside location.
	4162	2475	1.0			The small residue and small washover was of silty herbaceous detritus with some seeds; these included moderate numbers of *Montia fontana* ssp. *chondrosperma* and *Spergula arvensis* (as well as earthworm egg capsules) and a small range of other taxa in trace amounts with no strong character.

Context group, phase, date	Context	Sample	Weight (kg)	Context notes	Sediment	Results
7.6.2 2-1 M-LC2	72233	3541	1.0	fill in square cut 72236		The moderate-sized residue and small flot contained much herbaceous detritus and some seeds with, as might be expected in the fill of a cut containing a range of occupation material (according to the excavation narrative), a wide variety of likely sources represented: wetland, peatland, food remains. Of the taxa recorded at an abundance of '2' only *Eleocharis palustris* sl, *Ranunculus* Section *Ranunculus* and *Rumex acetosella* agg. seem likely to have arrived in turf, but amongst the rare taxa the following possible turf indicators were noted: *Linum catharticum*, *Montia fontana* ssp. *chondrosperma*, *Potentilla* cf. *erecta*, *Prunella vulgaris* and *Ranunculus flammula*.
7.10.1 2-1 M-LC2	72515	3778	1.0	build-up, ?over Roman road		There was a small to moderate-sized residue and a small washover. The more abundant taxa recorded were *Carex* sp(p)., *Cenococcum* (sclerotia), *Eleocharis palustris* sl and *Juncus* cf. *gerardi*, but amongst the rarities were *Hypnum* cf. *cupressiforme*, *Luzula* sp(p)., *Montia fontana* ssp. *chondrosperma*, *Potentilla* cf. *erecta*, *Prunella vulgaris*, *Ranunculus flammula*, and *Ranunculus* Section *Ranunculus*, which form a small 'turf' group.

Table 7. Plant remains and other components in a group of samples from Wellington Row, York (material examined during the assessment in 1995). All material was uncharred unless otherwise indicated. Lists are sorted taxonomically and (for material other than identified plant remains) alphabetically. The numbers for each taxon and context are abundance scores (on the four-point semi-quantitative scale explained in the caption to Table 2). Numbers in brackets indicate tentative determinations for taxa identified securely from other contexts.

	Context	4159	4160	4162	4197	4198	4199	4200	4206	4208	4211	72233	72515
	'turf bank' sample?				✓	✓	✓	✓	✓	✓	✓		
Taxon	**Parts recorded**												
Filicales	pinnule fragments	-	-	-	-	-	-	-	1	-	-	-	-
Juglans regia	nutshell fragments	-	-	-	-	-	-	-	-	-	-	1	-
Alnus sp(p).	buds and/or bud-scales	-	-	-	-	-	-	-	-	-	1	-	-
Corylus avellana	nuts and/or nutshell fragments	1	-	-	-	-	-	-	1	1	-	-	-
Quercus sp(p).	buds and/or bud-scales	-	-	-	-	-	-	-	-	-	-	1	-
Ficus carica	seeds	-	-	-	-	-	-	-	-	-	-	1	1
Urtica dioica	achenes	-	-	-	-	-	-	-	-	1	-	1	-
U. urens	achenes	-	-	-	-	-	-	-	-	-	-	1	-
Polygonum aviculare agg.	fruits	1	-	1	-	-	-	-	1	-	-	1	1
P. persicaria	fruits	-	-	-	-	-	1	-	-	-	1	1	1
P. lapathifolium	fruits	-	-	1	-	-	-	-	-	-	1	-	-
Bilderdykia convolvulus	fruit fragments	1	-	-	-	-	-	-	-	-	-	-	-
	fruits	-	-	-	-	-	-	-	-	-	-	-	1
Rumex acetosella agg.	fruits	1	-	1	-	-	-	1	-	-	2	2	-

	Context	4159	4160	4162	4197	4198	4199	4200	4206	4208	4211	72233	72515
Rumex sp(p).	fruits	-	-	-	-	-	-	-	-	-	-	1	-
Chenopodium Section *Pseudoblitum*	seeds	-	-	-	-	-	-	-	-	-	-	2	-
C. album	seeds	2	-	1	-	-	-	1	1	1	2	-	-
Atriplex sp(p).	seeds	1	1	-	1	-	-	-	1	-	1	1	1
Chenopodiaceae	seeds	-	-	-	1	-	-	-	-	-	-	-	-
Montia fontana* ssp. *chondrosperma	**seeds**	**1**	**3**	**2**	**2**	**1**	**1**	**3**	**3**	**1**	**-**	**1**	**1**
Arenaria cf. *serpyllifolia*	seeds	2	-	-	-	-	-	-	-	-	-	-	-
Moehringia trinervia	seeds	1	-	-	-	-	-	-	-	-	-	-	-
Stellaria media	seeds	1	-	1	-	-	-	-	-	-	-	1	-
S. neglecta	seeds	-	-	-	-	-	-	-	-	-	(1)	-	1
S. graminea	seeds	-	-	-	-	-	-	-	1	-	-	-	-
Cerastium sp(p).	seeds	1	-	-	-	-	-	-	1	-	1	-	-
Spergula arvensis	seeds	-	-	2	-	-	-	-	-	-	1	1	-
Lychnis flos-cuculi	seeds	-	-	-	-	-	-	-	-	-	-	-	1
Agrostemma githago	seed fragments	-	-	-	-	-	-	-	-	-	1	-	1
Caltha palustris	seeds	-	-	-	-	-	-	-	-	-	-	1	-
Ranunculus* Section *Ranunculus	**achenes**	**2**	**-**	**-**	**1**	**-**	**1**	**1**	**2**	**2**	**2**	**2**	**1**
R. flammula	achenes	-	1	-	-	-	-	-	1	1	-	1	1

	Context	4159	4160	4162	4197	4198	4199	4200	4206	4208	4211	72233	72515
Ranunculus Subgenus *Batrachium*	achenes	-	1	-	-	-	-	-	-	-	-	1	-
Papaver somniferum	seeds	-	-	-	-	-	-	-	-	-	-	1	-
P. argemone	seeds	-	-	-	-	-	-	-	-	1	-	-	-
Fumaria sp(p).	seeds	-	-	-	-	-	-	-	1	-	-	-	-
Brassica sp./Sinapis arvensis	seeds	-	-	-	-	-	-	-	-	-	-	1	-
Brassica sp./Raphanus raphanistrum	pod segments and/or fragments	-	-	-	-	-	-	-	-	-	-	-	1
Filipendula ulmaria	achenes	-	-	-	-	-	-	-	-	-	1	1	-
Rubus idaeus	seeds	-	1	-	-	-	-	-	-	1	-	-	-
R. fruticosus agg.	seeds	1	-	-	-	-	-	-	-	-	-	1	-
Potentilla anserina	achenes	-	1	-	-	-	-	-	-	-	-	1	-
P. cf. erecta	**achenes**	-	**2**	-	**2**	**1**	**2**	**1**	**1**	**1**	-	**1**	**1**
P. cf. *reptans*	achenes	-	2	-	-	-	-	2	-	-	-	-	-
Potentilla sp(p).	achenes	-	-	1	-	-	-	-	-	-	-	-	-
Aphanes microcarpa	achenes	1	-	-	-	-	-	1	-	-	-	1	-
Linum usitatissimum	seeds	-	-	-	-	-	-	-	-	-	-	1	-
L. catharticum	seeds	1	-	-	-	-	-	-	-	-	-	1	-
Vitis vinifera	seeds	-	-	-	-	-	-	-	-	-	-	1	-
Hypericum sp(p).	seeds	-	-	-	-	-	-	-	-	1	-	-	-
Viola sp(p).	seeds	2	-	-	-	-	-	-	-	-	-	-	-

	Context	4159	4160	4162	4197	4198	4199	4200	4206	4208	4211	72233	72515
Hydrocotyle vulgaris	mericarps	-	2	-	2	1	-	-	-	-	-	-	-
Coriandrum sativum	mericarp fragments	-	-	-	-	-	-	-	-	-	-	1	-
Oenanthe cf. *lachenalii*	mericarps	-	-	-	-	-	-	-	-	-	-	1	-
Aethusa cynapium	mericarps	1	-	-	-	-	-	-	-	-	-	-	-
Conium maculatum	mericarp fragments	-	-	-	-	-	-	-	-	-	-	-	1
Pastinaca sativa/ Heracleum sphondylium	mericarps	-	-	-	1	-	-	-	-	-	-	-	-
Daucus carota	mericarps	-	-	-	-	-	-	-	-	(1)	1	-	-
Calluna vulgaris	flowers	-	-	-	-	-	-	-	-	-	-	1	-
cf. *C. vulgaris*	charred root and/or basal twig fragments	-	-	-	-	-	-	-	-	-	-	1	-
cf. *Anagallis arvensis*	seeds	1	-	-	-	-	-	-	-	-	-	-	-
Primulaceae	seeds	-	1	-	-	-	-	-	-	-	-	-	-
Scutellaria galericulata	nutlets	-	-	-	-	-	-	-	1	-	-	-	-
Galeopsis Subgenus *Galeopsis*	nutlets	-	-	1	-	-	1	1	-	1	2	-	-
Stachys sp(p).	nutlets	1	-	-	-	-	-	1	-	-	-	-	1
Prunella vulgaris	nutlets	1	-	-	1	-	-	-	1	-	1	1	1
Mentha sp(p).	nutlets	1	-	-	-	-	-	-	-	-	-	-	-
Rhinanthus sp(p).	seeds	-	-	-	-	-	-	-	1	-	-	-	-
Plantago major	seeds	1	-	-	-	-	-	-	-	-	1	-	-
P. cf. *media*	seeds	-	-	-	-	-	-	-	1	-	-	-	-

	Context	4159	4160	4162	4197	4198	4199	4200	4206	4208	4211	72233	72515
Plantago lanceolata	charred seeds	-	1	-	-	-	-	-	-	-	-	-	-
	seeds	-	-	-	-	-	-	-	1	-	-	-	-
Sambucus nigra	seed fragments	-	1	-	-	-	-	-	-	1	-	-	-
	seeds	2	-	-	-	-	-	-	1	-	-	1	-
Campanula cf. *rotundifolia*	seeds	-	-	-	-	-	-	-	-	1	-	1	-
cf. *Aster tripolium*	achenes	-	-	-	-	-	-	-	-	1	1	-	1
Arctium sp(p).	achenes	1	-	-	-	-	-	-	-	-	-	-	-
Carduus/Cirsium sp(p).	achenes	1	-	1	-	-	-	-	1	-	-	-	1
Hypochoeris sp(p).	achenes	-	-	-	-	-	-	-	-	-	2	-	-
Leontodon sp(p).	achenes	-	-	-	-	-	-	-	2	-	-	-	-
Alisma sp(p).	carpels and/or seeds	-	-	-	-	-	-	-	-	-	-	1	1
Triglochin maritima	carpels	-	-	-	-	-	-	-	-	-	-	1	1
Potamogeton sp(p).	pyrenes	-	-	-	-	-	-	-	1	-	-	-	-
Juncus cf. *inflexus/effusus/ conglomeratus*	seeds	-	-	-	-	-	-	-	-	-	-	1	-
J. cf. *gerardi*	seeds	-	-	-	-	-	-	-	-	-	-	-	2
J. bufonius	seeds	-	-	-	-	-	-	2	-	-	-	-	-
Luzula sp(p).	seeds	-	-	-	1	-	-	-	1	-	-	-	1
Gramineae	waterlogged caryopsis/es	-	-	-	1	-	-	-	1	1	1	1	-
cf. Gramineae	culm bases	-	-	-	-	-	-	-	1	-	-	-	-
Cerealia indet.	charred caryopsis/es	-	-	-	-	-	-	-	-	-	-	1	-

	Context	4159	4160	4162	4197	4198	4199	4200	4206	4208	4211	72233	72515
	charred chaff fragments	-	-	-	-	-	-	-	-	-	-	-	-
Triticum sp(p).	charred rachis internodes	-	-	-	-	-	-	1	-	-	-	-	-
Danthonia decumbens	**caryopsis/es**	-	-	-	2	-	-	-	1	-	(1)	1	-
	spikelets/cleistogenes	-	-	-	2	(1)	-	-	-	-	(1)	-	-
Sparganium sp(p).	fruits	-	-	-	-	-	-	-	1	-	-	-	-
Scirpus setaceus	**nutlets**	1	3	1	-	1	-	2	-	1	-	-	-
Eriophorum vaginatum	sclerenchyma spindles	-	-	-	-	-	-	-	-	-	-	2	-
Eleocharis palustris sensu lato	nutlets	-	-	-	-	-	-	-	-	-	1	2	2
***Carex* sp(p).**	**nutlets**	1	2	-	2	-	-	2	1	2	-	1	2
Mosses (remains were leaf/leaves and/or shoot fragments)													
Sphagnum sp(p).		-	1	-	1	-	-	-	-	-	-	1	1
Polytrichum sp(p).		-	-	-	1	-	-	1	-	-	-	-	
cf. *Plagiomnium undulatum*		-	-	-	-	-	1	-	-	-	-	-	-
Thuidium cf. *tamariscinum*		-	-	-	-	-	-	-	1	-	-	-	-
Eurhynchium praelongum		-	-	-	-	-	1	-	(1)	-	2	-	-
Eurhynchium sp(p).		1	-	-	-	-	-	-	-	-	-	-	-
Hypnum cf. *cupressiforme*		-	-	-	-	-	1	-	-	-	-	-	1
Rhytidiadelphus cf. *squarrosus*		-	-	-	-	-	-	1	-	-	-	-	-

	Context	4159	4160	4162	4197	4198	4199	4200	4206	4208	4211	72233	72515
Hylocomium splendens		-	-	-	1	-	1	1	-	-	-	-	-
bark fragments		-	-	-	-	-	-	-	-	-	-	1	-
beetles		2	1	-	1	-	1	1	1	-	2	1	1
bone fragments		-	-	-	-	-	-	-	-	-	-	1	1
brick/tile		-	-	-	-	-	-	-	-	1	-	1	1
burnt bone fragments		-	-	-	-	-	-	-	-	-	-	-	1
Cenococcum (sclerotia)		-	1	-	-	-	-	1	-	-	-	-	2
charcoal		-	1	1	1	1	1	1	1	1	1	1	1
charred rhizome/root fragments		-	**1**	-	-	-	**1**	**1**	-	-	**1**	-	-
coal		-	-	-	-	-	1	-	-	1	-	-	-
Cristatella (statoblasts)		-	-	-	-	-	-	-	-	1	-	-	-
detritus peat fragments		-	-	-	-	-	-	-	-	-	-	-	1
dicot. leaf fragments		-	-	-	-	-	-	-	-	-	1	-	-
earthworm egg capsules		**2**	**2**	**2**	-	-	**1**	**1**	**2**	**1**	**1**	**1**	**1**
eggshell membrane fragments		-	-	-	-	-	-	-	-	-	-	-	1
fly puparia		1	1	-	-	-	-	1	1	-	-	1	-
gravel		1	1	2	-	-	2	1	-	1	1	2	2

	Context	4159	4160	4162	4197	4198	4199	4200	4206	4208	4211	72233	72515
grit		-	-	-	1	-	-	-	-	-	-	-	-
herbaceous detritus		1	-	1	-	-	-	-	2	1	-	3	-
Heterodera (cysts)		1	-	-	-	-	-	-	1	-	-	-	-
humic silt		-	2	-	-	-	-	-	-	-	-	-	-
iron-rich concretions		-	-	-	-	-	-	-	-	-	-	1	-
mites		-	-	-	2	-	1	-	2	-	2	-	-
mortar		-	-	-	-	-	-	-	-	-	-	1	-
moss (leafless stems)		-	**1**	-	**2**	**1**	**1**	**2**	**2**	-	**2**	-	-
ostracods		-	-	-	-	-	-	-	-	1	-	-	-
oyster shell fragments		-	-	-	-	-	-	-	-	-	-	1	-
pottery		-	-	-	-	-	-	-	-	-	-	1	-
Pre-Quaternary megaspores		-	-	-	-	-	-	-	-	1	-	-	-
root casts		-	-	-	-	-	-	-	-	1	-	-	-
root/rootlet fragments		-	-	-	2	1	1	-	-	-	-	-	-
sand		1	2	2	2	2	2	1	2	2	2	3	2
small mammal tooth		-	-	-	-	-	-	-	-	-	-	1	-
snails		1	-	-	-	-	-	-	1	2	-	-	-
twig fragments		-	1	-	-	-	-	-	-	-	1	-	1
twig fragments (charred)		-	-	-	-	-	2	-	-	-	-	-	-

	Context	4159	4160	4162	4197	4198	4199	4200	4206	4208	42111	72233	72515
unwashed sediment		-	-	-	-	-	2	2	-	-	-	-	-
wood fragments		1	1	-	-	-	-	-	1	1	1	2	1
?wood chips		-	-	-	-	-	-	-	-	-	-	-	1

Table 8. Plant remains and other components in the samples from Wellington Row, York (material examined during the present study). All material was uncharred unless otherwise indicated. Lists are sorted taxonomically and (for material other than identified plant remains) alphabetically. The numbers for each taxon and context are abundance scores (on the four-point semi-quantitative scale explained in the caption to Table 2). Numbers in brackets indicate tentative determinations for taxa identified securely from other contexts.

