4. Ancient woodland use in the midlands: understanding environmental and landscape change through archaeological and palaeoecological techniques

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The use and exploitation of trees, woods and forests have played a very important role in the history of humankind and the environment. Such use also provides some insight into and understanding of the creative minds of our ancestors. Unlike implements of pottery, metal and stone, however, wooden artefacts rarely survive long enough for us to study and classify as a means of understanding our past cultural heritage.

What survive most often at archaeological sites are the remains of charcoal and pollen from waterlogged deposits near to or at the excavated site. Charcoal can be present in features such as post-holes or slot-trenches, indicating the types of wood used as building material. Wood and its by-product charcoal were used as fuel for everyday use at domestic hearths and in association with metal-working activities. Recent excavations along many road schemes in Ireland have uncovered hundreds of charcoal production pits where oak wood was converted into charcoal for metal-working and industrial uses from prehistory until recent times (see Kenny, Chapter 8). Specific wood types such as oak were selected and used in cremation burial rites (O'Donnell 2007). Wood was also a key raw material in the manufacture of tools and containers (O'Sullivan 1990).

Pollen analysis, the study of vegetation history by counting the microfossils of pollen grains, is a technique used for reconstructing woodland succession as well as the scale and type of vegetation that was present in close proximity to archaeological remains. Pollen analysis can also reveal the impact of both humans and climate on that vegetation in the past.

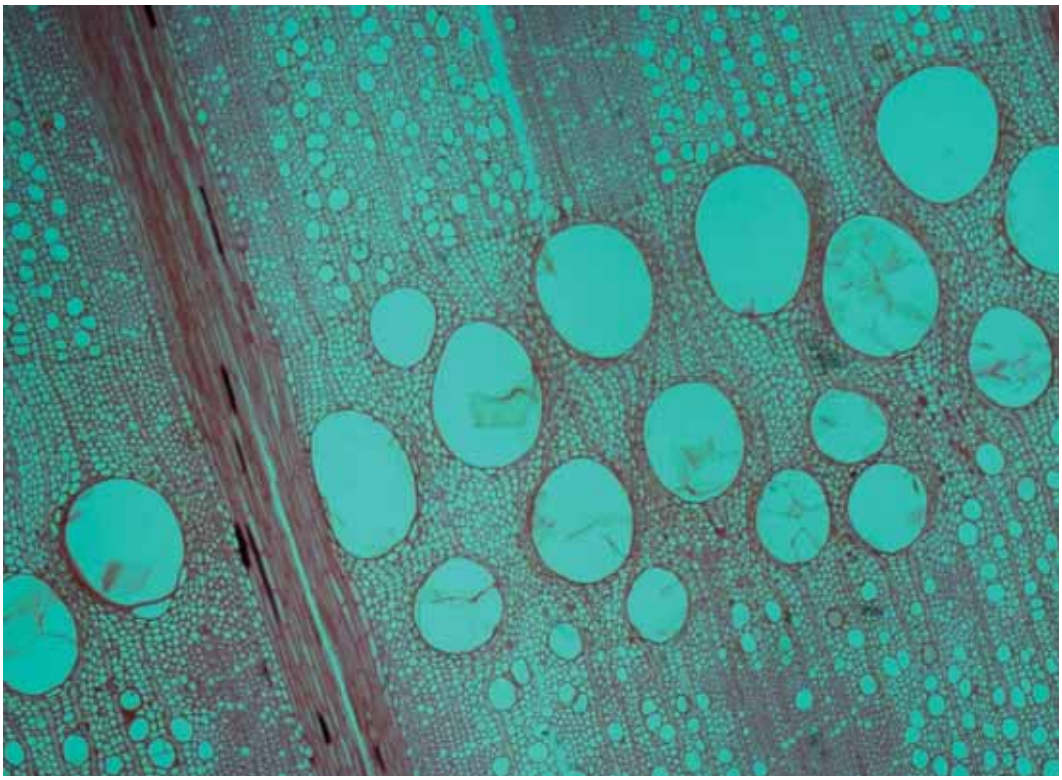
By combining the analysis of wood selection and use, which is intrinsically linked to human influence, with a record of pollen data from sediment cores it is possible to recreate past landscapes. Linking palaeoenvironmental and archaeological research has become an increasingly important method of understanding past landscape and societal change in Ireland, and an NRA-funded Ph.D research project is currently adopting this approach in assessing ancient landscape change in the midlands (see below).

