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1 **Introduction**

This report presents the results of archaeobotanical remains (plant macrofossil and charcoal) from soil samples associated with the Black Pig Dyke Regional Project. The samples analysed were primarily associated with the 1986 season of excavation at the site.

2 **Soil Sampling Strategy and Scope of Works**

Forty two samples representing the North and South bank and ditch and a number of samples from Aghnaskew were selected for the identification and analyses of plant macrofossils and archaeological wood charcoal. These samples were submitted for analysis to determine the archaeobotanical and wood species present and to select suitable carbonised remains for the purpose of radiocarbon dating. *(Table 1).*

Archaeobotanical analysis is an important component of archaeological excavation and post-excavation works. These remains provide valuable information about explicit activities carried out at a site, including the function and nature of certain features, arable agriculture practices, site economy, diet, food processing and how local natural resources were exploited (Murphy and Whitehouse 2007; McClatchie 2007). Cereal grains, nutshells, seeds and fruit-stones represent the most commonly preserved non-wood plant macro-remains. Delicate chaff from arable crops is also frequently recovered. Other plant components can sometimes be preserved, including cereal bran, leaves, bud-scales and thorns. Vegetative tissues (parenchyma) from roots and tubers, which can be used in a range of activities, may also be recovered.

Woodland resources, including wood and charcoal, are of enormous importance in the past. Communities during both the prehistoric and historic periods were dependant on woodland resources for everyday living, including construction materials for buildings, manufacture of most implements, firewood and fuel (Kelly 1988; O’Donnell 2007; Stuijts 2007; OCarroll 2011). Analysis of wood and charcoal remains can provide functional evidence for various activities at a site, as well as insights into cultural, ecological and economic variables. Certain wood species may have been selected for particular uses, such as structural posts, firewood, pyre material fuel and wattle work. Charred remains also provide suitable material for the purpose of obtaining radiocarbon dates (C14 dating). In this case, short-living plant species, such as cereal grain, nutshell and young roundwoods are selected for dating.
3 Methodology

3.1 Sample processing

Bulk dry soil samples are processed using a system of floatation where each sample is soaked in water and agitated by hand to loosen any charred remains from the soil particles which allows for this material to be separated and float to the surface. This floating material (flot) is poured off and trapped in a sieve (mesh size 250 µm) and, once dried, scanned for plant remains using a binocular microscope. The larger residual material left behind (retent) is washed through a 1mm, 2mm and 5mm mesh or sieve and air-dried. Once dry, each retent is sorted by eye and any material of archaeological significance removed.

3.2 Plant macrofossil analysis

All flot samples were viewed under a low powered binocular microscope (magnification x0.8 to x5). Charred plant macro-remains are identified to species level and quantified. In the case of very large samples, a sub-sample of approximately 500 individual constituents are randomly identified and removed. Abraded grains are recorded using an abundance scale based on the universal DAFOR system, which is a quantitative definition of frequency for counting plant communities - Dominant (>250) = D, Abundant (51-250) = ++++. Frequent (21-50) = ++. Occasional (6-20) = + and Rare (1-5) = +

This scaling is necessary where abraded grains which are fragmented and where the embryo ends are absent can be more difficult to quantify as being from one or more component.


3.3 Charcoal analysis

For the purpose of this project, a sub-sample of charcoal fragments (100-200 fragments) were chosen from larger samples. These samples include 101V2, 101V3, 101V5 and 101V6, where 60%-80% of each sample was analysed. The remaining samples were sorted and analysed at 100%. This provides an accepted representation of the wood species present from a sample, which is in line with the standard sub-

1 Soil samples are processed according to the standards and guidelines outlined in the Institute of Archaeologists of Ireland (IAI) Environmental Sampling Guidelines for Archaeologists, (IAI, 2006) and Palaeoethnobotany: Handbook of Procedures. 2nd edition, San Diego: Academic Press (Pearsall, D 2000)

2 The DAFOR scale is a useful tool to visually assess the abundance of any species on a semi-quantitative level (Sutherland, W J 1996)
sampling strategy for archaeological charcoal by the National Roads Authority *New Palaeo-Environmental Guidelines* (McClatchie, et al 2014) and current practicing archaeological specialists (Keepax, 1988; O’Carroll, 2012).