	Context	4181	4209	4211	4212	4214	4215
	'turf bank' sample?	✓	✓	✓	✓	✓	✓
Taxon	**Parts recorded**						
Equisetum sp(p).	nodal sheath fragments	-	1	-	-	-	-
	stem epidermis fragments	-	1	1	-	-	-
	stem fragments	1	-	-	-	-	-
Urtica dioica	achenes	1	-	-	1	-	-
Polygonum aviculare agg.	fruits	-	-	-	1	1	1
P. persicaria	fruits	-	-	1	-	1	-
P. lapathifolium	fruits	1	-	1	1	1	-
Bilderdykia convolvulus	fruit fragments	-	-	1	-	-	-
	fruits	-	-	-	1	-	-
Rumex acetosella agg.	fruits	1	-	2	2	1	-
Rumex sp(p).	fruits	-	-	-	1	-	-
Chenopodium ficifolium	seeds	-	-	-	1	-	-
C. album	seeds	2	1	2	2	-	1
Atriplex sp(p).	seeds	-	-	1	-	-	-

	Context	4181	4209	4211	4212	4214	4215
Montia fontana* ssp. *chondrosperma	**seeds**	**2**	**-**	**1**	**2**	**3**	**2**
Stellaria cf. *graminea*	seeds	-	-	-	1	-	-
Cerastium sp(p).	seeds	-	-	1	1	-	-
Spergula arvensis	seeds	1	-	1	2	1	-
Ranunculus* Section *Ranunculus	**achenes**	**1**	**1**	**2**	**2**	**-**	**1**
R. flammula	achenes	-	-	1	-	-	-
Fumaria sp(p).	seeds	-	-	-	1	-	-
Brassica rapa ssp. sylvestris	seeds	-	-	-	1	-	-
Potentilla cf. *erecta*	achenes	2	-	-	-	2	2
Leguminosae	flowers and/or petals	1	-	-	1	-	-
Daucus carota	mericarps	-	-	1	-	-	-
Myosotis sp(p).	nutlets	-	-	1	-	-	-
Galeopsis Subgenus *Galeopsis*	nutlets	2	-	2	1	1	1
Prunella vulgaris	nutlets	-	-	-	1	-	-
Veronica beccabunga-type	seeds	1	-	-	-	-	-
Plantago lanceolata	charred seeds	-	-	-	1	-	-
Sambucus nigra	seed fragments	-	1	1	-	1	-
Valerianella sp(p).	sterile cells from fruits	-	-	1	-	-	-

	Context	4181	4209	4211	4212	4214	4215
cf. *Senecio* sp(p).	achenes	-	-	-	1	-	-
Carduus/Cirsium sp(p).	achenes	-	-	(1)	1	-	-
Centaurea sp(p).	achenes	-	-	1	-	-	-
Hypochoeris sp(p).	achenes	-	-	1	2	-	-
Leontodon sp(p).	achenes	1	-	-	-	1	-
Juncus bufonius	seeds	1	-	-	1	1	2
Juncus sp(p).	seeds	1	-	-	-	-	-
Luzula sp(p).	seeds	-	-	1	-	-	-
Gramineae	charred caryopsis/es	-	-	-	1	1	1
	waterlogged caryopsis/es	1	1	(1)	-	-	1
cf. Cerealia indet.	charred caryopsis/es	-	-	-	-	-	1
Triticum cf. *spelta*	charred glume-bases	-	-	-	-	-	1
Danthonia decumbens	caryopsis/es	-	-	-	-	1	1
	charred caryopsis/es	1	-	-	-	-	-
	cleistogenes (basal sterile flowers)		-	-	-	-	1
Scirpus setaceus	**nutlets**	**1**	-	-	-	**3**	**2**
***Carex* sp(p).**	**nutlets**	**1**	**1**	-	**1**	**1**	**1**
	root/rootlet fragments	-	1	-	-	-	-

	Context	4181	4209	4211	4212	4214	4215
Mosses (remains were leaf/leaves and/or shoot fragments)							
Polytrichum commune var. *commune*		1	-	-	-	1	1
Plagiomnium undulatum		-	-	-	-	1	1
Plagiomnium sp(p).		-	-	-	1	-	1
Leucodon sciuroides		-	-	-	1	-	-
Thuidium tamariscinum		-	-	-	-	2	-
Calliergon cuspidatum		-	-	-	-	1	-
Eurhynchium praelongum		-	-	2	-	-	-
Eurhynchium sp(p).		-	-	-	1	-	-
Rhytidiadelphus squarrosus		-	-	-	-	-	1
Hylocomium splendens		1	-	-	-	1	2
	bark fragments	-	-	-	1	-	-
	beetles	1	-	2	2	1	1
Cenococcum	sclerotia	1	1	-	-	-	-
	charcoal	1	-	-	1	1	1
	charred herbaceous detritus	-	-	-	1	1	-
	concreted sediment	-	2	-	2	-	-
dicotyledon	stem fragments	-	-	-	1	-	-

	Context	4181	4209	4211	4212	4214	4215
earthworm (Annelida)	**egg capsules**	**1**	-	**2**	**1**	1	**2**
	herbaceous detritus	1	-	1	-	-	1
Heterodera	cysts	-	1	-	1	-	-
	?iron pan fragments	-	-	-	-	-	1
mites		-	-	2	2	1	2
moss indet.	leaf/leaves and/or shoot fragments	-	-	-	-	2	-
moss	**leafless stems**	**1**	-	**1**	**2**	**1**	**2**
	charred root/rhizome fragments	**1**	-	**1**	**1**	**1**	**1**
	root/rootlet fragments	1	1	1	1	1	1
snails		-	2	-	-	-	-
	twig fragments	-	-	1	1	-	-
	charred twig fragments	1	-	-	-	-	-

Table 9. The more abundant components of the 'turf' samples (contexts marked '✓' in Table 7 and all those in Table 8) from Wellington Row, York. All items present in two or more assemblages are included, apart from some, such as 'beetles', 'charcoal' or 'mites' which are interpretatively neutral in the absence of further identification. Ab. is the sum of abundance scores recorded on the four-point semi-quantitative scale explained in the caption to Table 2.

Taxon/item	**Parts recorded**	**Ab.**	**No. samples**
Montia fontana ssp. *chondrosperma*	seeds	11	6
moss	leafless stems	10	6
Ranunculus Section *Ranunculus*	achenes	9	6
Potentilla cf. *erecta*	achenes	8	6
Carex sp(p).	nutlets	7	4
earthworm (Annelida)	egg capsules	6	5
Chenopodium album	seeds	5	4
Galeopsis Subgenus *Galeopsis*	nutlets	5	4
Gramineae	caryopses	4	4
	root/rootlet fragments	4	3
Scirpus setaceus	nutlets	4	3
Atriplex sp(p).	seeds	3	3
	charred rhizome/root fragments	3	3
Hylocomium splendens	leaf/leaves and/or shoot fragments	3	3
Prunella vulgaris	nutlets	3	3
Danthonia decumbens	caryopses	3	2
Eurhynchium praelongum	leaf/leaves and/or shoot fragments	3	2
	herbaceous detritus	3	2
Hydrocotyle vulgaris	mericarps	3	2
Rumex acetosella agg.	nutlets	3	2
Cerastium sp(p).	seeds	2	2
cf. *Aster tripolium*	achenes	2	2
cf. *Danthonia decumbens*	spikelets/fragments	2	2
Corylus avellana	nutshell	2	2

Taxon/item	Parts recorded	Ab.	No. samples
Luzula sp(p).	seeds	2	2
Polygonum persicaria	nutlets	2	2
Polytrichum sp(p).	leaf/leaves and/or shoot fragments	2	2
Ranunculus flammula	achenes	2	2

Table 10. Plant remains (and other items) from samples from three contexts from the Early Christian rath at Deer Park Farms, Co. Antrim, N. Ireland, with a 'turf' character recorded during excavation. Numbers are abundance scores on the four-point semi-quantitative scale explained in the caption to Table 2.

	Context	**398**	**2435**	**3065**	
	Sample	**130**	**827**	**1009**	**1038**
Populus sp(p).	buds and/or bud-scales	-	1	-	-
Betula sp(p).	fruits	-	1	-	-
Corylus avellana	nuts and/or nutshell fragments	1	-	-	-
	charcoal fragments	-	-	1	-
Urtica dioica	achenes	-	1	1	1
Rumex sp(p).	fruits	-	-	-	1
Ranunculus Section *Ranunculus*	achenes	-	-	1	1
R. flammula	achenes	-	1	1	2
Rubus idaeus	seeds	-	1	1	1
R. fruticosus agg.	seeds	-	-	-	1
Potentilla cf. *erecta*	achenes	-	1	1	2
Potentilla sp(p).	achenes	-	-	1	
Linum catharticum	seeds	-	-	1	
Viola sp(p).	seeds	-	1	1	1
Calluna vulgaris	root and/or basal twig fragments	-	-	-	1
Ajuga reptans	nutlets	-	1	1	1
Prunella vulgaris	nutlets	-	-	1	2
Sonchus asper	achenes	-	1	-	
Danthonia decumbens	caryopsis/es	-	-	-	1
	cleistogenes (basal sterile flowers)	-	-	-	2
	waterlogged spikelets/spikelet fragments	-	-	-	2
Scirpus setaceus	nutlets	-	-	1	
Carex sp(p).	nutlets	-	2	2	3

	Context	398	2435	3065	
	Sample	**130**	**827**	**1009**	**1038**
Sphagnum sp(p).	leaf/leaves	-	-	1	
Fissidens adianthoides	leaf/leaves and/or shoot fragments	-	-	-	1
cf. *Calliergon cuspidatum*		-	-	-	1
Pseudoscleropodium purum		-	-	-	1
Eurhynchium sp(p).		-	-	1	
	?monocot root/rhizome fragments	-	-	-	1
	?root/rootlet fragments	2	-	-	-
Cenococcum	sclerotia	1	-	-	-
	bark fragments	1	-	-	2
	basalt gravel	1	1	1	-
	charcoal	1	-	-	-
earthworms (Annelida)	egg capsules	-	2	-	1
flies (Diptera)	puparia	-	-	1	-
moss	leaf/leaves and/or shoot fragments	-	-	-	1
	peat/mor humus	-	2	2	2
	rhizome fragments	-	1	-	-
	twig fragments	1	-	1	-

Table 11(a). The more abundant plant remains (and other items) from Deer Park Farms. Ab. = abundance, here defined as the sum of abundance scores (using the four-point scale explained in the caption to Table 2) across all subsamples except spot finds and bulk-sieved samples (n=126). An indication is given of those taxa likely to have arrived with turves, both grass sods (GS) and heathland/moorland peat turves (MT), though the distinction between the two cannot be absolute.

(b) Some other taxa considered likely to represent turves but present at lower overall abundances.

(a)

Taxon/item	**Parts recorded**	**Ab.**	**No. samples (n=126)**	**GS**	**MT**
	basalt gravel	170	100	*	*
Urtica dioica	achenes	159	97		
Carex sp(p).	nutlets	143	99	*	*
Stellaria media	seeds	133	88		
	wood fragments	127	87		
	twig fragments	115	90		
	charcoal	113	88		
earthworm (Annelida)	egg capsules	93	76	*	
Rubus fruticosus agg.	seeds	91	73		
Polygonum lapathifolium	fruits	90	66		
Ranunculus flammula	achenes	90	75	*	
Rumex sp(p).	fruits	89	73		
Sonchus asper	achenes	88	68		
	bark fragments	88	63		
Ranunculus Section *Ranunculus*	achenes	82	73	*	
Betula sp(p).	fruits	81	64		
Cenococcum	sclerotia	80	60	*	
Corylus avellana	nuts and/or nutshell fragments	79	66		
Galeopsis Subgenus *Galeopsis*	nutlets	79	61		

Taxon/item	Parts recorded	Ab.	No. samples (n=126)	GS	MT
Polygonum persicaria	fruits	78	65		
Prunella vulgaris	nutlets	77	64	*	
Calluna vulgaris	shoot fragments	73	55		*
	root and/or basal twig fragments	72	44		*
Hylocomium splendens	leaf/leaves and/or shoot fragments	72	54	*	*
Hypnum cf. *cupressiforme*	leaf/leaves and/or shoot fragments	71	54	*	*
Linum usitatissimum	seeds	68	50		
Viola sp(p).	seeds	64	59		
Pteridium aquilinum	stalk fragments	58	42		
Chenopodium album	seeds	57	50		
Corylus avellana	buds and/or bud-scales	56	47		
Neckera complanata	leaf/leaves and/or shoot fragments	56	50		
flies (Diptera)	puparia	54	50		
Potentilla cf. *erecta*	achenes	52	40	*	*
Thuidium tamariscinum	leaf/leaves and/or shoot fragments	52	47	*	*
Isothecium myosuroides	leaf/leaves and/or shoot fragments	50	43		
Gramineae	waterlogged caryopsis/es	48	44		
Mammalia	burnt bone	48	46		
Lapsana communis	achenes	46	44		
Linum usitatissimum	capsule fragments	46	34		
Ajuga reptans	nutlets	45	38	*	
Betula sp(p).	buds and/or bud-scales	45	36		
Spergula arvensis	seeds	43	41		

Taxon/item	Parts recorded	Ab.	No. samples (n=126)	GS	MT
Calluna vulgaris	capsules	40	29		*

(b)

Taxon/item	Parts recorded	Ab.	No. samples (n=126)	GS	MT
Calluna vulgaris	leaves	38	32		*
Pseudoscleropodium purum	leaf/leaves and/or shoot fragments	36	34	*	*
Calluna vulgaris	flowers	34	28		*
	seeds	32	22		*
Scirpus setaceus	nutlets	28	22	*	
Erica cinerea	leaves	27	21		*
Breutelia chrysocoma	leaf/leaves and/or shoot fragments	25	21		*
Erica cinerea	seeds	23	14		*
Danthonia decumbens	caryopses	22	18	*	*
Juncus inflexus/effusus/ conglomeratus	seeds	22	17	*	
Juncus cf. *articulatus*	seeds	20	18	*	
Heterodera (Nematoda)	cysts	17	13	*	
Montia fontana ssp. *chondrosperma/M. fontana*	seeds	14	14	*	
Danthonia decumbens	spikelets/chaff	12	7	*	*
	root/rootlet fragments	10	7	*	*
Calluna vulgaris	twig fragments	8	6		*
Danthonia decumbens	cleistogenes	8	5	*	*
Pleurozium schreberi	leaf/leaves and/or shoot fragments	7	7		*
Rhytidiadelphus triquetrus	leaf/leaves and/or shoot fragments	7	7	*	

Taxon/item	Parts recorded	Ab.	No. samples (n=126)	GS	MT
Linum catharticum	seeds	7	6	*	

Table 12. Deer Park Farms: Numbers of samples and their context types for records included in correlation matrix/species association represented by Figure 1.

not given	1	occupation layer	4
		occupation surface	1
bank	1	?old soil	3
bedding	6	organic material	1
drain fill	2	pit fill	1
fill	1	post-hole	1
layer	74	spread	12
?layer	1	turfy clay	1
midden layer	1	wall fill	6

Table 13. Numbers of records and total abundance of 'core' turf group taxa (as defined at Deer Park Farms, but with the addition of Montia*) for Anglo-Scandinavian deposits at 16-22 Coppergate, York. A total of 479 subsamples from 402 contexts is represented. Ab., as before, is sum of abundance scores (here, with one exception, '1' for all records).*

Taxon/item	**Parts recorded**	**Ab.**	**No. samples (n = 479)**
Ajuga reptans	nùtlets	1	1
Danthonia decumbens	caryopses	56	55
	cleistogenes	3	3
Leontodon sp(p).	achenes	33	33
Linum catharticum	seeds	18	18
Montia fontana ssp. *chondrosperma*	seeds	14	14
Potentilla cf. *erecta*	achenes	57	57
Scirpus setaceus	nutlets	23	23

Table 14 (a). The more abundant plant remains (and other items) from a group of five samples from Period 5C pit fills at 16-22 Coppergate in which Danthonia *remains were recorded. Ab. = abundance, here defined as the sum of abundance scores (using the four-point scale explained in the caption to Table 2) across all subsamples. An indication is given of those taxa likely to have arrived with turves, both grass sods (GS) and heathland/moorland peat turves (MT), though the distinction between the two cannot be absolute.*

(b) Some other taxa considered likely to represent turves but present at lower overall abundances.