Wood and charcoal analysis

Each wood taxon (one or more organisms classified as a group) has a distinct microstructure, and charcoal and wood can therefore be identified to species level under a high-powered microscope. When slivers of wood or charcoal are examined in this way, the patterns in their microstructure are compared to known species or reference keys and the identifications are made (Illus. 1).

Pollen analysis

Pollen grains are dispersed into the air by vegetation and can accumulate in sediments in lakes, peat bogs and waterlogged ditches, building up sequentially. Sediments are extracted



*Illus. 1—Microstructure of oak (*Quercus *sp.): a transverse section showing wide ray and tree-ring growth (Lorna O'Donnell).*

Illus. 2—Extracting a pollen core from Ballinderry Lough, Co. Westmeath (Ellen OCarroll).

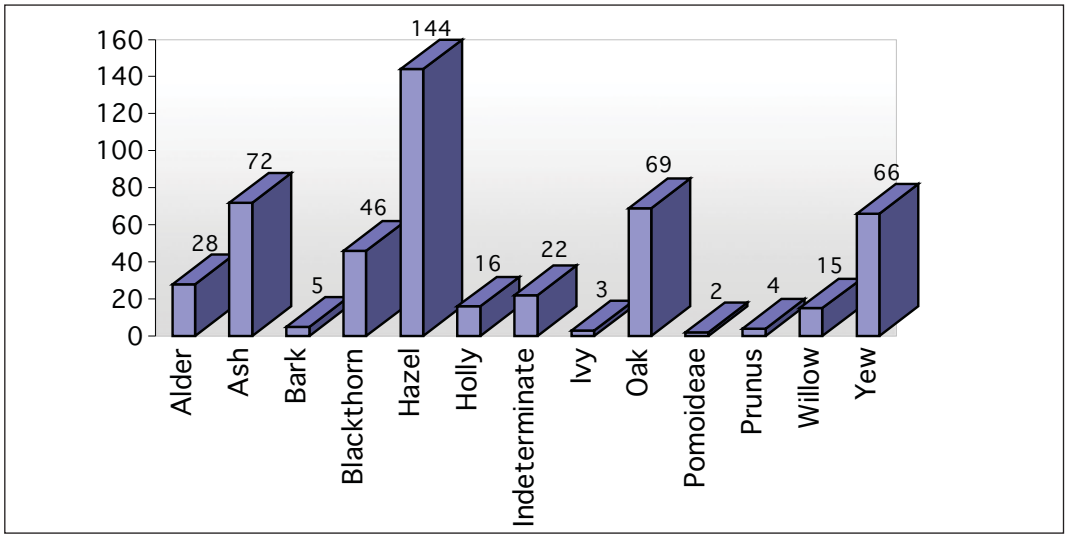
for study by coring to obtain a vertical sequence of sediments deposited at particular times (Illus. 2). Samples are then taken from the core at 1 cm intervals and examined under a high-powered microscope. As the outer surface of a pollen grain is highly durable, pollen is preserved in sediments and is available for identification and counting. Each grain is different in structure and shape; by identifying the quantity and variety of pollen grains at each level in the past, one can reconstruct the types of vegetation that existed in any given area (Moore et al. 1991). This analysis results in the creation of a pollen diagram, which is a graphical expression of the frequency of the different types of pollen over time, with radiocarbon dating of organic samples from the core providing a chronological framework.

Baronstown 1—a case-study from the M3

An example of linking palaeoenvironmental and archaeological research is provided by the investigation of a 'defensive or military' ringfort at Baronstown, Co. Meath, which was excavated by Stephen Linnane of Archaeological Consultancy Services Ltd in advance of the construction of the M3 Clonee to North of Kells motorway scheme (Linnane & Kinsella 2007; 2009a; 2009b).[1] The impressive ringfort ditch was 4 m wide and 3 m deep and was surrounded by numerous smaller enclosing features, two possible houses and cereal-drying kilns (Illus. 3).