Wood charcoal identifications are undertaken in accordance with Section 25 of the National Monuments Act, 1930, as amended by Section 20 of the National Monuments Amendment Act 1994, to alter an archaeological object. The wood species identifications were conducted under a binocular microscope using incident light and viewed at magnifications of 100x, 200x and 400x where applicable. Wood species identifications are made using wood reference slides and wood keys devised by Franklin and Brazier (1961), Schweingruber (1978), Hather (2000) and the International Association of Wood Anatomists (IAWA) wood identification manuals and (www.lib.ncsu/edu/insidewood) by Wheeler, Bass and Gasson (1989).

4. Results

The charcoal and charred plant macrofossil identifications from The Black Pig Dyke Project are presented in Table 2.

4.1 Carbonised plant macrofossils

Ten fragments of carbonised hazel nutshell (*Corylus avellana*) fragments (0.3g) were recovered from Sample 3 (101C). Two fragments of carbonised hazel nutshell fragments (0.1g) were recovered from Sample 14 (101N). Charred hazelnut shell is a common occurrence on archaeological sites (Moffett, 2011). Its presence is usually interpreted as being discarded food remains or fuel debris. The volume of nutshell is too low to make any inferences about the material in these contexts however.

4.2 Wood charcoal identifications (see Appendix 1 for list of woods)

Eleven wood species totalling 1336 charcoal identifications were recorded from the project. Oak (*Quercus* spp.) dominates the charcoal assemblage identified, accounting for 75% of the overall material. Lower occurrences of willow (*Salix* spp.) and hazel (*Corylus avellana*) were also recorded, making up 12% and 6% respectively of the identified charcoal. Values for ash (*Fraxinus excelsior*), holly (*Ilex aquifolium*), blackthorn (*Prunus spinosa*), pomaceous fruitwoods (*Maloideae* spp.), heather (*Calluna vulgaris*), birch (*Betula* spp.), alder (*Alnus glutinosa*) and scot’s pine (*Pinus sylvestris*) accounted for <2% of the charcoal assemblage identified from the site (Fig. 1). The total weight of the assemblage identified was 91.35 grams (Fig. 2). With the exception of the *Calluna* charcoal, the larger fragments identified were predominantly from heartwood. No features pertaining to curled or root wood were noted, which indicates that the wood burnt was from well formed branch or
trunkwood. Approximately 60% of the Calluna charcoal fragments identified derived from small branchwood (<60mm) based on the steeply curved angle of the annual growth rings. No obvious insect channels were noted from the charcoal assemblage either, suggesting that the material was freshly used after being cut or that it was well seasoned prior to use.

Fig. 1 Percentage of wood species recorded

Fig. 2 Total weight per species in grams
5. Discussion

5.2 Charcoal from archaeological sites

Charcoal is a common occurrence from archaeological sites and generally represents the fuel debris and burning activities associated with domestic activities that were carried out at a site. Charcoal is the product of chemical reactions that occur when wood is heated (i.e. thermal decomposition) (Smart and Hoffman, 1988). The premise of charcoal analysis is that wood used as firewood was collected from as close to a site as possible (Shackleton and Prins, 1992) for ease of transport. The amount of charcoal taxon within a sample and the ubiquity throughout these samples are therefore used as indicators of relative abundance in the local vegetation (Smart and Hoffman, 1988). Based on this paradigm, the amount of charcoal taxon within samples and ubiquity throughout these samples from a site are used as indicators of relative abundance in the local vegetation. This therefore provides a basis to create a model for woodland reconstruction and patterns of woodland change. In the case of archaeological sites, certain wood species will inevitably saturate charcoal assemblages, since they represent specifically chosen wood depending on use and functionality. It must be considered however that the charcoal recorded from archaeological sites represents only those wood species that a) were chosen to be burnt and b) that were preserved and not burnt away to ash. It is also likely that many of the species recorded were abandoned structural timbers or wood brought to the site for uses in construction works or other activities which were later reused as firewood.

5.3 Wood charcoal assemblage

Despite oak dominating the charcoal assemblage from The Black Pig’s Dyke Archaeological Project, this species was largely confined to Feature 5 (Sample 22 and Sample 23), where fragment counts were in excess of 800. Oak also dominated at Aghnaskeew (Sample 39) accounting for 100% of the assemblage (77 counts) and from Feature 3 accounting for 69% of the sample (16 counts). Based on this saturation, it is most probable that these represent the remains of a charred oak plank or post. The high number of fragments recorded strongly indicates that these elements may have been burnt and left in situ. This compares well to the oak charcoal recovered from the palisade slot excavated at Aghareagh West, Scotshouse, Co. Monagan in 1982 by Aidan Walsh (Walsh, 1991, 19).