(a)

Taxon/item	**Parts recorded**	**Ab.**	**No. samples (n=5)**	**GS**	**MT**
Potentilla sp(p).	achenes	9	5	?	
Calliergon cuspidatum	leaf/leaves and/or shoot fragments	7	5	*	
Carex sp(p).	nutlets	7	5	*	*
Stellaria media	seeds	7	5		
Atriplex sp(p).	seeds	5	5		
Chenopodium album	seeds	5	5		
C. murale	seeds	5	5		
Corylus avellana	nutshell	5	5		
Danthonia decumbens	caryopses	5	5	*	*
earthworms (Annelida)	egg capsules	5	5	*	
Polygonum aviculare agg.	nutlets	5	5		
P. persicaria	nutlets	5	5		
Sambucus nigra	seeds	5	5		
Urtica urens	achenes	5	5		
Lamium Section *Lamiopsis*	nutlets	5	4		
Chenopodium Section *Pseudoblitum*	seeds	5	3		
Agrostemma githago	seeds	4	4		
Calluna vulgaris	twig fragments	4	4		*

Taxon/item	Parts recorded	Ab.	No. samples (n=5)	GS	MT
Neckera complanata	leaf/leaves and/or shoot fragments	4	4		
Polygonum lapathifolium	nutlets	4	4		
Prunella vulgaris	nutlets	4	4	*	
Ranunculus flammula	achenes	4	4	*	
R. sardous	achenes	4	4	*	
R. sceleratus	achenes	4	4		
R. Section *Ranunculus*	achenes	4	4	*	
Rubus fruticosus agg.	seeds	4	4		
Silene vulgaris	seeds	4	4	*	
Urtica dioica	achenes	4	3		
Anthemis cotula	achenes	3	3		
Chenopodium ficifolium	seeds	3	3		
Danthonia decumbens	cleistogenes	3	3	*	*
Hordeum sp(p).	charred grains	3	3		
Potentilla anserina	achenes	3	3	*	
Prunus spinosa		3	3		
Pseudoscleropodium purum	leaf/leaves and/or shoot fragments	3	3	*	*
Raphanus raphanistrum	pod segments/ fragments	3	3		
Scirpus maritimus/lacustris	nutlets	3	3		
Sonchus oleraceus	achenes	3	3		

(b)

Taxon/item	Parts recorded	Ab.	No. samples (n=5)	GS	MT
Calluna vulgaris	capsules	2	2		*
Eleocharis palustris sensu lato	nutlets	2	2	*	

Taxon/item	Parts recorded	Ab.	No. samples (n=5)	GS	MT
Eurhynchium praelongum	leaf/leaves and/or shoot fragments	2	2	*	
Hypnum cupressiforme	leaf/leaves and/or shoot fragments	2	2	*	*
Leontodon sp(p).	achenes	2	2	*	
Montia fontana ssp. *chondrosperma*	seeds	2	2	*	
Thuidium tamariscinum	leaf/leaves and/or shoot fragments	2	2	*	*
Agrostis sp(p).	caryopses	1	1	*	*
Calluna vulgaris	shoot fragments	1	1		*
cf. *Ctenidium molluscum*	leaf/leaves and/or shoot fragments	1	1	*	
cf. *Danthonia decumbens*	cleistogenes	1	1	*	*
Gramineae	caryopses	1	1	*	*
	culm-nodes	1	1	*	*
	spikelets/ fragments	1	1	*	*
Hylocomium splendens	leaf/leaves and/or shoot fragments	1	1	*	*
Hypochoeris sp(p).	achenes	1	1	*	
Linum catharticum	seeds	1	1	*	
Potentilla cf. *erecta*	achenes	1	1	*	*
Reseda lutea	seeds	1	1	*	
Rhytidiadelphus squarrosus	leaf/leaves and/or shoot fragments	1	1	*	
Scirpus setaceus	nutlets	1	1	*	

Table 15 (a). The more abundant plant remains (and other items) from selected samples from seven contexts at 16-22 Coppergate in which Leucobryum glaucum *or* Polytrichum juniperinum *were recorded (for details see Table 16). Ab. = abundance, here defined as the sum of abundance scores (using the four-point scale explained in the caption to Table 2) across all subsamples. An indication is given of those taxa likely to have arrived with turves, both grass sods (GS) and heathland/moorland peat turves (MT), though the distinction between the two cannot be absolute. Taxa marked 'C' are indicators of calcareous substrates (in contrast to the majority of the taxa in the MT column).*

(b) Some other taxa considered likely to represent turves but present at lower overall abundances.

(a)

Taxon/item	**Parts recorded**	**Ab.**	**No. samples (n = 9)**	**GS**	**MT**
Calluna vulgaris	flowers	13	8		*
Hylocomium splendens	leaf/leaves and/or shoot fragments	12	9	*	*
Pseudoscleropodium purum	leaf/leaves and/or shoot fragments	11	8	*	*
Genista tinctoria	stem fragments	10	6		
Rubia tinctorum	root fragments	10	6		
Diphasium complanatum	shoot fragments	9	6		
Calluna vulgaris	twig fragments	9	5		*
Neckera complanata	leaf/leaves and/or shoot fragments	8	7		
Hypnum cupressiforme	leaf/leaves and/or shoot fragments	8	6	*	*
Carex sp(p).	nutlets	7	7	*	*
Corylus avellana	nutshell	7	7		
Thuidium tamariscinum	leaf/leaves and/or shoot fragments	7	7	*	*
Chenopodium album	seeds	7	6		
flies (Diptera)	puparia	7	6		
Calluna vulgaris	shoot fragments	7	5		*
	capsules	7	4		*

Taxon/item	**Parts recorded**	**Ab.**	**No. samples (n = 9)**	**GS**	**MT**
Carduus/Cirsium sp(p).	achenes	6	6		
Atriplex sp(p).	seeds	6	5		
Humulus lupulus	nutlets	6	5		
Bilderdykia convolvulus	nutlets	5	5		
Leucobryum glaucum	leaf/leaves and/or shoot fragments	5	5		*
Potentilla sp(p).	achenes	4	4	?	
Ranunculus Section *Ranunculus*	achenes	5	5	*	
Raphanus raphanistrum	pod segments/ fragments	5	5		
Rumex sp(p).	nutlets	5	5		
Sambucus nigra	seeds	5	5		
Urtica urens		5	5		

(b)

Taxon/item	Parts recorded	Ab.	No. samples (n = 7)	GS	MT
Eleocharis palustris sensu lato	nutlets	4	4	*	
Ranunculus flammula	achenes	4	2	*	
Calliergon cuspidatum	leaf/leaves and/or shoot fragments	3	3	*	
Dicranum sp(p).	leaf/leaves and/or shoot fragments	3	3	*	*
earthworm (Annelida)	egg capsules	3	3	*	
Erica tetralix	leaves	3	3		*
Plagiomnium undulatum	leaf/leaves and/or shoot fragments	3	3	*	
Viola sp(p).	seeds	3	3	*	
Calluna vulgaris	root/basal twig fragments	3	2		*
	seeds	3	2		*
cf. *Ctenidium molluscum*	leaf/leaves and/or shoot fragments	2	2	*	
Erica tetralix	seeds	2	2		*
	flowers	2	2		*
Eurhynchium praelongum	leaf/leaves and/or shoot fragments	2	2	*	
Luzula sp(p).	seeds	2	2	*	
Pleurozium schreberi	leaf/leaves and/or shoot fragments	2	2		*
Polytrichum juniperinum	leaf/leaves and/or shoot fragments	2	2		*
Potentilla anserina	achenes	2	2	*	
Prunella vulgaris	nutlets	2	2	*	
Racomitrium canescens	leaf/leaves and/or shoot fragments	2	2		*
Ranunculus sardous	achenes	2	2	*	

Taxon/item	Parts recorded	Ab.	No. samples (n = 7)	GS	MT
Rhytidiadelphus squarrosus	leaf/leaves and/or shoot fragments	2	2	*	
	?*Callunetum* mor humus	2	1		*
Hypnum cf. *jutlandicum*	leaf/leaves and/or shoot fragments	2	1		*
Anomodon viticulosus	leaf/leaves and/or shoot fragments	1	1	*C	
Dicranum cf. *scoparium*	leaf/leaves and/or shoot fragments	1	1		*
Ditrichum flexicaule	leaf/leaves and/or shoot fragments	1	1	*C	
Empetrum sp(p).	seeds	1	1		*
Erica cinerea	flowers	1	1		*
E. tetralix	capsules	1	1		*
Hylocomium cf. *brevirostre*	leaf/leaves and/or shoot fragments	1	1		*
Hypochoeris sp(p).	achenes	1	1	*	
Leontodon sp(p).	achenes	1	1	*	
Montia fontana ssp. *chondrosperma*	seeds	1	1	*	
Potentilla cf. *erecta*	achenes	1	1	*	*

Table 16. Context information concerning the samples whose records are included in Table 15. Key to subsamples: M—subsample of 0.5 kg sieved to 0.3 mm; VW—bulk-sieved sample (usually of some tens of kg in weight), sieved to 1 mm, and whose residue was sorted roughly and whose washover was examined in detail. Key to dates of archaeologically-defined periods: 4B—c.930/5-c.975; 5B—c.975-early/mid 11th C.

Context	Period	Context type and tenement	Sample	Subsample
14941	5B	pit fill, C	1169	VW
15761	4B	floor, B	954	VW
20342	5B	backfill, A	1250	M
			1251	VW
			1260	M
21463	5B	external layer, D	1705	VW
21766	5B	external layer, D	1862	VW
22102	5B	pit fill, C	1359	M
34413	4B	external layer, B	2397	VW

Table 17. Plant remains from contexts at Layerthorpe Bridge, York, in which remains of turves may have been preserved: (a) taxa present in at least half of the samples from either Anglo-Scandinavian or medieval period (though it is possible that most of the contexts are of the earlier date). (b) Other taxa which might have arrived with grass sods (GS) and/or heathland/moorland peat turves (MT). Key: Ab.—sum of abundance scores (using the four-point scale explained in the caption to Table 2); NS—number of subsamples in which remains were recorded.

(a)

		A/Sc		med.			
Taxon/item	**Parts recorded**	**Ab.**	**NS (n= 9)**	**Ab.**	**NS (n=7)**	**GS**	**MT**
	bark fragments	22	8	10	4		
	sclereids (from bark)	20	6	8	4		
	charcoal	14	7	9	5		
Urtica dioica	achenes	10	6	6	5		
cf. *Calluna vulgaris*	charred root/basal twig fragments	11	6	7	5		*
U. urens	achenes	10	6	6	5		
Atriplex sp(p).	seeds	8	5	6	4		
	bone fragments	7	7	5	4		
	wood fragments	7	7	5	4		
Carex sp(p).	nutlets	7	6	6	5	*	*
Raphanus raphanistrum	pod segments/ fragments	7	6	4	4		
Anthemis cotula	achenes	7	5	8	5		
Polygonum aviculare agg.	nutlets	7	5	6	4		
Chenopodium album	seeds	6	5	7	5		
Sambucus nigra	seeds	6	5	6	5		
cf. *Calluna vulgaris*	root/basal twig fragments	6	5	4	4		*
Polygonum hydropiper	nutlets	6	5	3	3		
flies (Diptera)	puparia	6	5	3	3		
Corylus avellana	nutshell	5	5	6	5		

		A/Sc		med.			
Taxon/item	**Parts recorded**	**Ab.**	**NS (n= 9)**	**Ab.**	**NS (n=7)**	**GS**	**MT**
Linum usitatissimum	seeds	5	5	6	3		
Stellaria media	seeds	5	5	4	4		
	burnt bone fragments	5	5	4	4		
	fish bone	5	5	4	4		
	charred root/rhizome fragments	5	5	3	3	?	?
Calluna vulgaris	flowers	5	5	2	2		*
	charred herbaceous detritus	5	5	2	2		
	leather fragments	5	5	2	2		
Linum usitatissimum	capsule fragments	4	4	7	4		
Ranunculus Section *Ranunculus*	achenes	4	4	5	4	*	
Polygonum persicaria	nutlets	4	4	4	4		
Coronopus squamatus	fruits	4	3	4	4		
Calluna vulgaris	shoot fragments	3	3	5	4		*
Rumex sp(p).	nutlets	3	3	4	4		
Linum usitatissimum	stem/stem epidermis fragments	-	-	9	3		
	pottery	-	-	5	5		
Daphnia	ephippia	-	-	4	4		

(b)

		A/Sc		med.			
Taxon/item	**Parts recorded**	**Ab.**	**NS (n= 9)**	**Ab.**	**NS (n=7)**	**GS**	**MT**
Hypnum cf. *cupressiforme*	leaf/leaves and/or shoot fragments	5	4	3	3	*	*
Potentilla anserina	achenes	5	4	3	3	*	
Dicranum sp(p)., incl. *D. scoparium*	leaf/leaves and/or shoot fragments	5	4	2	2		*