A total of 492 wood fragments (artefacts, stakes, chips etc.) from Baronstown were analysed by the author for species identification, wood use and woodworking (Illus. 4). The artefact assemblage included numerous yew cask and bucket staves and stave fragments (Illus. 5), a lathe-turned alder bowl, an alder scoop/ladle (Illus. 6), two possible pegs/dowels (of ash and hazel), an ash rod, a dowelled yew object, a hazel withy (rope) and a possible handle/tenon of blackthorn. The samples were identified as alder (*Alnus glutinosa*; 28

Illus. 3—Aerial view of the impressive 'military' ringfort at Baronstown, Co. Meath (Studio Lab).



Illus. 4—Wood species identifications from Baronstown (Ellen OCarroll).

Illus. 5—Yew cask stave from Baronstown (John Sunderland).

Illus. 6—Carved alder scoop from Baronstown (John Sunderland).

samples), ash (*Fraxinus excelsior*; 72 samples), blackthorn (*Prunus spinosa*; 46 samples), hazel (*Corylus avellana*; 144 samples), holly (*Ilex aquifolium*; 16 samples), ivy (*Hedera helix*; three samples), Pomoideae (hawthorn, mountain ash, apple and pear; two samples), blackthorn/cherry (*Prunus* sp.; four samples), oak (*Quercus* sp.; 69 samples), willow (*Salix* sp.; 15 samples) and yew (*Taxus baccata*; 66 samples).

The wood selected for making the tools and containers demonstrates that the inhabitants of the site had an in-depth understanding and knowledge of the attributes of the various wood species. For instance, yew would have been selected for the manufacture of the staves because it is strong, very elastic and durable, and objects made from it rarely warp or crack. It is clear from the wood analysis that the wood from Baronstown could not all have been derived from the same source. A variety of woodlands were exploited: broad-leaved, wet, coppiced and scrub woodlands.

When a wider landscape approach is taken through the analysis of pollen from the basal fills of the Baronstown ditches we get a somewhat different picture. The pollen identified was principally from herbaceous taxa, including some cereals, with a few arboreal (tree) taxa represented, including alder, birch, hazel and oak (Archaeological Services Durham University 2009). The lower levels of tree pollen relative to herbaceous pollen are to be expected, as pollen studies from other sites throughout Ireland suggest that large-scale destruction of the major woodlands had taken place during the later Iron Age to provide land for farming (Mitchell 1987, 121). The results of the pollen analysis do not indicate any high numbers of yew trees in the area, which is significant given the quantity of yew staves/stave fragments recovered from the site. Another absent tree pollen is ash, which is surprising as ash was the second most dominant taxon identified from the wood assemblage. The different pictures may be related to a number of factors, such as different periods for the dispersal of the pollen in the ditches and the use of the wood on site, variable decomposition rates of specific pollen types in certain soils, as well as the possibility of trade in yew for the manufacture of wooden staves. The pollen may in this particular case be a reflection of the very local landscape close to the ditches, while the wood analysis is perhaps a more accurate reflection of the woods present in the vicinity and surrounding environment of the site, as well as of the wood selected for use at the site.

Analysis of the findings from Baronstown highlights the importance of a multidisciplinary approach to include a tightly dated pollen core that links in with the actual archaeological on-site activity. If the wooden artefacts had not survived and pollen was the only indicator, it is clear that the importance of yew and ash to the people who occupied the site would not have been readily recognised.

NRA Research Fellowship Programme

In 2008 the NRA awarded funding from its Research Fellowship Programme to the author to conduct a Ph.D research project entitled *Understanding environmental and landscape change in the midlands of Ireland through the cultural use of woodland*. This research is being undertaken at the Botany Department, Trinity College, Dublin, and is combining palaeoecological techniques and archaeological data (including information derived from NRA-funded excavations) in order to quantify woodland use and its impact in the Irish midlands since the Mesolithic period (c. 8000–4000 BC).

