BIRMINGHAM ARCHAEO-ENVIRONMENTAL

BAE

Beckingham Marshes, Nottinghamshire: A palaeoenvironmental assessment of deposits associated with the River Trent

E-J.Hopla and Dr.B.R.Gearey MIfA

Beckingham Marshes, Nottinghamshire: A palaeoenvironmental assessment of deposits associated with the River Trent

By

E-J.Hopla and Dr.B.R.Gearey MIfA

September 2009

Summary

Following an initial assessment in 2006 and palaeoenvironmental sampling in 2008 by Birmingham Archaeo-Environmental, it was suggested that a programme of palaeoenvironmental assessment was carried out at Beckingham Marshes. Coring was undertaken to the east of the site in fields 18 and 19 along two transects which were located to follow the line of the proposed pipeline. The stratigraphy in the eastern area of the site consisted of grey-brown silty clays to a depth of 1.0m, underlain by dark brown herbaceous well humified peats to a depth of 2.5m. This peat unit was in turn underlain by a grey-brown organic-rich silt. Pollen analysis was carried out throughout the humified peat layer in core 10, field 18. The pollen record indicates that the floodplain environment was dominated by sedge fen with an alder fen carr developing during the Middle Bronze Age. The local dominance of alder on the site was replaced by sedge carr by the Late Iron Age. Pollen preservation was poor throughout the middle segment of the diagram and no further work is thus recommended.

KEYWORDS: Beckingham Marshes, Nottinghamshire, River Trent, Pollen, Radiocarbon Dating

Contact address for authors:

Birmingham Archaeo-Environmental
Institute of Archaeology and Antiquity
University of Birmingham
Edgbaston
Birmingham
B15 2TT

Prepared for:

RSPB
46 The Green
South Bar
Banbury
Oxfordshire
OX16 9AB

Beckingham Marshes, Nottinghamshire: A palaeoenvironmental assessment of deposits associated with the River Trent

1. INTRODUCTION

The RSPB propose to develop a wetland habitat at Beckingham Marshes, Nottinghamshire (NGR SK799896, figure 1) to restore breeding wader bird populations in the area. As part of the planning proposal, around 60 ha of the area will be restored to wet grassland, primarily through the raising of the local water level by the re-profiling of existing ditches. In addition, surface scraping of certain areas within Beckingham Marshes will be undertaken to both encourage seepage and develop freshwater pond areas.

An initial assessment of the deposits at Beckingham Marshes was undertaken in 2006 (Tetlow and Moscrop, 2006). However, since completion of the assessment, a number of changes have been made to the proposed restoration projects which were not adequately accounted for in the initial assessment. An extensive drainage ditch is now required proximal to an oil pipeline that runs through the site in order to reduce the potential threat of pipeline corrosion. In addition, a number of the fields were not assessed for their palaeoenvironmental potential during the initial assessment. It was therefore proposed to undertake further coring across the site in order to assess the spatial and temporal variations in the sedimentary archive.

A coring strategy was developed to concentrate on the areas within Beckingham Marshes that were to be affected by drainage ditch construction and surface scraping, the results of which were described in Hill, *et al*. (2008). Recommendations were made for the palynological assessment of Core 10 (Field 18) supported by radiocarbon dates (see Figure 2) was assessed for pollen and radiocarbon dating. This report describes the results of these assessments and makes recommendations for further analyses.

The study site is located on the west bank of the River Trent to the west of Gainsborough. The floodplain is bounded to the east by the Jurassic escarpment of the Lincoln edge and to the west by the Mercia Mudstone. The geology consists of the drained and reclaimed Holocene alluvium which overlies Devensian First Terrace sands and gravels, which also outcrop along the floodplain edge and in places as 'islands' within the alluvium. The Holocene development of the River Trent has recently been summarised by Howard (2005).

2. METHODS

2.1 Pollen Assessment

A total of 10 subsamples were assessed for pollen from core 10. Pollen preparation followed standard techniques including potassium hydroxide (KOH) digestion, hydrofluoric acid (HF) treatment and acetylation (Moore *et al.,* 1991). At least 125 total land pollen grains (TLP) excluding aquatics and spores were counted for each sample. However, pollen concentrations were very low in three samples (0.56m, 1.04m and 1.52m depths) and pollen was absent from samples from 1.20m and 1.36m

depths, for which full counts were not possible.

2.2 Radiocarbon Dating

A total of 2 sub-samples (see Table 1) were submitted for radiocarbon dating to BETA Analytic Inc., Florida. The two peat samples were taken from 0.80-0.85m and 1.70-1.75m depths. Each sample underwent acid/alkali/acid pre-treatment prior to dating.

3. RESULTS

3.1 Radiocarbon Dating

The radiocarbon dating samples are summarised in Table 1. The samples yielded sufficient organic carbon for successful dating and all analyses are reported as having proceeded normally. It can be concluded that that the radiocarbon dating framework has provided a reliable chronology.

3.2 Pollen Assessment

Five out of the 10 pollen samples provided sufficient counts for palaeoenvironmental interpretation. However, pollen concentrations were low in samples from 0.56m, 1.04m, 1.20m, 1.36m and 1.52m depths to permit a reliable palaeoenvironmental assessment. The results from the pollen assessment are presented in the form of a pollen diagram (Figure 3) produced using the computer programmes TILIA and TILIA*GRAPH (Grimm 1991). A stratigraphic column and the associated radiocarbon dates are also provided. All percentage figures are of Total Land Pollen (TLP) unless otherwise specified.