		A/Sc		med.			
Taxon/item	**Parts recorded**	**Ab.**	**NS (n= 9)**	**Ab.**	**NS (n=7)**	**GS**	**MT**
Aulacomnium palustre	leaf/leaves and/or shoot fragments	5	4	1	1		*
Leucobryum glaucum	leaf/leaves and/or shoot fragments	5	3	4	3		*
Carex sp(p).	charred nutlets	4	3	-	-	*	*
earthworm (Annelida)	egg capsules	3	3	3	3	*	
Prunella vulgaris	nutlets	3	3	2	2	*	
Ranunculus sardous	achenes	3	3	2	2	*	
Calliergon cuspidatum	leaf/leaves and/or shoot fragments	3	3	1	1	*	
Calluna vulgaris	charred shoot fragments	3	3	1	1		*
Thuidium tamariscinum	leaf/leaves and/or shoot fragments	3	3	1	1	*	*
Pleurozium schreberi	leaf/leaves and/or shoot fragments	3	2	-	-		*
	charred ?*Callunetum* mor humus	3	1	-	-		*
Eleocharis palustris sensu lato	nutlets	2	2	3	3	*	
Potentilla cf. *erecta*	achenes	2	2	3	3	*	*
Calluna vulgaris	charred flowers	2	2	-	-		*
	charred shoot tips	2	2	-	-		*
Eurhynchium praelongum	leaf/leaves and/or shoot fragments	2	2	-	-	*	
Leontodon sp(p).	achenes	2	2	-	-	*	
	charred moss	2	2	-	-	*	*
	?burnt peat/mor humus	2	1	1	1		*
	root/rootlet fragments	2	1	-	-	*	*
Calluna vulgaris	capsules	1	1	2	2		*
Cenococcum	sclerotia	1	1	2	2	*	

		A/Sc		med.			
Taxon/item	**Parts recorded**	**Ab.**	**NS (n= 9)**	**Ab.**	**NS (n=7)**	**GS**	**MT**
Ranunculus flammula	achènes	1	1	2	2	*	
Calluna vulgaris	charred capsules	1	1	1	1		*
Erica tetralix	charred leaves	1	1	1	1		*
	leaves	1	1	1	1		*
	?*Callunetum* mor humus	1	1	-	-		*
Eleocharis palustris sensu lato	charred nutlets	1	1	-	-	*	
Hylocomium cf. *brevirostre*	leaf/leaves and/or shoot fragments	1	1	-	-		*
Hypochoeris sp(p).	achenes	1	1	-	-	*	
Juncus squarrosus	seeds	1	1	-	-		*
Potentilla anserina	charred achenes	1	1	-	-	*	
P. cf. *erecta*	charred achenes	1	1	-	-	*	*
Hylocomium splendens	leaf/leaves and/or shoot fragments	-	-	3	3	*	*
Calluna vulgaris	shoot tips	-	-	1	1		*
Heterodera (Nematoda)	(cysts)	-	-	1	1	*	
Luzula sp(p).	seeds	-	-	1	1	*	
Pseudoscleropodium purum	leaf/leaves and/or shoot fragments	-	-	1	1	*	*
moss	leafless stems	-	-	1	1	*	*

Table 18. Contexts at Layerthorpe Bridge, York, in which remains of turves may have been present.

Context	Dating	Context type
14	medieval	?river silt
1012	medieval	?river deposit
1029	Anglo-Scandinavian Ph 4	waterlain silt
1039	Anglo-Scandinavian Ph 3	organic deposit, ?dump [overlying later wattle revetments]
1052	Anglo-Scandinavian Ph 3	clay/clay silt E of wattle forming N-ward extension of bank
2005	Medieval	sandy river deposit
2006	Medieval	sandy river deposit
2022	Anglo-Scandinavian Ph 4	silt laid down within channel 2033
2023	Anglo-Scandinavian Ph 4	waterlain silt
2131	Anglo-Scandinavian Ph 2	peaty material, ?river deposit - substantial layer covering whole of timber structure and area of earlier channel and area to E
2160	Anglo-Scandinavian Ph 1	first waterlain dep, after constr of wattle revetment - silt in channel west of bank
2178	Anglo-Scandinavian Ph 1	organic fill of timber-lined ?sluice/overflow

Table 19. Numbers of records (by phase) for plant remains from deposits at Low Fisher Gate, Doncaster, which may represent material used for thatching or have originated in turves (including imported peat). Material was uncharred unless specified otherwise. Key to dating of periods: 2—?Anglo-Saxon;3—Norman: early 12th into 13th C.;4-7—1st half of 13th C; 8-9—mid 13th C.;10-12—late 13th/14th C.;13—first half 14th C.;15—late 14th/early 15th C.; 17—15th/16th C.;18—16th C.;19—16th-18th C.

Period	2	3	4-7	8-9	10-12	13	15	17	18	19
No. contexts sampled via one or more GBA or BS samples	1	15	45	69	46	10	21	33	9	21
No. contexts examined	1	8	27	53	29	10	21	29	8	21
Taxon and parts recorded										
Ulex sp(p).										
(immature pods and/or pod fragments)	0	0	0	0	0	0	0	1	0	0
(leaves (spines))	0	0	0	0	0	0	0	2	0	0
(leafy shoot fragments)	0	0	0	0	0	0	0	2	0	1
(leafy twig fragments)	0	0	0	0	0	0	0	2	0	0
(flowers)	0	0	0	0	0	0	0	1	0	0
Erica tetralix L. (charred leaves)	0	0	1	1	1	0	0	0	0	0
(leaves)	0	0	0	0	0	0	0	1	0	0
(charred seeds)	0	0	1	1	0	0	0	0	0	0
Erica cinerea L. (seeds)	0	0	0	1	0	0	0	2	0	0
(leaves)	0	0	0	1	0	0	0	0	0	0
Calluna vulgaris (L.) Hull (buds)	0	0	0	1	0	0	0	0	0	0
(capsules)	0	0	0	0	0	0	0	1	0	0
(charred buds)	0	0	0	1	0	0	0	0	0	0
(charred flowers)	0	0	0	1	0	0	0	0	0	0
(charred leaves)	0	0	0	1	0	0	0	0	0	0
(charred shoot fragments)	0	0	1	2	4	0	2	0	0	0
(leaves)	0	0	2	5	3	1	1	0	0	0
(root and/or basal twig fragments)	0	0	0	0	0	0	0	1	0	0
(shoot fragments)	0	0	1	1	0	0	0	1	0	0
(twig fragments)	0	0	0	0	0	0	0	1	0	0
cf. *C. vulgaris*										
(charred root and/or basal twig fragments)	0	1	9	17	20	4	9	4	1	0
(root and/or basal twig fragments)	0	0	1	0	0	0	0	3	0	0
cf. *Juncus squarrosus* L. (charred seeds)	0	0	1	3	2	0	2	1	0	0
Gramineae/'Cerealia' (waterlogged culm nodes)	0	0	0	0	0	0	0	0	0	1
(charred culm nodes)	0	1	1	5	2	1	1	0	0	0
(waterlogged culm fragments)	0	0	0	0	0	0	0	0	0	1
(charred culm fragments)	0	1	0	3	1	0	0	0	0	0
'Cerealia' (charred rachis fragments)	0	1	0	1	0	0	0	0	0	0
(waterlogged rachis fragments)	0	0	0	0	0	0	0	0	0	1
Triticum/Hordeum sp(p). (charred rachis fragments)	0	0	0	0	1	0	0	0	0	0
Hordeum sp(p). (charred rachis fragments)	0	0	0	1	1	0	0	0	0	0
cf. *Hordeum* sp(p). (charred rachis fragments)	0	0	1	0	0	0	0	0	0	0
cf. *Secale cereale* L. (charred rachis fragments)	0	1	0	0	1	0	0	0	0	0
Eriophorum vaginatum L.										
(charred sclerenchyma spindles)	0	0	1	0	1	0	0	0	0	0

Period	2	3	4-7	8-9	10-12	13	15	17	18	19
Cladium mariscus (L.) Pohl (nutlets)	0	0	0	0	0	0	0	3	0	0
(nutlets with perigynium)	0	0	0	0	0	0	0	1	0	0
(charred nutlets)	0	0	0	0	0	0	1	0	0	0
(charred leaf fragments)	0	0	0	3	2	0	0	0	0	0
Sphagnum imbricatum Hornsch. ex Russ. (leaves)	0	0	0	0	0	0	0	0	1	1
Sphagnum sp(p). (leaves)	0	1	0	0	1	0	0	0	0	1
Polytrichum sp(p). (charred shoot fragments)	0	0	1	1	0	3	0	0	0	0
For the following mosses, all the remains were leaves and/or shoot fragments										
Leucobryum glaucum (Hedw.) Ångstr.	0	0	0	0	0	0	0	1	0	0
Thuidium cf. *tamariscinum* (Hedw.) Br. Eur.	0	0	0	0	0	0	0	0	0	1
cf. *Cratoneuron commutatum* (Hedw.) Roth	0	0	0	0	0	0	0	1	0	0
Campylium stellatum (Hedw.) Lange & Jens.	0	0	0	0	0	0	0	2	0	0
Scorpidium scorpioides (Hedw.) Limpr.	0	0	0	0	0	0	0	5	0	0
Pseudoscleropodium purum (Hedw.) Fleisch	0	0	0	0	0	0	0	1	0	0
cf. *Eurhynchium* sp(p).	0	0	0	0	0	0	0	0	0	1
Hypnum cf. *cupressiforme* Hedw.	0	0	0	0	0	0	0	0	0	1
cf. *H. cupressiforme*	0	0	0	0	0	0	0	0	0	1
Rhytidiadelphus sp(p).	0	0	0	0	0	0	0	1	0	0
Pleurozium schreberi (Brid.) Mitt.	0	0	0	0	0	0	0	1	0	0
Hylocomium splendens (Hedw.) Br. Eur.	0	0	0	0	0	0	0	2	0	0

Table 20. Plant and other remains from excavations at Carr Naze, Filey Brigg, N. Yorkshire (from 24 samples from 10 contexts). All the more abundant items are included (a), together with rarer taxa which may be related to the presence of burnt turves (b). With the exception of one robber-trench fill, all the samples were from occupation deposits in the signal station courtyard. Caption abbreviations as for previous tables.

(a)

Taxon/item	**Parts recorded**	**Ab.**	**NS (n= 24)**	**GS**	**MT**
	charcoal	21	20		
snails		16	16		
cf. *Calluna vulgaris*	charred root/basal twig fragments	16	15		*

(b)

Taxon/item	**Parts recorded**	**Ab.**	**NS (n= 25)**	**GS**	**MT**
	charred root/rhizome fragments	11	11	*	*
Carex sp(p).	charred nutlets	9	9	*	*
Gramineae	charred caryopses	5	5	*	*
	charred herbaceous detritus	4+?4	3+?4	*	*
Plantago lanceolata	charred seeds	3	3	*	
Potentilla cf. *erecta*	charred achenes	1	1	*	*

Table 21. Charred plant remains from Flixborough, N. Lincolnshire. Those marked with an asterisk may well have arrived with salt-marsh or other turves. The very few records for medieval (post-Conquest) deposits are excluded, as are those for uncharred material which seems very likely to be of recent origin. Numbers of contexts in which the remains were recorded (out of a total of 386 examined for plant remains in some way) are also given, with percentage frequency in the few cases where a value of 5% or more was achieved.

GYMNOSPERMAE	
Coniferae (conifer): charcoal fragments	1
ANGIOSPERMAE	
cf. *Salix* sp(p). (?willow): charcoal fragments	5
Salix/Populus sp(p). (willow/poplar/aspen): charcoal fragments	19 (5%)
cf. *Betula* sp(p). (?birch): charcoal fragments	2
Alnus sp(p). (alder): charcoal fragments	6
Betula/Corylus (birch/hazel): charcoal fragments	3
Corylus avellana L. (hazel): charcoal fragments	27 (7%)
charred nuts and/or nutshell fragments	12
Quercus sp(p). (oak): charcoal fragments	80 (21%)
large charred wood fragments	2
cf. *Quercus* sp(p). (?oaks): charred bud and/or bud-scales	1
Cannabis sativa L. (hemp): charred achenes	1
Polygonum aviculare agg. (knotgrass): charred fruits	1
P. persicaria L. (persicaria/red shank): charred fruits	2
Bilderdykia convolvulus (L.) Dumort. (black bindweed): charred fruits or fruit fragments	3
Rumex acetosella agg. (sheep's sorrel): charred fruits	1
Rumex sp(p). (docks): charred	8
Chenopodiaceae (goosefoot family): charred seeds	4
Chenopodium album L. (fat hen): charred seeds	6
Atriplex sp(p). (oraches): charred seeds	6
**Suaeda maritima* (L.) Dumort. (annual seablite): charred seeds	1
Stellaria media (L.) Vill. (chickweed): charred seeds	1
Silene vulgaris/S. alba (Miller) Krause in Sturm (bladder/white campion): charred seeds	2
**Ranunculus sardous* Crantz (hairy buttercup): charred achenes	4
Raphanus raphanistrum L. (wild radish): charred pod segments and/or fragments	2
Rubus sp(p). (blackberries, etc.): charred seeds	1
Rubus fruticosus agg. (blackberry/bramble): charred seeds	1
**Potentilla anserina* L. (silverweed): charred achenes	1
cf. Pomoideae (?Crataegus/Malus/Pyrus/Sorbus): charcoal fragments	1
Prunus domestica ssp. *insititia* (L.) C. K. Schneider (plums, etc.): charred fruitstones	3
Leguminosae (pea family): charred pods and/or pod fragments	1
charred seeds	6
Vicia faba L. (field bean): charred cotyledons or seeds	2
cf. *Vicia* sp(p). (?vetches, etc.): charred seeds	1
cf. *Pisum sativum* L. (?garden/field pea): charred cotyledons or seeds	3
**Medicago lupulina* L. (black medick): charred pods and/or pod fragments	1
*cf. *Trifolium* sp(p). (?clovers, etc.): charred seeds	3
Linum usitatissimum L. (cultivated flax): charred seeds	3
cf. *Acer* sp(p). (?maple, etc.): charcoal fragments	2
cf. Umbelliferae (?carrot family): charred mericarps	1
cf. *Calluna vulgaris* (L.) Hull (?heather, ling): charred root and/or basal twig fragments	1
Fraxinus excelsior L. (ash): charcoal fragments	6
Galium aparine L. (goosegrass, cleavers): charred fruits	3

Galium sp(p). (bedstraws, etc.): charred fruits	1
Boraginaceae (borage family): mineralised nutlets	2
Hyoscyamus niger L. (henbane): seeds	1
**Rhinanthus* sp(p). (yellow rattles): charred seeds	1
**Plantago maritima* L. (sea plantain): charred capsules	7
charred seeds	4
**P.* cf. *lanceolata* L. (?ribwort plantain): charred seeds	1
Carduus/Cirsium sp(p). (thistles): achenes	1
Lapsana communis L. (nipplewort): charred achenes	2
**Juncus* sp(p). (rushes): charred capsules	18 (5%)
charred seeds	1
*Gramineae (grasses): charred caryopses	13
charred culm nodes	5
Gramineae/'Cerealia' (grasses/cereals): charred caryopses	1
charred culm nodes	5
'Cerealia' indet. (cereals): charred caryopses	21 (5%)
charred culm fragments	1
charred culm nodes	1
**Puccinellia maritima* (Hudson) Parl. (common saltmarsh-grass): charred culm fragments	5
*cf. *Puccinellia* sp(p). (?saltmarsh-grasses): charred caryopses	1
Bromus sp(p). (bromes, etc.): charred caryopses	4
cf. *Bromus* sp(p). (?bromes, etc.): charred caryopses	5
Triticum 'aestivo-compactum' (bread/club wheat): charred caryopses	9
T. cf. *'aestivo-compactum'* (?bread/club wheat): charred caryopses	1
Triticum sp(p). (wheats): charred caryopses	5
cf. *Triticum* sp(p). (?wheats): charred caryopses	2
Secale cereale L. (rye): charred caryopses	2
cf. *S. cereale* L. (?rye): charred caryopses	1
Hordeum sp(p). (barley): charred caryopses	15
charred caryopses, incl. hulled/sprouting	1
charred rachis fragments	1
cf. *Hordeum* sp(p). (?barley): charred caryopses	8
Avena sp(p). (oats): charred caryopses, some or all sprouting	1
cf. *Avena* sp(p). (?oats): charred caryopses	5
Scirpus maritimus L. (sea club-rush): charred nutlets	1
S. maritimus/S. lacustris s.l. (sea club-rush/bulrush): charred nutlets	1
S. lacustris s.l. (bulrush): charred nutlets	2
**Eleocharis palustris* s.l. (common spike-rush): charred nutlets	7
silicified exocarp	1
**Carex* sp(p). (sedges): charred nutlets	10