This research project has two principal aims. The first is to create a detailed and consolidated reconstruction of the woodland environment and its use from the Mesolithic period to the present day along two new sections of the N6 route in counties Westmeath and Offaly (initially the N6 Kilbeggan–Athlone Dual Carriageway was the main focus of the project, but now archaeological investigations on the N6 Kinnegad–Kilbeggan Dual Carriageway will also be addressed). Considerable resources have been invested in archaeological site investigations in this region over the past five years, and the detailed analysis of woodland exploitation will offer an ideal framework within which to link past human exploitation of the area with the surrounding environment. Furthermore, these sections of the N6 boast unrivalled data sources, from the quantity of NRA-funded excavations undertaken in the area, to enable the completion of a thoroughly comprehensive investigation. This aim will be achieved by marrying environmental archaeological and palaeoecological techniques. The second aim is to develop a series of recommendations and guidelines for the sampling and analysis of wood, charcoal and pollen on or near archaeological remains for use by field archaeologists working on future NRA-funded archaeological investigations.

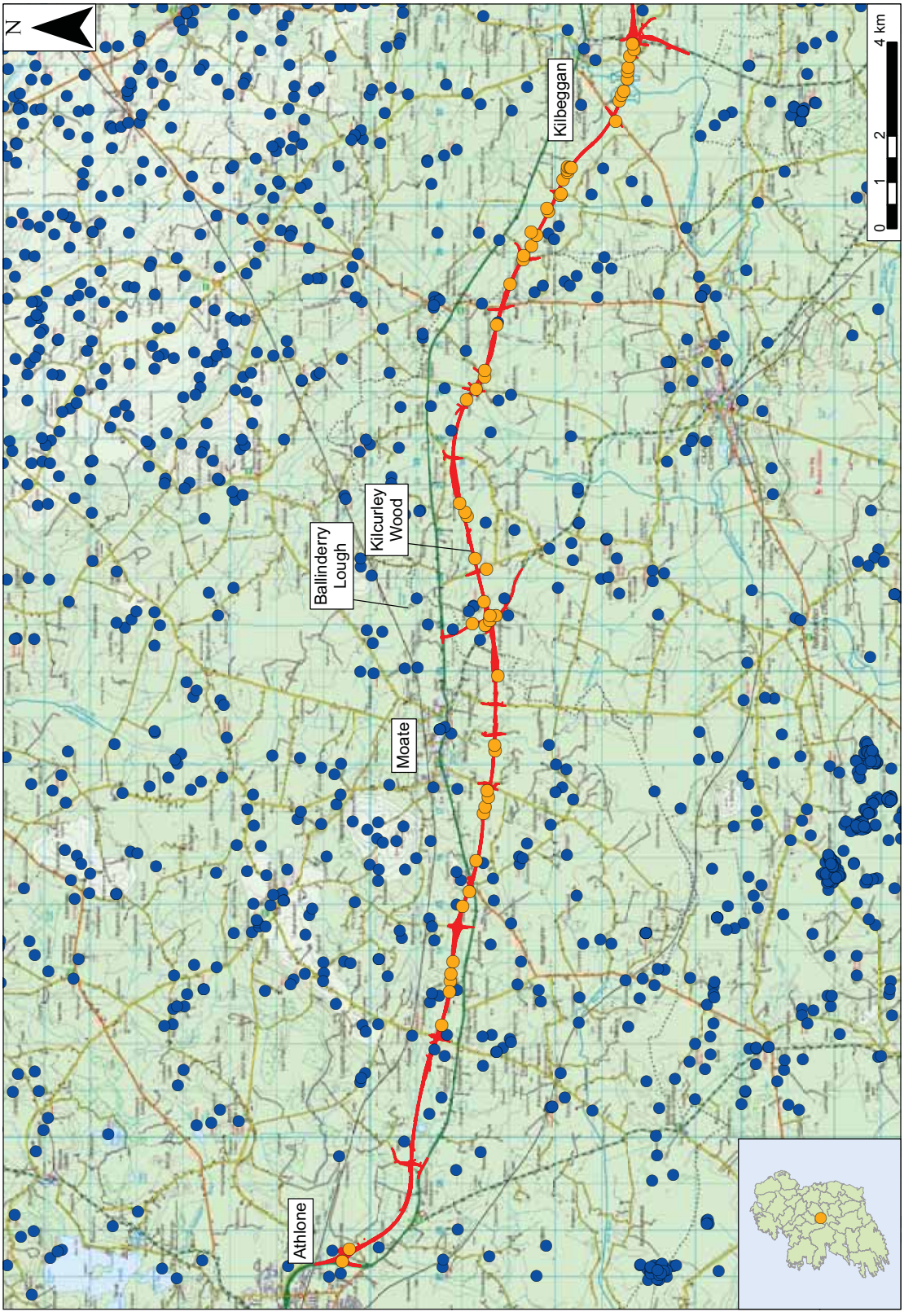
Although this study is at a preliminary stage, some interesting results and trends are emerging; these are outlined below.