In contrast, the presence of oak from deposits associated with samples from the North bank/ditch and South bank was surprising much lower, making up just 5% and 28% respectively (Fig. 3). While it was difficult to ascertain the age of the wood recorded, the growth ring patterns displayed widths of 2mm-3mm, suggesting fast growth. Fast-grown oak holds proportionally stronger summerwood than slow-grown
oak and is therefore stronger wood (Stuijts, 2005, 143). Whether this was known by those that felled these trees is difficult to establish, but would have significantly added to the construction quality of the wood.

The wood was also in good condition, free of insect infestation. This indicates that the oak was perhaps used soon after felling or well seasoned prior to being burnt, however it is difficult to establish if this material was primarily collected for firewood or derived from structural elements. Oak is traditionally the wood of choice used in large construction works from the prehistoric to the medieval period in Ireland and is commonly identified from archaeological structural deposits (O’Donnell., 2007; Lyons, et al, 2011; O’Carroll, 2012). Its dense heartwood makes it easy to cleave and split radially, ideal for planking and large construction works.

The charcoal assemblage from North bank/ditch and South bank contained the most diverse wood species (willow, hazel, ash, holly, blackthorn, pine, heather, birch, alder and pomaceous fruitwood). Willow dominated particularly from 101AK and 101AL (Samples 37 and 38), both features associated with the top of the north slope of the North ditch. While oak and pomaceous woods were also identified from here, values were too low and may be interpreted as redeposited material from another source. As firewood, willow burns well, but sparks easily and doesn’t provide long lasting fuel due to its high water content. Instead, its naturally vigorous shoots make it suitable for hurdle making and wattle work. The high proportion of willow charcoal here could signal the remains of structural debris from a wattle fence or light palisade. The presence of willow, albeit low, exclusively from many of the other samples analysed (101A, 101G, 101AS, 101AP, 101AF, 101W and 101X) also strongly suggests debris from structural activities. Another species commonly associated with light
construction activities is hazel. While hazel values are altogether lower from the assemblage, it is most notable from 101D (Sample 4), 101N (Sample 14) and 101AH (Sample 34). Here it is found alongside willow in all three contexts, together with birch, ash and holly. Similar to willow, hazel produces good firewood, but is more valuable as a material in hurdle or wattle making (Gale and Culter, 2000). Interestingly, only one deposit (101Q-Sample 17) contained hazel charcoal, while it is found in a mixed wood assemblage from 101D, 101N, 101S and 101AH. Similarly, ash is also a common wood used in both fuel and construction works (Gale and Cutler, 2000). Its frequency in charcoal from structural deposits is particularly noted from Iron Age dated sites reared along many of the recent infrastructural schemes, namely the N8/M8 in Tipperary (Lyons, 2010), the N9/N10 in Kilkenny (Lyons, et al, 2011) and N6 through Westmeath and Offaly (OCarroll, 2012).

While it is generally the perception that wood remains represent fuel debris, and the majority of the wood recorded certainly produce good quality firewood, the types of wood is of interest, particularly in the structural context suggested for willow and hazel. The thorny blackthorn is documented in early Irish tracts as being used to construct fences, particularly lining the top and sides of wattle fencing similar to barbed wire (Kelly, 1997, 375). It is also commonly used for cattle enclosures (Forest, 2014). It appears in many early Irish sagas being associated with destruction, death or sacrifice (ibid.). Holly ranks as a ‘noble of the wood’ in early medieval literature and produces very good charcoal being a particular preference of blacksmiths for forging (Kelly, 1997b). It was synonymous with evading evil, promoting safe passage and offered protection against lightning (Forest, 2014). The spiked evergreen leaves and red berries during winter months were seen as symbols of life force and its defensive capabilities (ibid.). More practically, holly wood is a strong durable wood suitable for making rods and poles and may have been used in manufacturing fences along with willow, hazel and blackthorn. The presence of pine as firewood is unusual but not uncommon. Pine produces poor fuel but as another high ranking wood in early Irish literature, it was favoured more for building (Kelly, 1997). Wood such as alder, birch and pomaceous woods are also commonly recorded from prehistoric and medieval charcoal deposits in Ireland (O'Donnell, 2007), although generally found amongst other wood species, as is the case from these samples. Heather charcoal is less frequent from archaeological sites, possibly due to its scrubby nature, where it tends to burnt to ash easily. Its context within 101L (Sample 12) and 101S (Sample 19) is notable and could be an intentional use of heather within these deposits. Heather (Calluna) is a natural insulator and these properties make it ideal for bedding, padding and thatching (Bonhôte et al., 2002). If the wood remains recorded from this project were largely associated with construction works, then heather may also have formed part of the structural fabric.
The variety of wood species from the North and South bank and ditch features could potentially represent a mix of domestic and structural debris. Charcoal from on-site occupational activity may have been dumped into open ditches, however the absence of any other domestic finds from previous excavations, such as pottery, animal bone and cultivated plants is unusual. It is therefore tempting to interpret the charcoal as largely structural debris, the remains of light fencing placed within the ditch itself.