Table 22. Contexts from a variety of sites examined by the author in which at least three 'taxa' preserved by charring and perhaps brought with turves were recorded. The taxa whose records were selected for inclusion were Ajuga reptans, Calluna vulgaris *or cf.* C. vulgaris *(root-basal twig fragments)*, Carex *sp(p).*, Hypochoeris *sp(p).*, Leontodon *sp(p).*, Linum catharticum, Montia fontana sensu lato, Potentilla *cf.* erecta, *charred herbaceous detritus and charred root/rhizome fragments. Ab.—sum of abundance scores (using four-point scale explained in the caption to Table 2). Contexts from sites of rural character are indicated by an asterisk; the remainder are essentially urban.*

Site	Context	Context information	Date (all AD)	Ab.	No. taxa
Bedern (Vicars Choral), north-east, York	4047	pit fill	mid 15th-early 17th C	3	3
Cooper Farm, Long Riston, nr Beverley, East Riding of Yorkshire	72*	ditch fill	11th-13th C	3	3
16-22 Coppergate, York	7257	floor	*c.* AD975-early-mid 11th C	3	3
Flixborough, N. Lincs.	5983*	dump	mid 8th-early 9th C	3	3
Kingswood II, nr Hull	184*	ditch fill/riverbank slope/edge	early Romano-British	4	3
Magistrates' Courts, Hull	2016	layer	medieval	4	3
Sherburn, N. Yorkshire	1005*	ditch fill	12th-13th C	4	3
TSEP site 218: NE of High Catton, E. Riding of Yorkshire	1003*	upper fill of ditch 1005	4th C	3	3
	1025*	fill of oven/drying kiln base		3	4
TSEP site 901: S of Ganstead, E. Riding of Yorkshire	4030*	ditch fill	?	3	4
41-9 Walmgate ('Time Team' site), York	1005	black humic layer	Anglo-Scandinavian	3	3
	1035	fill of small cut 1036		4	3
118-26 Walmgate, York	3405	floor	11th-13th C	5	3
West Lilling, N. Yorkshire (BP Pipeline)	2025*	fill	Roman/ Romano-British	3	3
	6150*	fill in 6151		3	3
	6161*	fill in 6160		3	3
	6289*	fill in 6290		3	3

Table 23. Contexts from a variety of sites examined by the author in which at least five 'taxa' preserved by waterlogging and perhaps brought with turves were recorded. The taxa whose records were selected were Ajuga reptans, Calluna vulgaris *or cf.* C. vulgaris *(root-basal twig fragments)*, Carex *sp(p).*, Danthonia, Hypochoeris *sp(p).*, Leontodon *sp(p).*, Linum catharticum, Montia fontana sensu lato, Potentilla *cf.* erecta, Scirpus setaceus, *charred herbaceous detritus and charred root/rhizome fragments. Ab.—sum of abundance scores (using four-point scale explained in the caption to Table 2). Contexts from sites of rural character are indicated by an asterisk; the remainder are essentially urban.*

Site	Context	Context information	Date (all AD)	Ab.	No. taxa
(site adjacent to) 1-5 Aldwark, York	646	bank (1st phase) (lens of peat/brushwood)	11th C	5	5
7-9 Aldwark, York	142	fill in pit 137	?Anglo-Scandinavian	8	5
	143			5	5
Bedern (Area IV), York	1702	well fill	mid 2nd-mid 3rd C	10	5
	1703			9	6
	1706			6	6
Blanket Row, Hull	2539	secondary fill of pit 2542	14th C	7	5
16-22 Coppergate, York	19271	pit fill	11th C	5	5
Cumbria Art College, Stanwix, Carlisle	122*	old ground surface under clay dump	?Roman	6	5
Dominican Priory, Beverley	229	pit fill (above 231)	?12th-14th C	6	5
Magistrates' Courts, Hull	1457	organic rich levelling or occupation debris	13th-14th C	7	6
North Cave, E. Riding of Yorkshire	263*	well fill	1st C	7	5
North Street, York	1459	silt sand and organic build-up	late 2nd C	6	5
22 Piccadilly (ABC Cinema), York	2278	build-up	early-mid 11th C	5	5
5 Rougier Street, York	1329	channel-fill	mid-late 2nd C	5	5
	1373			6	5
	1381			6	5
	1383			5	5
	1399			6	5
	1408			7	7

Site	Context	Context information	Date (all AD)	Ab.	No. taxa
24-30 Tanner Row (General Accident Extension), York	1408	organic accumulation over metalled surface	mid-late 2nd C	10	6
	1422	post-natural ground surface	mid 2nd C	6	6
	2261	build-up	mid-late 2nd C	8	6
	2262		late 2nd C	7	5
	2270			12	5
	2351			8	6
	2361		mid-late 2nd C	5	5
	2419			11	6
	4156	well fill	early-mid 3rd C	5	5
	4207	pit fill	late 2nd C	6	5
	4254	pit fill		7	5
Walmgate (118-26), York	3468	pit fill	10th C	5	5
West Lilling, N. Yorkshire (BP Pipeline)	2025*	?ditch fill	Roman/ Romano-British	7	6
	6289*	fill in feature 6290 (?ditch fill)		6	6

Table 24. Records further to those in Table 22 where the number of 'turf' taxa recorded was four, and also excluding records for Leontodon *and* Hypochoeris. *Contexts already entered in Table 23 are not included here even if they score four taxa through the exclusion of these two taxa. All other conventions as for Table 23.*

Site	Context	Context information	Date (all AD)	Ab.	No. taxa
Adams Hydraulics, Phases I-III, York	11045	ditch fill	early 3rd C	5	4
16-22 Coppergate, York	6471	pit fill	*c.* AD975-early/mid 11th C	4	4
	19288	pit fill	11th C	4	4
	31061	pit fill	mid 9th-early 10th C	4	4
5-7 Coppergate (Hardings/Habitat), York	402	occupation deposits	?Anglo-Scandinavian	4	4
Dowbridge Close. Kirkham, Lancashire	216*	fill of linear feature (three separate assemblages)	Roman	9	4
				6	4
				5	4
	330*	fill of linear feature		5	4
Leven/Brandesburton bypass, E. Riding of Yorkshire	351*	fill from sump 350	?3rd C	4	4
Lurk Lane, Beverley	1234*	secondary fill of ditch 1242	early 9th-early 10th C	5	4
Piccadilly (22) (ABC Cinema), York	2230	build-up	early-mid 11th C	4	4
Skeldergate (58-9) (buried soil), York	2356*	buried soil	1st-2nd C	4	4
TSEP site 218: NE of High Catton, E. Riding of Yorkshire	1025*	fill of oven/drying kiln base	4th C	4	4
TSEP site 901: S of Ganstead, E. Riding of Yorkshire	4030*	ditch fill	Romano-British	5	4
24-30 Tanner Row (General Accident Extension), York	1389	organic accumulation	late 2nd C	4	4
	2345	layer	late 2nd C	6	4
	2408			4	4
	2417	fill of ditch		4	4

Site	Context	Context information	Date (all AD)	Ab.	No. taxa
	3042	pit fill	12th-13th C	5	4
	4202	levelling deposit	late 2nd C	7	4
	4228	layer respecting timber-lined drain		5	4
Wellington Row (Stakis Hotel), York	4197	turf	1st-early 2nd C	8	4
	4198			4	4
	72233	pit fill	mid-late 2nd C	7	4

Table 25. Sites in the ABCD with ***two or more*** *of the following plants recorded as charred remains from prehistoric and later deposits:* Carex *sp(p) (C).,* Danthonia decumbens *(D),* Montia fontana *and sspp. (M), and* Potentilla *(cf.)* erecta *(P), sorted by site name. Names of sites with greatest prominence of these remains are emboldened. Records of* Carex *marked 'X' include specimens identified to one or more grassland/moorland species which might be imported with turves. x indicates cases where there are abundant remains (many tens of specimens) though no attempt has been made to relate these to* concentrations *in samples and some are combined numbers from several or many samples from a single phase. BA: Bronze Age; IA: Iron Age; RB: Romano-British. ABCD 'lists' are separate sets of records for individual contexts or groups of contexts (where amalgamated for a phase or period within the archaeological sequence) and will not represent the plant material from the same quantities of deposit.*

ABCD Site name	**Location**	**County/ Region (1974-96)**	**Type of site and contexts**	**Date of assemblage**	**No. ABCD lists**	**C**	**D**	**M**	**P**
Asheldham Camp 85	Dengie Peninsula	Essex	post hole & pit fills, debris of a burnt down granary	Early IA	1	x		x	
Ashville Estate 74-6	Abingdon	Oxfordshire	rural settlement, pit & ditch fills	Middle IA	4	X		x	
				RB	1	x		x	
Bierton	Vale of Aylesbury	Buckinghamshire	occupation deposits	Late IA	1	x		x	
Bonny Grove Farm 92	nr Middlesbrough	Cleveland	farmstead, feature fills	RB	1	x	x		
Borough High St (199)	Southwark	London	ditch fill	Roman	1	x	x		
Brough of Birsay 74-82	Orkney (Mainland)	Orkney (Scotland)	settlement ?monastic, features	Norse/Early med.	1	x		x	x
			settlement, ?monastic features	Norse	1	x		x	x
Brough Rd 76-82	Birsay, Orkney		?	later Pictish/ early Viking	1	x		x	

ABCD Site name	Location	County/ Region (1974-96)	Type of site and contexts	Date of assemblage	No. ABCD lists	C	D	M	P
Brough St Giles 88-90	nr Brompton-on-Swale, Richmond	North Yorkshire	?feature fills	IA	1	x	x		
			hospital	four phases within period late 12th-mid 17th c.	4	x	x		
Bu	Orkney	Orkney (Scotland)	broch, floor layers/middens	IA	1	X		x	x
Cefn Graeanog 77	Clynnog, Lleyn Peninsula	Gwynedd (Wales)	farmstead, floor layers/occupation	medieval	1	x	x		
Chester House 85	nr Acklington	Northumberland	occupation site, feature fills	IA/RB	1	X	x		
Church Chare 90-1	Chester-le-Street	Durham	fort, fills and layers	Roman (late 3rd/early 4th c. AD)	1	x	x		
Church Close 84-5 (medieval)	Hartlepool	Cleveland	settlement, ditch fills	early-mid 13th c.	1	x	x		
Crown Court 85-6	Newcastle upon Tyne	Tyne & Wear	quayside settlement, spreads, fills, hearths	15th-16th c.	1	x	x		
Dalton Parlours 76	Collingham, nr Wetherby	West Yorkshire	villa, building fill	Roman (3rd-mid-late 4th c.)	1	x	x		
Dod Law West	nr Wooler	Northumberland	hillfort, rampart layers	IA	1	X	x	x	x

ABCD Site name	Location	County/ Region (1974-96)	Type of site and contexts	Date of assemblage	No. ABCD lists	C	D	M	P
Dragonby 64-73	nr Scunthorpe	Humberside	settlement, mostly pit & ditch fills	Late IA (*c* AD10-45)	2	X	x	x	
				Late IA (*c*100BC-*c*AD10)	1	X	x	x	x
			settlement, mostly fills	Roman (*c*10-300 AD)	1	X	x		
			settlement, well fills		1	X		x	
Dubby Sike 84	Upper Teesdale	Durham	settlement with stone structures; pit & feature fills, layers	Late IA/Roman	1	X		x	
Dunstons Clump 81	Babworth, nr East Retford	Nottinghamshire	settlement enclosure, pit/post hole fills	IA/RB	1	x	x		
Erw-wen 80-1	near Harlech	Gwynedd (Wales)	roundhouse, drain fill, hearth pit fill	?neolithic	1	x		x	
Eston Nab 84-7	Eston, Middlesbrough	Cleveland	enclosures	IA	1	x	x	x	
Hallshill 81-6	nr East Woodburn	Northumberland	roundhouse, posthole, pit fills & hearth	later BA	1	x	x		
Holland 79	nr Kirkwall, Mainland	Orkney (Scotland)	barrow	BA	1	x		x	
Kirkby Thore 83	nr Appleby	Cumbria	fort, feature fills	Roman (2nd c. AD)	1	X	x		

ABCD Site name	Location	County/ Region (1974-96)	Type of site and contexts	Date of assemblage	No. ABCD lists	C	D	M	P
Lofts Farm 84-5	Heybridge, Blackwater Estuary	Essex	double ditched enclosure, feature fills	neolithic	1	x		x	
Maiden Castle 85-6 (a)	nr Dorchester	Dorset	hillfort/occupation	not closely dated: Neo-lithic to IA	1	x	x	x	
Mavis Grind 78-9	Shetland	Shetland (Scotland)	house	Late BA/ Early IA	1	x	x		
Moel y Gerddi 80-1	near Harlech	Gwynedd (Wales)	circular settlement, feature fills	neolithic	1	x			x
Murton High Crags	nr Berwick-upon-Tweed	Northumberland	domestic settlement, fills and layers	Late IA	1	X	x		x
Rock Castle 87	Gilling West, nr Richmond	North Yorkshire	ditched enclosure, ditch and pit fills	IA/RB	1	X	x	x	x
Rougier St (5) 81	York	North Yorkshire	massive accumulation of burnt grain across whole trench	Roman (late 2nd c AD)	1	x		x	
Scotch Corner 95	Catterick/Richmond	North Yorkshire	settlement, fills of ditches	Late IA (1st cAD)	1	x	x		
South Shields Fort	South Shields	Tyne & Wear	fort, layer (probably represents spillage from granary through cracks in the floor)	Roman (3rd c. AD)	1	X	x	x	x
			fort, layer		1	X	x	x	x
			fort, well fills in *vicus*	Roman, 4th c.	1	X	x		

ABCD Site name	Location	County/ Region (1974-96)	Type of site and contexts	Date of assemblage	No. ABCD lists	C	D	M	P
Stanwick 84-9	nr Catterick	North Yorkshire	fortified occupation, fills, layers	Late IA/RB	1	X	x	x	x
Thirlings 73-81	nr Wooler	Northumberland	settlement, pit fills	late neolithic	1	x		x	
Thornbrough 83-4	nr Corbridge	Northumberland	native settlement, mostly fills	late RB	1	X	x	x	x
Thorpe Thewles 80-2	nr Stockton-on-Tees	Cleveland	rural settlement	Late IA	1	X	x	x	x
Watkins Farm	Northmoor, nr Oxford	Oxfordshire	settlement	IA	1	x		x	
West Stow 65-72 (Saxon)	nr Bury St Edmunds	Suffolk	refuse disposal	Roman	1	x		x	
			'SFB'	Saxon	1	x		x	
Wytch Farm Oilfield sites:	Isle of Purbeck	Dorset							
Ower Farm			midden	medieval	1	x		x	
Ower Peninsular			miscellaneous	Late IA/RB	1	x		x	
West Creech			pit and gully fills	Mid-late IA	1	x		x	

Table 26. Taxa recorded in assemblages with the 'core' group of taxa in Table 25 (prehistoric sites only): the list, for taxa present in 20 or more lists in the ABCD, represents the top 10% of the individual taxon/part/preservation records and is presented in descending order. All the remains were charred, and all were propagules unless otherwise indicated. Taxa which may be interpretatively significant in respect of turves are shown in bold.