N6 study area

The route of the new 57-km-long N6 Kilbeggan–Athlone Dual Carriageway in counties Offaly and Westmeath was the main focus of the multidisciplinary environmental research at the outset (Illus. 7). Archaeological investigation along the Kilbeggan–Athlone section identified over 86 archaeological sites reflecting approximately 6,000 years of human activity in the area. The range of sites excavated along the road scheme and included in the study includes some small-scale Neolithic activity, two Bronze Age settlement sites and numerous burnt mounds (*fulachta fiadh*), Iron Age metal-working sites and industrial activity (e.g. cereal-drying kilns and charcoal production pits), and an early medieval ringfort. Two significant complexes in County Offaly were also excavated, comprising a Late Bronze Age settlement/ritual site at Tober (Walsh 2007) and a multiphase enclosure at Cappydonnell Big (Coughlan 2007; 2009b).

Although some substantial medieval sites were excavated along the N6, the bulk of the remains were prehistoric, mostly Bronze Age in date and associated with burnt mound activity. This is in contrast to the previously documented archaeological sites in the study area recorded in the Record of Monuments and Places (RMP), which are more indicative of a fossil medieval landscape comprising ecclesiastical and secular sites.

Driving from Kinnegad to Athlone along the new M6 motorway today, one would be mistaken in thinking that this was always a landscape largely devoid of trees. Throughout various periods over the last 5,000 years the area would have been densely wooded, and the surrounding woodlands would have been integral to the life and, indeed, survival of our ancestors. The wood and charcoal identified from the excavated sites would have been selected for specific purposes, and therefore it is important to compare the wood analysis with the pollen record. This provides a full and accurate picture of the surrounding landscape and the changes wrought by human influences and interactions. This area of work



Illus. 7—Location of N6 Kilbeggan to Athlone Dual Carriageway, with RMP sites in blue and excavated sites in orange (based on the Ordnance Survey Ireland map).

is especially important in Ireland, where there are very few written records up to the 18th century relating to the quantity and type of woodland in Ireland (McCracken 1971). These complementary approaches form the basis of palaeoecological reconstruction and archaeological modelling of woodland exploitation and use in Ireland.

Pollen work

To help interpret changes in the wider landscape, thereby linking the environment to the archaeological data sets from the N6, a regional pollen core and a local pollen core have been extracted from two locations within the study area. A long pollen core extracted from Ballinderry Lough, Co. Westmeath, 2 km east of Moate, will provide a tightly dated sequence of vegetation change in the surrounding area, focusing on a 30-km radius (Illus. 2 & 7). This is in contrast to a shorter pollen core extracted from a closed-canopy woodland in Kilcurley Wood, Co. Westmeath, 2 km south-east of Ballinderry Lough, where a more localised and shorter vegetation history will be studied (Illus. 7). These two cores will facilitate a comparative evaluation of the local vegetation (woodland) and a more regional record of vegetation change (lake) throughout the Holocene period (9500 BC to present) in the midlands.