5.4 Interpreting the local woodland
Woodland reconstruction of the area has relied on pollen analysis, which was carried out at Aghareagh West, Co. Monaghan (Walsh, 1991)). This sequence revealed high values for alder and hazel, but with an obvious absence of oak (ibid., 19). In a broader context, Iron Age pollen sequences dating from the last centuries BC to the first centuries AD reveal an upsurge in tree pollen percentages coinciding with a lapse in farming activity. This is evident from sites such as Garry Bog and Sluggan Bog Co. Antrim ((Plunkett, 2009), Breaghmore, Co. Tyrone (Pilcher, 1969), Corlea, Co. Westmeath (Caseldine and Hatton, 1996), Derryville, Co. Tipperary (Caseldine and Gearey, 2005) and Lough Sheeauns, Co. Galway (Molloy and O'Connell, 1991). During this time, a period of woodland regeneration occurred, where secondary woodland comprising ash, hazel, holly and birch was expanding (Hall, 2011). At Lough Kinale, Derragh, Co. Longford, pollen analysis revealed pine, birch, ash, oak and alder to be growing locally. This trend is not wholly universal however as records from Emlagh Bog (Newman et al., 2007), Clonfert Bog, Co. Galway (Hall, 2006) and Red Bog, Co. Louth (Weir, 1995) show strong signals for arable agriculture.

The charcoal recorded as part of this project can therefore help to support and improve upon the pollen record for this site. Species such as willow, blackthorn and pomaceous woods can be under-represented in pollen profiles as they are insect pollinated. While alder and hazel were both recorded as part of this project, oak values are higher than the picture presented through pollen analysis. Whether oak was absent from the immediate woodland and brought from elsewhere is possible, however re-using oak timbers cannot be ruled out either. Transporting such large timbers is cumbersome and wood acquisition strategy models are revealing that woods would have been collected as close to a site as possible (Shackleton and Prins, 1992, Asouti and Austin, 2005, Marston, 2009). Based on this paradigm then, the local woodland is likely to have been mixed. Oak seems plentiful, with species common to riverine environments (willow and alder), and clearings or areas of regeneration (ash, hazel, birch, blackthorn, holly and pomaceous woods) also growing close to the site. The presence of Calluna, a species common to heaths and bogs reveal that these habitats were being exploited. Interestingly, the presence of pine and
*Calluna* are both indicators of increased dryness and could signal that local areas were drying out.

6. **Conclusions**

The samples from the Black Pig’s Dyke Archaeological Project primarily contained wood charcoal, with charred hazelnut shell remains and uncharred wood fragments (willow) recovered from just two samples. The dominance of oak charcoal from Feature 3, Feature 5 and Aghaskew is most likely the remains of a burnt plank or post. In contrast, the wood species from charcoal within the North and South ditch/bank samples was more diverse (oak, ash, hazel, willow, birch, holly, heather, blackthorn, pomaceous wood, alder and pine). It is possible that these remains may have entered open features through re-deposition from hearths or fire-related activities. The preponderance of willow from many of the samples however could represent the remains of a light wattled fence. The presence of hazel, holly, blackthorn and heather in the context of the ditch could also be associated with a light structure.

While the charcoal recovered provides a site-related record of wood use congruent with the archaeological context itself, it also contributes to profiling the local woodland composition. Oak, which is absent from existing pollen records for the site, is well represented, suggesting that oak woodland may have been growing nearby or was easily accessible. A re-use of oak timber cannot be ruled out however. The wood assemblage recorded also reveals that a variety of habitats, such as scrub, riverine and heathlands were being exploited. This project has shown that charcoal analyses and pollen provide complementary information on human activity and the local environment. While the wood selection is strongly influenced by cultural and other ethnographic considerations, rather than local abundance or ready availability of a particular species, it has provided new insights into wood resource for Iron Age activity at this particular site.