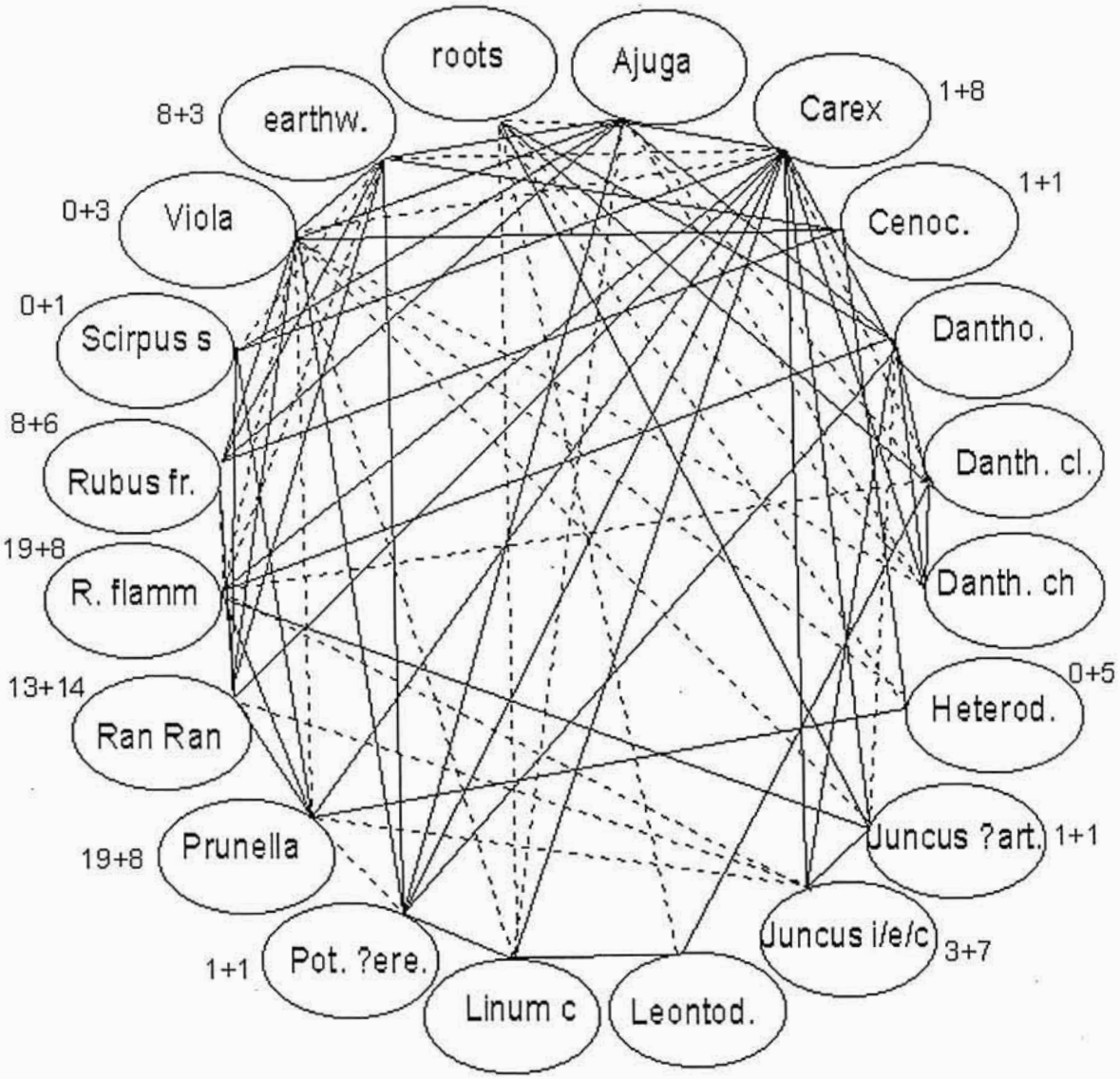
Gramineae	150	**Potentilla cf. erecta**	41
Carex sp.	126	Raphanus raphanistrum (pods/segments)	41
Rumex sp.	108	**Carex pilulifera**	40
Cerealia	106	Triticum dicoccon (glume-bases)	39
Triticum sp.	106	**Gramineae (rhizome fragments)**	36
Rumex acetosella agg.	94	Hordeum vulgare (rachis internodes)	36
Bilderdykia convolvulus	88	**Juncus squarrosus**	36
Avena sp.	87	**Ranunculus flammula**	36
Plantago lanceolata	86	**Empetrum nigrum**	35
Chenopodium album	84	Triticum sp. (brittle rachis internodes)	34
Stellaria media	78	Avena sp. (awns)	32
Corylus avellana (nutshell)	76	**Ranunculus Section Ranunculus**	32
Polygonum aviculare agg.	72	Galium sp.	30
Lathyrus/Vicia sp.	71	**Ranunculus repens**	30
Hordeum vulgare	70	**Calluna vulgaris (flowers)**	29
Chenopodium sp.	65	Matricaria maritima	29
Hordeum sp.	64	Urtica urens	29
Galium aparine	61	**Prunella vulgaris**	28
Triticum spelta (glume-bases)	60	Compositae	27
Leguminosae	59	**Trifolium sp.**	27
Triticum spelta	59	Triticum sp. (glumes)	27
Danthonia decumbens	57	Brassica sp.	26
Bromus hordeaceus ssp. hordeaceus/secalinus	56	Caryophyllaceae	25
Montia fontana ssp. chondrosperma	55	Odontites verna	25
Calluna vulgaris (leaves)	54	Valerianella dentata	25
Triticum sp. (glume-bases)	54	**Calluna vulgaris**	24
Chenopodiaceae	53	Cerealia (chaff)	24
Polygonum sp.	51	Galium palustre	24
Polygonum lapathifolium/persicaria	48	Hyoscyamus niger	24
Spergula arvensis	47	Triticum aestivo-compactum	23
Cerealia (culm fragments)	46	**Eleocharis sp.**	22
Polygonum lapathifolium	46	Avena sp. (floret-bases)	21
Atriplex sp.	44	Rosa sp.	21
Juncus sp.	44	Solanum nigrum	21
Polygonum persicaria	44	**Carex pulicaris**	20
Triticum dicoccon	44	Cyperaceae	20

Table 27. Taxa recorded in assemblages with the 'core' group of taxa in Table 25 (post-prehistoric sites only): the list, for taxa present in 20 or more lists in the ABCD, represents the top 10% of the individual taxon/part/preservation records and is presented in descending order. All the remains were charred, and all were propagules unless otherwise indicated. Taxa which may be interpretatively significant in respect of turves are shown in bold.

Gramineae	139	Chenopodiaceae	34
Carex sp.	129	Stellaria media	34
Avena sp.	107	Compositae	32
Cerealia	91	Polygonum aviculare agg.	30
Triticum sp.	87	Raphanus raphanistrum	29
Rumex sp.	77	Spergula arvensis	29
Leguminosae	75	Triticum spelta	29
Hordeum sp.	71	Cerealia (culm fragments)	28
Plantago lanceolata	69	**Ranunculus flammula**	28
Hordeum vulgare	58	Triticum sp. (brittle rachis internodes)	26
Corylus avellana (nutshell)	56	Hordeum sp. (rachis internodes)	24
Galium aparine	56	Polygonum lapathifolium	24
Rumex acetosella agg.	56	Bromus sp.	23
Danthonia decumbens	53	**Calluna vulgaris (flowers)**	22
Bilderdykia convolvulus	52	Cruciferae	22
Chenopodium album	51	Hordeum vulgare (rachis internodes)	22
Agrostemma githago	49	Triticum cf. aestivo-compactum	22
Chenopodium sp.	48	Avena sp. (awns)	21
Triticum spelta (glume-bases)	45	**Carex pilulifera**	**21**
Bromus hordeaceus ssp. hordeaceus/secalinus	43	Caryophyllaceae	21
Secale cereale	40	**Prunella vulgaris**	**21**
Triticum sp. (glume-bases)	40	Triticum aestivum	21
Lathyrus/Vicia sp.	39	**Eleocharis sp.**	**20**
Anthemis cotula	36	Matricaria perforata	20
Montia fontana ssp. chondrosperma	36	Raphanus raphanistrum (pods/segments)	20
Atriplex sp.	35	Triticum aestivo-compactum	20

Figure 1. Constellation diagram showing the pairwise co-occurrences (using Spearman's rank order correlation as a measure) of a group of taxa which seem likely to have arrived in grass sods, from deposits at Deer Park Farms, Co. Antrim, N. Ireland.

Lines connecting taxa represent the strongest correlations ($P \leq 0.001$), with pecked lines representing cases where $0.01 \leq P > 0.001$. The numbers indicate the additional strong correlations (using the same two criteria of P values) to other taxa, not shown in the diagram. The abbreviations for taxa names are as follows: Cenoc.—Cencoccum *(sclerotia); Dantho.*—Danthonia *(caryopses); Danth. cl.*—Danthonia *(cleistogenes); Danth. ch.*—Danthonia *(chaff and spikelets); Heterod.*—Heterodera *(cysts); Juncus art*—Juncus *cf.* articulatus*; Juncus i/e/c*—Juncus inflexus/effusus/conglomeratus*; Leontod.*—Leontodon *sp(p).; Linum c.*—Linum catharticum*; Pot. ?ere.*—Potentilla *cf.* erecta*; Ran Ran*—Ranunculus *Section* Ranunculus*; R. flamm*—R. flammula*; Rubus fr.*—Rubus fruticosus *agg.; Scirpus s*—Scirpus setaceus*; earthw.—earthworm (egg capsules).*



Appendix. Some published examples (not an exhaustive list!) of the recognition of turves in archaeological deposits, including those in which plant macrofossil evidence has been investigated

The entries (arranged chronologically) follow this format:

- *Site name, location, date of excavation, and Grid Reference, where known (post-1996 Local Government re-organisation county/region/district names are used; country is given only when not a site in England)*
- *Nature of archaeological evidence*
- *Results of study of plant macrofossils (if any)*
- *Results of study of other biological remains or of sediments (if any)*

Plant names follow Smith (1978) or Tutin et al. *(1964-90) and have been altered from the original text if necessary.*

Neolithic

SILBURY HILL, WILTSHIRE, 1968-9 (SU 100 685)

Williams (1976) examined material from 'a heap of stacked turves at the centre of the mound.' At least nine moss taxa, mainly *Pseudoscleropodium purum* and *Rhytidiadelphus squarrosus*, with some *Calliergon (Acrocladium) cuspidatum* recorded. These are all consistent with collection of turves from chalk grassland.

GIANTS' HILLS 2 LONG BARROW, SKENDLEBY, LINCOLNSHIRE (TF 429 709)

Evans and Simpson (1991) describe the primary fill of the main ditch surrounding the mound as a coarse and variable chalk rubble with turves derived from the pre-mound soil, generally thicker in the deeper and narrower segments of the ditch; a sample of turf from this layer contained 'a sparse [molluscan] assemblage, clearly indicative of derivation from the pre-barrow soil'. No analysis of plant remains.

SCORD OF BROUSTER, SHETLAND, SCOTLAND, 1977-9 (HU 256 517)

Milles (1986) examined a sample from the construction phase of House 2 ('wall matrix NW side' and 'wall core'). This was described as containing charcoal of *Erica*, *Calluna*, grass stem and rhizomes and cereal grains by Gordon Hillman, who determined the material prior to radiocarbon dating (date was 2440±80bc, CAR-252); Milles treats non-cereal remains in charred plant assemblages (following Hillman) as (i) contaminants of cereal crop; (ii) plants brought as, for example, roofing, bedding, fuel, basketry, matting, decoration and food; and (iii) casual arrivals on feet and clothing (and draws some comparisons with material from a single sample from a cache of grain at Ness of Gruting, where some similar non-crop plants were recorded, albeit in very small amounts).

DALLADIES, FETTERCAIRN, KINCARDINESHIRE, SCOTLAND (NO 627 673)

Piggott (1974, 27ff.) discusses the use of turves at Dalladies, and more generally in early prehistoric monuments: 'At an early stage in the excavation of [the mound in] Cuttings 12 and 14 the superficial appearance of the fine-grained laminated mound material, showing horizontal banding of yellow-brown and grey-white layers, or, alternatively of dark grey or black masses of similar structure in cross-section, immediately suggested a stack of turf, and in places of burnt turf, consonant with the fact that flanking ditch-quarries had not been found. This

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impression was confirmed in detail by a pedological examination carried out by soil-scientists from the Macaulay Institute of Research, Aberdeen .... They concluded ... that the mound 'had been constructed of stacked-up turves presumably cut from the surface round about the site' and that there were 'patches of gravelly material, as well as of stone-free turf, indicating the turf layer on the ground was variable in depth, but nowhere very thick': individual turfs averaged about 12-15 cm thick in their compressed state. The blackening of some of the layers of stacked turfs was due to dust and small fragments of wood charcoal, identifiable as Oak (*Quercus* sp.) in 'an intimately mixed mineral/humus A horizon', and in both the mound material, and in the buried soil on which it had been built, the circumstances indicate 'that the surface distribution of charcoal and slight translocation of the clay took place before the turf was cut to construct the barrow' over a short time interval that might however have had a minimum duration of a dozen years. In sum, the situation is interpreted as that of 'a brown podsol forest soil developed under deciduous woodland in which oak was an important component' (although scanty pollen grains also attest alder.. and birch ... with fern spores as well) which had been cleared by a process involving fire - some sort of 'slash-and-burn' or *Brandwirtschaft*.

'Traces of the original ground surface survived under the mound, with a profile similar to that of the turf used in its construction, 'but the A/B horizon merges rapidly into more ochreous, very stony material' 'rather closer to the original ground surface than the condition of the stacked turf would have led one to expect had the profile remained subsequent to burial'. This modification, it is suggested, could have come about 'by the action of a rising water table in the underlying terrace gravels', for the modern water table has been drastically lowered by agricultural change and the gravel working itself ... the old land surface was examined for land mollusca by Dr J G Evans, but with negative results.

(p. 41) 'A word may be said about the use of horizontally laid turf as mound material, demonstrated at Dalladies and to be suspected at [three other sites] and elsewhere where 'earth' rather than stones constitute the mound and there are no signs of flanking quarry-ditches, which in fact have not been recorded at any Scottish long barrow. The technique of stripping turf and top-soil from an extensive but shallow area is in fact analogous to the surface quarrying of oolite slabs from the uppermost levels of the rock in the Cotswolds, and recent excavations have shown its widespread use in fourth- or third-millennium monuments, as well as its well-known use in second-millennium (Bronze Age) barrows. ... In Scotland, the Pitnacree round barrow with a mortuary structure akin to Dalladies, and a C14 date of *c.* 2860 bc, has a make-up largely of turf, some of it forming grey stained layers, and the old land surface appeared to have been cultivated ... In Ireland it was used extensively at the passage-grave of Newgrange, where the turf had been cut from land left fallow after cereal cultivation, with dates around 2500 bc .... Turf was also used for part of the mound at Knowth ... and more extensively at Fourknocks .... And in yet another passage-grave, Barclodiad y Gawres in Anglesey, sods of a marsh peat were used ....