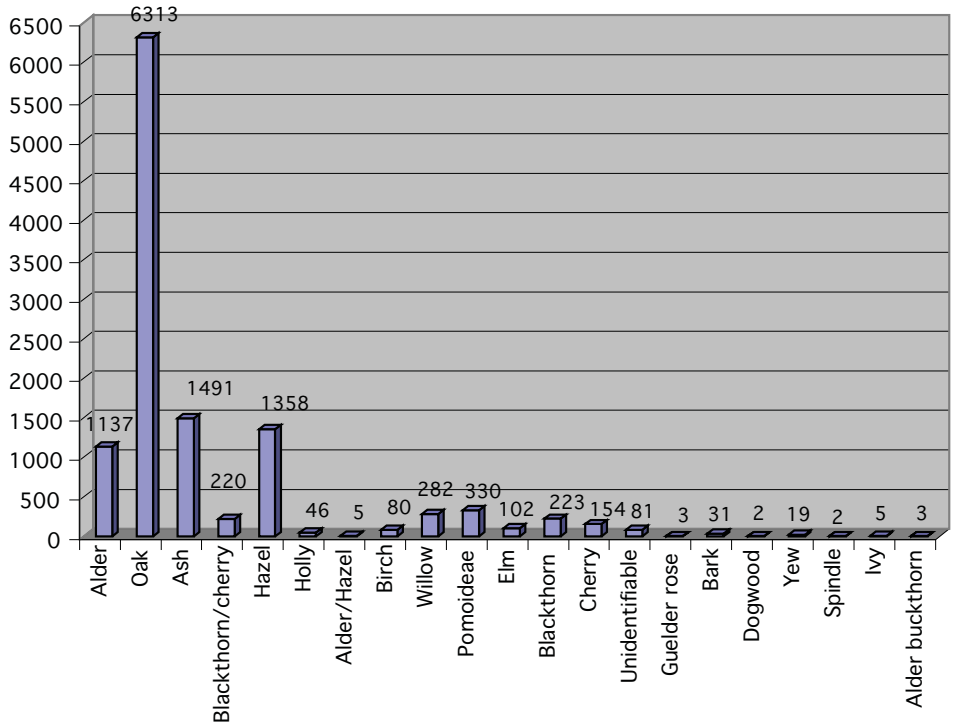
Preliminary analysis of the regional pollen core from Ballinderry Lough is ongoing at the time of writing. Further radiocarbon dates and analysis at a tighter resolution along the core are required to highlight specific changes in the landscape at particular periods and to identify human activity in the study area. The provisional results show a noticeable decline in woodland cover as the Holocene progresses. For instance, during the Bronze Age (c. 2400–800 BC), which is characterised by a rise in archaeological monuments and, by inference, population in the area, there is an opening up of the landscape. This is evidenced in the core by a rise in ribwort (*Plantago lanceolata*), a common weed of cultivated land, and a corresponding drop in oak (*Quercus*) and ash (*Fraxinus excelsior*) trees. The decline of woodland would have continued apace as human settlement expanded across the region in subsequent periods. By AD 1700 there is a conspicuous drop in hazel (*Corylus avellana*), oak, alder (*Alnus glutinosa*) and elm (*Ulmus* sp.) pollen towards the top of the core, which most likely relates to clearance of the woodland landscape during the Plantation period. This decrease in woodland pollen is noted in other cores from the midlands, such as that from Monaincha, Co. Tipperary (Hall 2003). There is also a corresponding rise in pine pollen during this post-1700 period.

Overall, the pollen diagram indicates the development of bog and marshland throughout the study area, with plenty of heather (*Calluna*) and sedges (Cyperaceae) recorded from along the latter half of the core, as well as scrub woodland and pastoral grasslands.

Previous pollen cores extracted and analysed from Cornaher Lough, Co. Meath (Heery 1998), at the eastern side of the N6 study area, and Clara Bog, Co. Offaly (Connolly 1999), to the south of the current N6, will also be studied to examine vegetation change in relation to human activity in the study area.

Charcoal and wood analysis

The research is more advanced in relation to the identification of charcoal and wood from the excavated sites on the N6 Kilbeggan–Athlone Dual Carriageway. A total of 17 wood taxa have been identified from charcoal samples from 55 of the 86 sites. The range of sites analysed includes small-scale Neolithic activity (pits and one possible structure), 27 Bronze



Illus. 8—Wood species identifications from charcoal recovered during excavations along the N6 (Ellen OCarroll).