6. **Recommendations**

1. There is no further identification work required on the charcoal or plant macrofossil assemblages

2. Some interpretations or phasing may need to be revised in line with any changes to the straigraphical report or if additional radiocarbon dates for the site become available
3. A record of the methodology and results of this analysis should be included in any final report.

7. Bibliography


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Appendix 1. Description of wood species identified

*Quercus* spp.

Oak is a tall deciduous woodland tree, often growing in association with hazel and ash. Two oak species are native to Ireland, *Quercus robur* (pedunculate oak) and *Q. petraea* (sessile oak) however, it is difficult to distinguish between each microscopically. It is a pioneer tree, which thrives well on fertile and acidic soils and can reach an age of 500 years or more (Hickie and O'Toole, 2002) Pedunculate oak grows to a height of 25m with a girth of 9m and prefers heavier and wetter soils. Acorns develop when the tree is ten years old and are popular with animals. Sessile oaks grow to a height of 40m and a girth of 13m. It grows best on lighter, sandy soils, somewhat acid soils where there is abundant rainfall. The wood is easy to cleave both radially and tangentially and has provided one of the most important building materials since the prehistoric period (Gale and Cutler, 2000). The heartwood timber is renowned for its durability but the paler sapwood is susceptible to beetle and fungal attack. The strength of the timber depends on the species and is influenced by climatic and edaphic factors (Edlin, 1951). When burnt, oak charcoal, particularly the dense heartwood, has higher calorific values than most European woods and this can make for good long-lasting fuel (Gale and Cutler, 2000).

*Fraxinus excelsior* L. (ash)

Ash is a wood that thrives well on nutrient-rich soils but is also a common woodland species and grows in mixed woodland with oak on damp, slightly acidic soils (Gale and Cutler, 2000). It generally avoids very wet environments although where soils are mineral-rich, it can sometimes be found in marginal forests and on stream beds. While ash is a light-loving species, the seedlings prefer shaded areas to grow. It can grow up to 45m in height and can reach an age of 150 years. It produces very good firewood and its timber is valued for its durability and elasticity and is commonly used in making furniture, shafts, spears, handles and agricultural equipment. Upon exposure, ash is prone to rotting. Pollen analysis indicates that ash became more common in the pollen record from the Neolithic period onwards (Mitchell, 1954). This could be as a result of more clearance due to agricultural practices at the time, where ash was able to germinate and grow more vigorously as secondary woodland and in marginal areas and hedges (Kelly, 1976).

*Corylus avellana* L. (hazel)

Hazel woodlands replaced birch in the early post-glacial forests and remains on some shallow limestone soils to the present day (Pilcher and Hall, 2001). The species can tolerate most soil types, but not waterlogged conditions and forms a small deciduous tree or shrub. It commonly occurs in understorey of oak and/or ash woodlands, where it may grow to a height of 10m or more. In open areas or woodland glades hazel grows as a shrub. Hazel is a common species
recorded from Irish archaeological sites and its widespread presence is highlighted in pollen diagrams from the Neolithic to the medieval period (Caseldine and Hatton, 1996). It produces good firewood and is a suitable wood for kindling. The wood is soft enough to be split yet flexible and strong enough to be used in rope making and basketry. It has also proved a useful resource in the construction of hurdles, wattling, palisades and trackways from prehistoric times (Pilcher and Hall, 2001).