Neolithic/Beaker

NEWGRANGE, CO. MEATH, IRELAND, 1962-75 (O'Kelly (1982) and reports by Groenman-van Waateringe and Pals, and by Monk [and Williams], therein)

p. 71 'The old turf and humus layer [under the monument], much compressed and blue-black in colour, was clearly visible under the redeposited turves and an old turf line was visible also in the part of the cutting not covered by them. The kerbstones were set in sockets dug in the turves and were packed with boulders as elsewhere. The slabs in question are all heavy ones, estimated to weigh from 2 to 7 tonnes apiece, and it seems inconceivable that such could have been set into a freshly laid loose and soft layer of sods, because any attempt to do this would have so disturbed the individual sods of turf that they would no longer be recognizable in plan or profile. In fact they showed no such disturbance, which must mean that the stones were set up when the turves were already consolidated, that is to say, into an existing turf mound ....'

p. 85 'the cuttings on the south side [of the cairn] showed that the mound had a layered structure consisting of stones interspersed with layers of turves ... in the lower layers the individual turves were clearly identifiable, both horizontally as well as in section, though of course they were very much compressed ... The turves varied in colour from place to place, probably owing to the differences in the soil and vegetation of the areas from which they were cut. The vegetational surfaces were seen in section as dark-grey to black streaks of varying thicknesses depending

on the amount and nature of the vegetation growing on them at the time they were cut and the amount of compression that had subsequently taken place. The clods of topsoil making up the bodies of individual turves varied in colour from a light blue-grey to almost white, and in certain cases where the content of organic matter was very high, there were marked bright blue streaks of vivianite resulting from chemical changes which took place long after the turves had been deposited .... It could be seen also that most of the turves were laid with the vegetational surfaces upward. They were mainly small in area, approximately 30 x 40 cm, but there were many long turves 60 to 70 cm in length, and there were also lengths of 2 to 2.5 m. These latter must have been rolled up when cut and unrolled when brought into position.'

p. 91 'Forty-two separate layers of turves could be counted at this point [the innermost part of the cutting behind kerbstone K53, on the N side of the monument], representing, if our experiments at cutting turves were reasonably accurate, an original minimum thickness of *c.* 4.2 m for the turf mound at this point. When blocks of the turves were cut out they could be easily separated into individual turves along the vegetation streaks and it was surprising to find these were still almost as green as when the turves were cut. Left exposed to the air, however, the vegetation quickly changed colour from green to dark brown. Mosses, grasses and leaves were clearly visible, though pressed flat. A C14 date of 2530±60 has been obtained from this vegetation.'

Two samples gave evidence for macrofossil plant remains. One, analysed by Pals, yielded some remains from weeds of disturbed places but most were from damp pastures, notably *Montia fontana* ssp. *chondrosperma*, but also *Potentilla erecta*. The material examined by Monk and Williams included moss (mostly *Brachythecium rutabulum*) with moderate numbers of seeds of *Ranunculus* Section *Ranunculus* and *Montia* (here identified as *M.* cf. *fontana*). Both assemblages were unusual [in the present author's experience] in containing moderate numbers of fruits of dandelion (*Taraxacum officinale* agg.). This taxon is—in contrast to its abundance in modern vegetation in the British Isles—rather rare in the fossil record and this rarity seems unlikely to be a function of non-preservation or non-recognition. The Newgrange records seem to be amongst the largest concentrations of remains of this plant to date!

Of the many samples taken for pollen analysis, only seven yielded assemblages which were not too corroded to be useful; there was differential preservation in most, resulting in an over-representation of *Alnus*; spectra indicated an open landscape with evidence from cereal pollen for arable agriculture, plus some taxa from nearby wetlands.

KNOWTH, CO. MEATH, IRELAND

Eogan (1984, pp. 44-5) reported that 'the outer part of the mound is of more complex construction. Its basal layer consisted of redeposited sods, except for an area on the eastern side.... Professor Mitchell considers that these sods were stripped from grassland that had a liberal scattering of nongraminaceous [*sic*] species. Here and there, pieces of twigs were mixed through the sods, suggesting that some of them came from an area with scrub vegetation.. The sods must have been dug by a wooden spade. In certain instances they were thickly cut, up to 15 cm, and some of the underlying shale is attached. Most were laid horizontally with the humus portions face-to-face, but in places they lie at an angle, possibly due to the manner in which they were tipped.'

Analysis of plant remains (by Groenman-van Waateringe and Pals) concentrated on pollen, with only a few macrofossil remains of rather small interpretative value being recorded.

TOFTS NESS, SANDAY, ORKNEY, SCOTLAND

Bull *et al.* (1999) identified grass turves as material contributing to anthropogenic soils, on the basis of analysis of lipid biomarkers.

Bronze Age

WEST HEATH, HARTING, EAST SUSSEX, 1973-5

Drewett (1976) reports on samples from a 'turf stack' (and hearth underneath it), from Barrow IV, which was radiocarbon dated. Charcoal analyses by Cartwright recorded alder and pine from the turf stack and there were additional analyses of pollen (by Baigent) and mites (by Denford).

SHEEPLAYS BARROWS, GLAMORGAN, WALES

Fox (1941, 98ff.) described a series of (probably Middle) Bronze Age barrows with a curious construction: 'around a primary cremation burial [in Sheeplays 293'] ... was a series of concentric circles of stake holes. Within the structural frame which these holes imply a turf-stack of peculiar form was erected. Subsequent to partial collapse, a casing of soil was heaped up against the stack, completing the structure of which the basal portion survives today. ... the central portion of the barrow ... was composed of clayey turf, grey and orange and black .... Hyde (p. 127) described plant remains from these structures, mainly charcoal, but also some 'carbonized grass stalks' occurring as 'black needle-like bodies ... up to about 1 mm [in diameter]', though these were from the urn in this barrow, rather than from overlying turves.

LETTERSTON, PEMBROKESHIRE, WALES

Savory (1948, 75) noted that 'the sections through barrow II revealed almost everywhere a laminated structure, with layers of grey clay or sand 2 to 6 in. [5 to 15 cm] thick, alternating with carbonaceous streaks about ⅓ in. [8 mm] thick—a structure which has commonly been attributed to the use of layers of sods.' Analyses of plant remains were limited to small amounts of charcoal.

LINGA FIOLD, WEST MAINLAND, ORKNEY, SCOTLAND (HY 264 153)

Pollen spectra from burnt cist fill materials from two mounds excavated at a Bronze Age Cemetery were characterised by high percentages of *Calluna* and *Plantago lanceolata*, which Bunting *et al.* (2001, 498) interpreted as 'reflecting components of the fuel of these pyres, and suggest this fuel included turves or peat blocks', these two taxa indicating several turf sources since they would not normally grow together. This is supported by unpublished data from other contexts at the site where plant macrofossils representing partly and completely combusted turf materials have been recorded.

Late Bronze Age/Early Iron Age

CLADH HALLAN, S. UIST, WESTERN ISLES, SCOTLAND

Unpublished material cited by Marshall *et al.* on a now defunct web page: reports on sunken-floored dwellings, each about 6m in diameter, dug into the calcareous sand of South Uist's west coast, with internal walls of stone and sharing an unusual continuous 'party wall' of turf and sand between each roundhouse.

Iron Age

HOWE, ORKNEY, SCOTLAND, 1978-82

Deposits associated with broch. Dickson (1994) reported (p. 137) that some samples contained [charred] seeds of several species of heathy turf plants and it seemed likely that these represented burnt turf. To test this hypothesis, turves from Orkney heaths were collected and samples broken up and sieved in the laboratory. Many heather stems and roots, occasional sedge rhizomes and seeds of heather, crowberry, bell heather, sedges, tormentil and woodrush were recognised, together with a megaspore of lesser clubmoss [*Selaginella*]. As some of these species are exclusive to heaths in Orkney [i.e. not found in other types of vegetation in the islands], it seems highly probable that the seeds and other associated remains such as heather stems derive from burnt turves.

Remains of turf plants were found from Later Phase 7, from a broch kiln, a floor around a hearth and an earth floor; it seems probable that the first two at least were used as fuel. Early and Later Phase 8 hearth and floor deposits contained remains of both turf plants and peat. This could be an early example of the use of turves as back peats [blocks arranged over a fire to prevent it from going out].

BORNISH, S. UIST, WESTERN ISLES, SCOTLAND

Unpublished material by N. Sharples, posted on web site 2001: 'One large 4th-6th century wheelhouse had caught fire, and its turf-covered roof crashed to the floor turning the smouldering roof-beams underneath to charcoal.'

MINGIES DITCH, OXFORDSHIRE 1977-8 (SP 391 059)

Allen and Robinson (1993) note that some bath-shaped pits at Mingies Ditch, Oxfordshire, may be all that is left of turf-built kilns, some experimental reconstruction having established that the only evidence for such structures might be an area of burning (in this case the pits may originally have been dug as mixing-pits for cob for the walls of the houses at this site, the increased depth being exploited to assist in the drawing of air into the kilns.

Roman

DAVYGATE , YORK, 1955-8 (SE 603 518)

Wenham (1962) described turves in the Fortress ramparts and (in a rare example of 'environmental archaeology' at this very early date), G. Taylor (Kew) reported remains of mosses (*Brachythecium rutabulum*, *Eurhynchium praelongum*, fragments of grass (recognised by their silica bodies) and a few tentatively identified seeds, as well as some fragments of oak timber. (There were also identifications of the insects *Agriotes obscurus* and *Sitona* sp., both of which are consistent with grassland.)

Various sites throughout Great Britain, excavated in 1967 and cited by Wilson (1968):

CAERSWS, POWYS: 'The 13-ft. ditch [of the rampart] was subsequently filled with rubble to carry a turf revetment, which was now added to the rampart front and later cut back to receive a fort-wall of stone.'

ANTONINE WALL (see also BAR HILL, below)

> Near CUMBERNAULD, N. LANARKSHIRE (CROY HILL E. beacon stance): a section was 'reopened to reveal the stone base of the wall, 15 ft. wide, with laid turf still standing on it 3 ft. high and extending also southwards to form the beacon-stance itself'.
>
> BOTHWELLHAUGH FORT, N. LANARKSHIRE: a section through the NE defences of the fort 'encountered a clay rampart 27 ft. thick, with rear kerb of sandstone slabs and added front revetment of turf on a cobbled base'.

HADRIAN'S WALL (see also BIRDOSWALD, below)

> MILEFORTLET 12 (Blitterlees, near Silloth), Cumbria: 'The turfwork of the S. rampart of the fortlet, 28 ft. wide at the base, was found to survive to a height of 8 ft'.

BOWES, CO. DURHAM: 'the original Agricolan rampart was seen to consist of enormous river boulders set in clay between a rear revetment of turf, still standing *c.* 5 ft. high, and a front revetment of timber'.

CHESTERTON ON FOSSE, WARWICKSHIRE: 'a section through the defences near the N. angle revealed that the original turf rampart had been cut back to receive a stone wall 11 ft. thick'.

GOSBECK'S FARM, COLCHESTER: 'the original theatre [in the temple precinct], of the late first or early second century, was entirely of timber. As reconstructed *c.* A.D. 150, the seating bank was of turf with a buttressed masonry revetment.'

BAR HILL, E. DUNBARTONSHIRE, SCOTLAND, 1906 and 1978-82 (NS 707 759)

Robertson *et al.* (1975) and Keppie (1985), in reconsidering the original excavations by Macdonald and Park (1906), noted an original turf-line surviving as a distinctive bluish-black layer over the southern half of the headquarters, and 'fresh-looking turf' carefully packing the ditch under Room 4 of the Antonine *principia*. The turf blocks were described by Macdonald and Park (1906, 14) as 'in a wonderful state of preservation' (and regarded by at least one later author as indicating they were not long in use in the wall before being re-used to fill the ditch).

Samples of turves were studied palynologically by Boyd (1985a, b) who recorded from the pollen 'washings' some moss (mainly *Polytrichum commune*), tree bud-scales, heather twigs and leaves and ericaceous flowers, nutlets of *Carex*, many *Juncus conglomeratus/effusus* seeds, and remains of *Potentilla erecta* and *Cenococcum* (data in microfiche only, Boyd 1985a). Four inverted turves could be recognised in the box section used for sampling. Each consisted of a thin (2 to 5 mm) layer of compressed moss fragments (mostly *Polytrichum commune*) regarded as the upper surface of the former soil. Above this in the core was a humus-rich, dark layer of variable thickness (20 to 30 mm), and a layer of lighter-coloured sandy silt which became less organic and more leached towards the base of each turf. The results of loss on ignition analysis confirmed that the turves were inverted. These sediments represented the humus-rich (A) and lower leached (E) horizons of four inverted podzol soil turves, stacked upon one another. Altogether, each turf was 70 to 120 mm thick.

Macrofossils were most common in the upper parts of the turves. Almost all the plants represented grow in open, acid grassland or heathland environments, and some of them (*Carex* cf. *panicea*, *Viola palustris*, *Juncus* spp., and the mosses *Polytrichum commune* and *Aulacomnium palustre*) commonly grow in damp places

The turves contained abundant and remarkably well preserved pollen. Tree pollen was sparse, especially passing up through a turf, with increasing *Calluna* and grass; the herbaceous types were mostly pastoral indicators: *Plantago lanceolata*, also *Ranunculus*, *Succisa*, Cyperaceae, and *Filipendula*, and there were two records of *Radiola*, a species of damp ground in grassland and on heaths; spores of *Gelasinospora*, which may indicate dry or burnt soil, tended to become more common towards top of the soil.

BIRDOSWALD, NEAR GILSLAND, CUMBRIA (NY 615 663)

Extensive investigation of the early turf wall of a section of Hadrian's Wall involved pollen and soil analysis of both a pre-fort ground surface and samples from the turves (see reports by McHugh and by Wiltshire, in Wilmott 1997). This showed that the area had been wooded prior to the establishment of the fort and that the turves probably came from some distance away (cf. the nearby Appletree section, discussed in the body of this report, where clearance had occurred before the turves, which were presumably local, were cut). No studies of plant macrofossil remains from turves were made at this site, though Tony Wilmott (pers. comm.) avers that some well preserved material with recognizable plant fragments were observed during excavation.

CRAWFORD, LANARKSHIRE, SCOTLAND

Maxwell (1974) described turf in ditches forming part of the defences of this fort and in one particular case [in excavations of the Northern defences, third period] 'the inner ditch was completely filled with peaty turf and a mixture of clay, small stones and earth, and then given a levelling layer of yellow gravel, probably dug from the upper scarp face of the large ditch, which was also carefully filled, but in a rather distinctive way. To begin with, a small platform of stones was built in the N half of the ditch and above this ten courses of turf blocks were laid [shown in the section fig. 5]. If the blocks originally measured 6 in [15 cm] in thickness, the standard measurement indicated by Vegetius, the top of the pile of turves would then have been on a level with the lips of the ditch ...'. [The outer second period ditch fill in the Western defences had a filling which] 'comprised blocks and clay and peaty turf,

and there was no natural silt. A certain quantity of occupation debris was mingled with the turf and clay fill, the most interesting items being a shoe, in a tolerably good state of repair, and the head of a wooden mallet .... The moist conditions had also preserved on the top of this in-fill much humbler items, such as tiny twigs and wood chippings, representing, doubtless, the waste material from building operations at the beginning of the third period.

A small amount of material from the Middle Antonine I ditch on the N and W fronts was examined archaeobotanically: 'Floral remains' identified 'from the peat stack ... section A. Moss: Hylocomium splendens [sic] (Hedw.) B. & S., a fairly common bryophyte found growing in woodlands and amongst grass and heather.' and 'from the peat-block filling of the middle Antonine I ditch, section C: Moss: Polytrichum commune' with some hazel nutshell and twigs and branches of hazel, birch and willow.

SCAFTWORTH, NOTTINGHAMSHIRE, 1995-6 (SK 6578 9298)

Van de Noort and Ellis (1997) describe an excavation at Scaftworth 'site 5' which revealed turves beneath a layer of brushwood, itself underlying road consolidation material; 'this levelling layer of turves comprises silty medium sands with occasional charcoal which is brown to dark brown in colour ... with the actual surface layer of the turves being black in colour ... the undulating nature of the turves may reflect either compaction due to the metalling overburden and/or by passage of traffic over the turf surface'

'Assessment [for preservation status] of the plant macrofossil content of the turves [by C. de Rouffignac] has identified a mixed assemblage derived from scrub and pasture/meadow plants, and wetland plants from the immediate vicinity of the road....', but no details of the results are presented and no further, more detailed, analyses have been undertaken. Assessment of pollen preservation was also undertaken (no identifications published).