Age burnt mounds, two Late Bronze Age habitation sites, one Iron Age metal-working site, two early medieval ringforts and six sites consisting of cereal-drying kilns and charcoal production pits, a multiperiod enclosure and 10 miscellaneous hearths and pits (mostly dating from the medieval period). Wood samples from the troughs of various burnt mounds were also analysed (see below).

The 17 taxa identified from the charcoal samples (Illus. 8), in order of representation, were oak (*Quercus* sp.; 6,313 fragments), ash (*Fraxinus excelsior*; 1,491 fragments), hazel (*Corylus avellana*; 1,358 fragments), alder (*Alnus glutinosa*; 1,137 fragments), Pomoideae (hawthorn, mountain ash, apple, pear; 330 fragments), willow (*Salix* sp.; 282 fragments), blackthorn/cherry (*Prunus* sp.; 220 fragments), blackthorn (*Prunus spinosa*; 223 fragments), cherry (*Prunus avium/padus*; 154 fragments), elm (*Ulmus* sp.; 102 fragments), birch (*Betula* sp.; 80 fragments), holly *(Ilex aquifolium*; 46 fragments), yew (*Taxus baccata*; 19 fragments), ivy (*Hedera helix*; five fragments), alder buckthorn (*Frangula alnus*; three fragments), guelder rose (*Viburnum opulus*; three fragments), spindle (*Euonymus europaeus*; two fragments) and dogwood (*Cornus sanguina*; two fragments). A total of 81 fragments were unidentifiable and 19 fragments were identified as bark.

Analysis of the results indicates that samples from the Neolithic sites consisted almost exclusively of oak. The lack of Neolithic habitation evidence within the study area, coupled with the charcoal identification, suggests that a largely wooded landscape was present throughout much of the midlands 5,000 years ago and this may have inhibited wide-scale settlement. This hypothesis will be tested by the data collected from the pollen cores along the N6.

Oak also played a major role in the Early Bronze Age, but by the later Bronze Age hazel and ash were more common, which may indicate a more open landscape cleared by people who came to occupy the area during the period. Elm charcoal was also identified in greater quantities from the Early Bronze Age samples. Oak was selected for structural purposes at the Late Bronze Age habitation site at Tober. It was also dominant in the Iron Age and its use was presumably related to increased iron-working activities. Oak was almost exclusively collected for use in charcoal production pits during the early to later medieval period. Alder appears not to have played as significant a role, particularly during the Bronze Age with regard to burnt mounds.

Eighty-two wood samples were analysed from the trough linings associated with some of the burnt mounds. Oak was generally selected for use as planks, particularly in the Early Bronze Age, although alder planks were used to line one trough of Middle Bronze Age date. A variety of wood types were used as posts and stakes, although ash and hazel were more often selected for such constructional uses.

Conclusion

Woodland resources were integral to everyday life in the past. Our ancient ancestors had an in-depth knowledge of woodlands: wood use analysis clearly demonstrates that their selection of wood for utensils, structures and fuel was based on a firm understanding of the characteristics of the different species.

Further work using the complementary approaches of pollen, charcoal and wood analysis in association with the results of archaeological excavation along the N6 will provide a detailed reconstruction of woodland environment and usage through various periods in the midlands of counties Offaly and Westmeath.

Acknowledgements

I would like to thank my Ph.D supervisor, Professor Fraser Mitchell, for his helpful comments on this paper and for his supervision and guidance throughout the project. Thanks also to Fintan Walsh and all at Irish Archaeological Consultancy Ltd, who were most helpful in the gathering of samples and plans, and to the staff at Archaeological Consultancy Services Ltd, who kindly provided background information on Baronstown 1. Lastly, I would like to thank the NRA for funding and for providing necessary data and maps in the preparation of this paper, in particular Rónán Swan, Head of Archaeology (acting), and Orlaith Egan, NRA Archaeologist.

Note

1. NGR 294401, 259365; height 107 m OD; excavation reg. no. E3070; ministerial direction no. A008; excavation director Steve Linnane.