**Alnus glutinosa L. Gärtner (alder or black alder)**

Alder is usually found growing close to running water, rivers or in damp woodland, in the latter often with oak (Rackham, 1995, Orme and Coles, 1985). In marshland alder grows as a shrub frequently mixed with willow and alder buckthorn to form alder carr (Gale and Cutler, 2000). It can also grow well in and on fen peat. Germination and early growth of alders requires a constant supply of water, however once the tree reaches maturity its root system makes the tree less dependent on high water levels (Stuijts, 2005). Alders commonly produce root nodules which contain nitrogen-fixing bacteria, known as Schinzia alni which enables alder to enrich soils through its fallen leaves hence allowing the tree to survive in poorer soil conditions (Milner cited in Culter and Gale, 2000; van der Meiden cited in Stuijts, 2005). In suitable conditions alder growth is fast, usually reaching a height of 25m with a maximum girth of 1m and can grow to an age of sixty to one hundred years (Strotelder cited in Stuijts, 2005). While alder makes for poor fuel, it produces good quality charcoal (Edlin, 1951). The wood can quickly turn a reddish colour after cutting and once dry it is water resistant and does not split easily. Once in a waterlogged state, alder is very durable and is often used in the construction of underwater bridge piles, houses and scaffolding (Gale and Cutler, 2000). Alder is traditionally used in the making of smaller objects such as bowls, handles and broomsticks and its bark can be used in the tanning of leather (Rackham, 1980).

**Betula spp. (birches)**

Birch was one of the first trees to arrive to Ireland after the end of the last glaciation. It grows as trees or shrubs with a preference for light and thrives on non-calcareous soils. It is often associated with heathland and successional oak woods, but can rapidly form secondary woodland in cleared areas and on abandoned peat cuttings. Birch species are generally short-lived, although some examples have known to reach ages of up to 70 and 80 years. Through most of its woodland history, birch played a minor role since its timber was too weak for structural purposes and rots easily outdoors and therefore not greatly valued. Birch wood however, makes a hot but short-lived fuel and produces high quality charcoal (Lines cited in Gale & Culter, 2000). It is best suited in the manufacturing of fine objects, such as furniture, bowls and tool handles. Birch bark has also been used in making shoes and roofs.
**Salix spp. (Willows)**

There are a number of different species of willow which cannot be differentiated through wood anatomy - *S. alba* (white willow), *S. fragilis* (crack willow), *S. caprea* (goat willow), *S. cinerea* (gray willow) and *S. aurita* (eared willow). They grow rapidly, and can be easily propagated from cuttings. General comments only about the genus can be made, as there are different varieties of it. They are not naturally a woodland species, although shrubby growth may occur under light woodland cover. All willows appear to favour wet conditions, and it may be a pioneer species on wet soils. The use of willow depends on the species concerned, for some grow as shrubs and others as trees, and a species may be particularly suited to some purpose. In general, the flexibility of willow shoots has led to coppicing or pollarding to produce the raw materials for baskets, frames, hurdles etc (Orme and Coles, 1985).

**Maloideae spp. (pomaceous fruitwood)**

The pomaceous wood species includes the genera Malus (apple), Pyrus (pear), Sorbus (rowan/mountain ash or whitebeam) and Crataegus (hawthorn). They are anatomically very similar and in the absence of bark, buds and leaves cannot be differentiated between each other very often. The pomaceous wood types are small deciduous spiny trees or shrubs and are common to the scrub margins of woodlands and hedgerows (Gale and Cutler, 2000). The apple species, often crab apple (*Malus sylvertris*) in woodlands, is a light-demanding tree and is often found in open oak woods. When dry, crab apple makes for good firewood. Rowan or mountain ash (*Sorbus sp.*) is a hard, smooth wood which can be split and worked with ease. The wood from all members of the Pomoideae is hard with a close, compact grain, ideal for carving and engraving.

**Ilex aquifolium L. (holly)**

Holly is an evergreen tree which grows on almost any soil type and can tolerate heavy shade, sometimes growing as understorey in oak or beech woodlands. It dislikes very wet soils and can thrive well in abandoned agricultural clearings (Gale and Cutler, 2000). Holly produces good firewood. The fine-grained nature of the wood makes it suitable for carving and turning (Orme and Coles, 1985). It can distort when drying and as such is usually used in small pieces and is not suited for outdoor use. It is traditionally used for walking sticks and can be easily coppiced and pollarded (Orme and Coles, 1985). Holly was seen to have held magical and protective powers with some cultures from prehistoric times and was therefore held in high esteem (Gale and Cutler, 2000). With many others it is also reputed to bring bad luck (Rackham, 1980). Holly artefacts are generally rare, perhaps reflecting the superstitions attached to the tree or the difficulty with working the wood (Gale and Cutler, 2000).

**Prunus spinosa (blackthorn)**

Blackthorn is a spiny suckering shrub or tree reaching a height of 5m. It can be found in maginal woodland canopy or in areas of woodland clearance or along streams and rivers with
alder. This species does not live beyond forty years, but produce new shoots from their roots, which are used to protect younger trees from being eaten by animals. Early medieval law tracts mention the use of blackthorn in fence making, the presence of thorns making it ideal for keeping livestock in or out (Kelly, 1997a). It produces a hot fuel but is short lived fuel.