Late Saxon

MAWGAN PORTH, CORNWALL, 1949..74 (SW 84 67)
Bruce-Mitford (1956; 1997) recorded:

1956:
pp. 175. 'On the fallen rubble and core-material, amongst still more blown sand, lay here and there clearly defined chocolate patches of soil often rectangular in shape - remains of turves that dropped in from the roofs.'

p. 195: 'Here and there on top of rubble falls, or on clean sand over the floors, lay coherent rectangles of reddish humus, standing out sharply from the sand and rubble - these were turves fallen from the roofs. In the courtyard a good deal of it had slipped from the eaves.'

1997:

excavation of Courtyard House 1, Room 1 (p. 11): 'A wider area was enclosed by slot 4 on the south side of the east doorway. Here the enclosed area also contained red and yellow clay on a layer of make-up material; over this layer had lain a layer of brown sandy earth, probably representing a fall of turf from the roof.'

Room 5 (p. 15): 'There are few traces of this roof structure, but several clearly defined patches of earthy material were found within this room, which were interpreted as turves, and various pieces of perforated stone may have been used as thatch weights .... While removing a sand layer from the surface of the occupation layer in the west end of the building, three turves were found lying on the occupation layer, one of which was recorded as 6in x 9in (152mm x 229mm).'

Doorway to Room 7 and Internal Features (p. 19): The doorway in the middle of the north wall had been blocked; a couple of large blocks had been placed in the doorway, resting on some occupation material, and then the space had been infilled with large stones, shillet blocks, and several pieces of turf .... Some patches of darker soil were

found on the surface of the occupation layer [inside the room] and were interpreted as the remains of turves, probably fallen from the roof.'

Courtyard (pp. 20-1): 'was fully excavated in the 1952 season, and several features of interest were associated with it: remains of turf on the surface, a late scatter of pottery .... The turf layer lay on a thin layer of blown sand and represents natural collapse of the structures after abandonment, along with some of the wall rubble. The turf layer was 4-5in (102-127mm) thick.'

There were no analyses of plant remains.

Anglo-Scandinavian/Viking Age

6-8 PAVEMENT (LLOYDS BANK SITE), YORK, 1972 (SE 604 517)

Buckland *et al.* (1974) observed, in discussing biological evidence from richly organic occupation deposits from this site 'One allochthonous groups [of insects] is particularly interesting in that it neatly supplements the botanical evidence. *Bradycellus ruficollis*, *Lochmaea suturalis*, the weevil *Strophosomus lateralis*, and the ant *Myrmica scabrinodes/sabuleti* form part of a heathland community and are usually associated with heather and ling (*Calluna vulgaris* and *Erica* spp.), a few rootlets of which were found *with a heath soil attached, but no pollen* [my italics; the authors only discuss importation of heather for bedding and dyeing, with no specific mention of turves].

FISHAMBLE ST, DUBLIN, IRELAND, 1977-81 (31 23)

Geraghty (1996) described material which appeared to be sods, confirmed by archaeobotanical analysis: pp. 27ff. 'The sod samples': 'During the excavation, 100-500mm-thick layers of soils were regularly found under the wood-chip floors of each house, sealing the remains of its predecessor. They were characteristically pale, fine-grained and inorganic, banded with thin, irregular dark layers containing visible fragments of grass and moss. They included few artefacts except scattered strands of wattle and pointed wooden pegs, triangular in section and up to 0.4m long. On the basis of these, the botanical remains and ethnographic precedent, the layers were interpreted as being the redeposited roofing sods of the demolished house (Wallace 1985, 118). Traditionally, many houses in Ireland were roofed with thatch fastened into sods with hazel 'scollops' or pins similar to those found on the excavation .... The sods were usually cut from areas of grassland where close grazing had caused a thick root mat; they were 0.6-0.9m wide by about 30mm thick and up to 4.5m long (although shorter ones were also used), and were rolled like a carpet on to a carrying stick as they were cut ....

'In addition to the deep layers between successive house levels, sods were found mixed with wood-chips and other debris in various contexts; ... [one of these] was only recognised as a sod layer after the analysis of the plant remains.

'The pure sod samples: A smaller than average number of taxa were recorded in these two samples ... and the plant assemblage was different from that in the floor, bench and outdoor samples. The dominant species was blinks (*Montia fontana*) associated in [one sample] with parsley piert (*Aphanes* sp.), milkwort (*Polygala* sp.) [*sic*!] and self-heal (*Prunella vulgaris*); large numbers of mites, which were not common in other samples, were also present. Blinks is usually considered typical of very wet conditions and parsley-piert of dry ground ... but they do occur together ...'.

THE BIGGINGS, PAPA STOUR, SHETLAND, SCOTLAND

Crawford and Ballin Smith (1999), in their summary (p. 98) write: 'In addition to grass and rushes, heathy and grassy turf was also used. Collection of this material would have meant cutting and digging of the sod, and drying it. Being relatively heavy even in a dry state, the turf would have required transporting to the settlement on a cart or in 'kishies' (panniers made of straw) (see Fenton 1978, 230-1). Turf was primarily used as roofing material, where it formed an insulating and absorbent outer skin to a timber roof lined with birch bark. The site provided evidence

for its use where it was often found in a burnt condition covering collapsed roofing timbers. Another, but uncertain, use might have been as wall-core packing. Turf was also possibly burnt on the domestic hearths and used for slower burning when a fire was kept alive overnight, for example in the fire pits.'

Discussing evidence from plant macrofossils, Dickson (1999), pp. 113ff notes: 'Plants of mainly grassy heaths and damp grassland were recorded in small quantity from nine contexts in the main dwelling-house, two contexts in Trench H and one in a Trench K building. The remains are mainly unburnt. Two of the contexts are from pits and one from the sump in Trench J ... It was concluded that heathy and grassy turf may have been used to stop the combustion process of peat and seaweed until required to be used for industrial purposes. The remaining contexts are from occupation levels and the presumed turf may therefore have had different uses.

Of the heathland plants, heather ... was found, always in small amount, in nine contexts. Tormentil (*Potentilla erecta*), often found in heathy pastures on Shetland, was recorded from six contexts. Heath-grass (*Danthonia decumbens*), which has more durable seeds than most non-aquatic grasses, was found in one context ....

If we assume that most of these plant remains could have originated from turves, two questions arise: what happened to the rest of the turves and how did turf remains become incorporated in the occupation debris? Grassy turves are, of course, largely held together by the roots of grasses and as these decayed away the remaining mineral part would become mixed with the general debris. Sand was, in fact recorded from all contexts and gravel of 10-20mm diameter was noted from [four contexts]. These contexts were. however, all dug down to the underlying natural sand.

The presumed turves could have been derived from several uses. Turf may well have been a component of the fill of the protective wall ... of the Phase 3 *stofa*'. In Viking houses in Iceland a raised platform on either side of the hearth was built of stones and turf (Fenton 1978, 191). Fenton also suggests that "it is probably what was meant by the broad benches on which people lay around the central fire of a Shetland house about 1614-18".

Another possibility is that turf may have been used as roofing over a waterproof layer of birch bark. Until recently houses in the Faeroe Islands (which were settled by Norse farmers) "were thatched with grass turf which was laid on a foundation of birch-bark" (Jóhansen 1985, 22). If such roofing has collapsed into the occupation levels, pieces of birch bark would surely be found there and in fact such bark was found in several contexts [the author does not say if these are related to those in which turf remains were recorded]. Living turf, which can still be seen on old roofs of outhouses in Shetland and Orkney, would originally have contained a variety of plants but these tend to disappear leaving a thatch vegetation composed almost entirely of grass as noted by Jóhansen (*ibid*). It will be appreciated that if old grassy turf roofs collapsed and the delicate grass seeds and vegetative parts decayed away, there would be very little evidence apart from the mineral soil, some of the durable birch bark pieces and perhaps rotted roof supports to interpret the former roofing. After centuries of weathering, exacerbated by the robbing of upper levels for building materials, interpretation of the presumed turves and other remains must be treated with caution.'

BIRSAY, ORKNEY, SCOTLAND,

Writing about Viking houses, Cruden (1965) states (p. 26): 'The two earlier houses on site C are about 15 metres long by 5 metres wide with the longwalls bowed outward. The walls are of turf about 1½ metres thick. From the beginning these walls were faced with dry-built local flagstones. Externally the faces were of alternate courses of turf and flagstone. Settings of some slabs on edge mark internal divisions. The roofs were supported by double rows of upright posts approximately following the lines of the bowed wall face. The posts were set roughly but not exactly in pairs. In some cases in similar houses a single post, approximately central, replaced the endmost pair. This arrangement implies continuous purlins on each side, which would carry rafters whose lower ends rested on the inner edge of the thick turf wall. The roofs were of sods, probably resting on wickerwork, and covered with thatch .... The later houses had turf walls about one metre thick which were faced with stone both inside and out.'

And again (p. 29) with respect to 'Earl Thorfinn's Palace', a large building incorporating part of the earlier 'Earl Sigurd's Hall', overlying middens containing Norse material of 10th and possibly 11th century date and subsequently burnt: 'The roof had been largely of turf, burnt layers of which overlay the collapsed walls and debris-strewn floors

... the western part of the palace consists of two or three rooms running east and west. Their outer walls, except the south facade, were of turf faced with stone.'

JARLSHOF, SHETLAND, SCOTLAND, 1925-35 (HU 405 905)

Referring to earlier work by Curle (1934), Hamilton (1956) reported (p. 107) that the walls of the rectangular house were 'constructed of undressed stones with a core of compacted earth in the centre. The inner face of the south wall showed contiguous courses laid one above the other but the exterior of the north wall bore evidence of having been constructed with alternate courses of stone and turf. This method of construction is well known in houses of the Viking period in Iceland .... In the present instance the south wall was partly revetted against the shoulder of the mound, the alternate turf courses being characteristic of the free-standing north wall which may have been thus treated to withstand wind pressure and to exclude draughts, giving additional warmth to the interior.' There were no relevant analyses of plant remains.

Medieval

GELLIGAER COMMON, GLAMORGAN

Fox (1939) reported remains of a series of medieval dwellings, in longhouse form on a tract of moorland, in which the walls were sometimes 'turfy', being built on or with stone

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MACEWEN'S CASTLE, ARGYLL & BUTE, SCOTLAND, 1968-9

Marshall (1983) describes the excavation of a fortified promontory: 'The Turf House ... was oval rather than rectangular in plan. The remaining walls, 2 ft 6 in - 3 ft thick, were built of turf. The separate turf layers showed clearly, especially in the section at the SW corner where seven could be counted. ... Opposite [the] doorway, in the W wall, was a narrow opening 1 ft 6 in wide which had two layers of turf across it. The turves in the wall had been laid sloping down to the sides of the opening thus showing that it was an original feature. ...

Two layers of turf were uncovered set against the inside of the wall at the N end. As these were set on the floor level and were overlaid by slip from the wall it seems as if there had been a narrow turf bench in that part of the house.

Some re-construction of the wall had taken place. In the trench cut on the S side a rebuild could be seen in the form of fresh turves set on top of collapsed ones. On the W wall to the S of the doorway stones had been set among the turves on the top of the wall. This was the only part where stones were found to be used in the wall. A platform of stones placed on a base of turves against the W wall may have served as a sleeping or working bench.

No analyses of plant remains from the turf structures were reported.

OLD LANYON, MADRON, CORNWALL (SW 422 337)

Beresford (1994) reports on a deserted medieval settlement in which the first phase of building (revealed in and alongside only one of the later buildings in stone) was in turf. He notes that 'whilst documentary evidence provides information on turf houses in East Anglia ... there is little archaeological evidence of turf walls in England except where examples have been excavated at Houndtor, Hutholes and Dinna Clerks on Dartmoor ... and in Cornwall at Tresmorn, Treworld' and those reported here. He comments that the remains of the turf-walled houses in south-west England are few and very confused, but their positions are clearly defined by lines of stake-holes left by the wattles which had lined the inner side of the walls, the wear of the floors, and by a number of hearths. Though not generally

accepted by archaeologists at first, Beresford's earlier (1988) account of the Dartmoor structures has, he avers, been accepted.

Post-medieval

EASTER RAITTS, BADENOCH, HIGHLAND, SCOTLAND, 1995-9 (NH 7774 0228)

Wood and Lelong (n.d.) describe turf-built structures: 'The best-preserved longhouse, structure 21 ... had been built by scooping slightly into a natural gravel slope on the north to create a level surface, and laying one and in places two courses of a double skin of stone footings, with a rubble and earth core; it measured c 10 m east/west by 3.5 m internally, with an annexe 4 m by 3 m built against its east end. The superstructure above the footings had been of turf, built against and on top of them with a thick batter. This was evident from thick, wedge-shaped deposits of brown and black-brown loam lying against them; variously leached stripes visible in the sections showed the layers of individuals turves, or remnants of successive turf walls which had slumped and been mostly removed for fertiliser, to be replaced by a new turf wall. ... Over the interior of the main part of the longhouse lay a deposit of thick, rooty decayed turf, probably representing collapsed walls or roof, which was rich in artefacts ...'.

CAUSEWAY HOUSE, BY STANEGATE, NEAR VINDOLANDA, NORTHUMBERLAND (NY 763 663)

Pearson (1990) identified plant remains from divots from between the rafters of the thatched roof of the granary of a house dated to AD 1770. The remains comprised desiccated specimens of vegetative material of *Calluna vulgaris*, *Carex* cf. *panicea*, and *Nardus stricta*, and shoots of the mosses *Hylocomium splendens*, *Pleurozium schreberi*, *Polytrichum formosum*, *Rhytidiadelphus squarrosus* and *Sphagnum recurvum*.

KEBISTER, SHETLAND, SCOTLAND (around HU 47 45)

Owen and Lowe (1999) describe the survey of a headland on the eastern side of Mainland, Shetland, revealed a series of dykes (field boundaries) of which one, ('The March Dyke') was built of blocks of peat each about 20 x 30 cm forming a bank some 1.2 m wide and 0.45 m high (and probably post-medieval in date). A second dyke was built of peat mixed with cut turves (confirmed pedologically), and turves were thought to have been used (with other materials) in the construction of various other features of this kind. A series of turf-built sub-rectangular and sub-circular structures was also identified, although sections indicated that both turves and peat blocks were used.

A 16th c. stone-built barn provided some samples of roofing turf examined by the late Camilla Dickson (pp. 229 and fiche in Owen and Lowe 1999): a block retrieved from Loading Room 1 measured 24 x 20 x 5 cm and was examined via two plant macrofossil samples (and pollen analysis). The humic sediment lacked recognizable plant material, this having been largely destroyed by soil fauna. Apart from basal stems of *Molinia*, the remains included nutlets of eight *Carex* species, tentatively identified *Danthonia*, *Juncus bufonius* and *J. squarrosus*, *Potentilla erecta* and megaspores of *Selaginella*. *Calluna* was sparse, suggesting this was a grass-sedge dominated area, not heathland proper. A further assemblage clearly containing turf-derived material was recorded from a sample of burnt debris on the clay floor of Loading Room 2, in material from a stage of final collapse and disuse of the barn, as well as from a pit fill (probably of 17th c. date), and from various other contexts at the site. Grassland, heath and mire plants were 'the largest category of plants to be represented at Kebister' (p. 242), and 'many seeds are present in assemblages which suggest that they derived from turf'.