**Pinus sylvertris (Scot’s pine)**

Pinus is a light demanding tree, often found with a dense undergrowth of grasses and shrubs. It can reach a maximum height of 35m and can live as long as 150 years. It was common pre-6000 BC in Ireland, before the expansion of peatbogs, when conditions were drier and is a characteristic of the transition between fen bog and raised bog (Godwin, 1975). Pollen records show that pine declined in north and central Ireland was diachronous during the later prehistoric period (ca. 7000-4000 BC), but as late as the BC/AD transition in the west of Ireland (Little et al., 1996, Mitchell and Ryan, 1997). Pine does not make ideal firewood as it spaks easily due to the high resin content. Instead it is commonly used in construction and joinery works. It becomes very durable in wet conditions and as such have a tradition of being used for water wheels and building piles.

**Calluna vulgaris (ling, heathers)**

It is a low-growing perennial shrub growing to 20 to 50 centimetres (7.9 to 19.7 in) tall, or rarely to 1 metre (39 in) and taller,[2] and is found widely in Europe on acidic soils in open sunny situations and in moderate shade. It is the dominant plant in most heathland and moorland in Europe, and in some bog vegetation and acidic pine and oak woodland. It is tolerant of grazing and regenerates following occasional burning, and is often managed in nature reserves and grouse moors by sheep or cattle grazing, and also by light burning
Table 1. List of samples analysed

<table>
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<th>Inventory Number</th>
<th>Sample No.</th>
<th>Weight</th>
<th>Description</th>
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<td>Sample 1</td>
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<td>1986: 101B</td>
<td>Sample 2</td>
<td>0.32g</td>
<td>South Bank, X 1 - Y9</td>
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<td>1986: 101C</td>
<td>Sample 3</td>
<td>8.68g</td>
<td>South Bank, X 1 - Y3</td>
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<td>1986: 101D</td>
<td>Sample 4</td>
<td>7.2g</td>
<td>Top of main North Bank</td>
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<td>1986: 101E</td>
<td>Sample 5</td>
<td>1.21g</td>
<td>S bank Y8, x0.96</td>
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Table 2. List of wood species identified from the Black Pig’s Dyke Archaeological Project

*f = fragment; g = grams; impress = impression of wood

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**Quercus spp.**
- Oak
  - 8f (0.8g) 12f (0.5g) 3f (0.1g) 16f (0.4g) 1f (0.1g) 1f (0.1g)

**Salix spp.**
- Willow
  - 5f (0.3g) 6f (0.3g) 1f (0.1g) 6f (0.4g) 4f (0.3g) 5f (0.3g) 4f (0.3g) 5f (0.5g)

**Corylus avellana**
- Hazel
  - 1f (0.1g) 14f (1.3) 1f (0.1g) 1f (0.1g) 8f (0.4g)

**Fraxinus excelsior**
- Ash
  - 1f (0.5g) 1f (0.1g) 8f (0.4g)

**Calluna vulgaris**
- Heather
  - 6f (0.5g)

**Ilex aquifolium**
- Holly

**Maloideae spp.**
- Pomaceous fruitwood

**Betula spp.**
- Birch

**Alnus glutinosa**
- Alder
  - 1f (0.1g)

**Pinus sylvestris**
- Pine

**Corylus avellana**
- Hazelnut shell
  - 10 f (0.3g) 2f (0.1g)

**TOTAL**

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**Quercus spp.**
- Oak
  - 168f (8.2g) 200f (7.2g) 150f (8.3g) 150f (7.9g) 200f (12.5g) 77f (6.1g)

**Salix spp.**
- Willow
  - 6f (0.6g) 2f (0.6g) 2f (0.5g) 3f (1.2g) 3f (3.2g)

**Corylus avellana**
- Hazel
  - 7f (0.6g) 7f (0.8g)

**Fraxinus excelsior**
- Ash
  - impress (0.4g) 5f (0.5g)

**Calluna vulgaris**
- Heather
  - 2f (3.02g)

**Ilex aquifolium**
- Holly

**Alnus glutinosa**
- Alder

**Betula spp.**
- Birch

**Pinus sylvestris**
- Pine
  - 1f (0.1g)

**TOTAL**

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