The basal segment of the diagram (1.64m-2.00m) is dominated by tree and shrub pollen (c.60%), which largely consists of *Alnus glutinosa* (alder), *Quercus* (oak) and *Corylus avellana*-type (hazel but may include sweetgale). Other trees and shrubs are rare but include *Pinus sylvestris* (scots pine), *Betula* (birch), *Ulmus* (elm), *Fraxinus* (ash) and *Salix* (willow).

However, trees and shrubs decline at 1.84m and herbaceous pollen dominates, predominantly Cyperaceae (sedges) at up to 60%. Other herbs present in the basal segment include Poaceae (wild grasses), *Filipendula* (meadowsweet), *Plantago lanceolata* (ribwort plantain) and Rosaceae (rose family). At 1.64m Cyperaceae declines and *Alnus* increases to become the dominant species, where it attains its highest values of over 60%. This rise in *Alnus* is dated to 2900±40 BP (BETA-260811, 1250 to 1240 cal BC, 1220 to 980 cal BC), which places this event in the Middle Bronze Age.

The local floodplain environment during this period was dominated by alder fen carr with areas of sedges. Willow and some grasses (most likely *Phragmites,* the common reed) would also have been associated with this wetland environment. The drier soils beyond the floodplain edges would probably have been dominated by oak woodland with a hazel understory and scattered stands of pine, birch and ash on suitable soils. Pine and birch may have been established on the exposed sands and gravels of the terrace gravels as well as on drier areas of the floodplain. The presence of ribwort plantain however indicates some open, perhaps disturbed, areas in the wider environment.

Pollen concentrations were too low in the subsequent samples from 1.52m, 1.36m, 1.20m and 1.04m to permit assessment. Where the pollen record

recommences at 0.88m, there has been a marked increase in herbaceous pollen at the expense of the trees and shrubs. This is dated to 2100±40 BP (BETA-260810, 340 to 330 Cal BC, 200 to 30 Cal BC) indicative of the Late Iron Age. *Alnus* has decreased to <5% and willow has disappeared from the record. The dryland tree and shrub taxa have also declined with values of *Corylus* falling to <10% and *Quercus* recorded at <5%.

Cyperaceae dominates the pollen spectra with values up to 80%. Poaceae has also risen up to 10%. Other herbs are scarce with *Filipendula, Galium* (bedstraws), Lactuceae and *Plantago lanceolata* at trace values. Spores have increased with Pteropsida (ferns) peaking at 0.88m at 60% TLP+spores and *Pteridium aquilinium* (bracken) up to 5%. Aquatics are rare although *Sparganium*-type (bur-reeds) increases slightly towards the top of the pollen diagram indicating areas of still-slow flowing water.

The alder fen carr indicated at the base of the diagram thus appears to have been replaced by open sedge fen by the Iron Age at the latest. The wider dryland also appears to have become more open with a decline in oak and pine accompanied by an increase in grasses and a slight rise in ash, which thrives in more open conditions. The record is heavily dominated by the local pollen signal and discerning changes at distance from the sampling site is difficult. The enhanced values for highly resistant spores such as Pteropsida may also indicate that the pollen record has been affected by differential preservation.

The pollen diagram can be compared with the results of detailed palaeoenvironmental analyses carried out at Bole Ings just to the south of Beckingham Marshes (Brayshay and Dinnin 1999). Floodplain peat accumulation commenced at this location at a date of 8200 years before present (BP) with *Alnus* fen carr becoming established around 6300 BP. The data suggests a phase of floodplain stability until around 2700 BP (the later Bronze Age) at which time, a decline in woodland and expansion of grassland and reedswamp. It is suggested that these changes are associated with an increase in wetness resulting from human clearance of woodland and agriculture. It is possible that the shift from alder to reedswamp apparent at Beckingham can also be correlated with this event at Bole Ings.

4. CONCLUSIONS AND RECOMMENDATIONS FOR FURTHER ANALYSIS

The accumulation of peat at the sampling site was taking place in an alder carr floodplain environment by the Middle Bronze Age (c. 3200 years before the present). Mixed oak-hazel woodland was established in the wider landscape. The composition of the local floodplain vegetation shifted to sedge carr during the Iron Age (c. 2000 years before the present). The exact nature or timing of this change is unclear due to the poor pollen preservation in the middle segment of the diagram, but the vegetation changes were probably related to hydrological fluctuations at the sampling site during sediment deposition. This might have been related perhaps to the elevation of local water tables or the migration of the river closer to the sampling site. Alternatively, it may be associated with the effects of human activity on the river system. As pollen

preservation was generally poor, no further palynological analysis is recommended on this sequence. However, it is recommended that samples are recovered during any further intrusive work at the site. In particular, the collection of bulk samples to allow assessment of coleoptera (beetles) and plant macrofossils may be profitable.

5. ARCHIVE

The cores and sub-samples are currently stored at Birmingham Archaeo-Environmental. These samples will be held until further notice.

REFERENCES

Brayshay, B. & Dinnin, M. 1999. Integrated palaeoecological evidence for biodiversity at the floodplain-forest margin. *Journal of Biogeography* 26, 1, 115-131.

Hill, T., McKenna, R & Vorenhout, M. 2008. Beckingham Marshes, Nottinghamshire: A palaeoenvironmental evaluation of fluvial deposits associated with the River Trent. BA-E Report, University of Birmingham.

Howard, A. J. 2005. The contribution of geoarchaeology to understanding the environmental history and archaeological resources of the Trent Valley, Uk. *Geoarchaeology* 20, 2, 93-107.

Moore, P.D., Webb, J.A. & Collinson, M.E. 1991. *Pollen Analysis*, 2nd Edition. Blackwell Scientific Publications, Oxford.

Tetlow, E. & Moscrop, D. 2006. A geoarchaeological assessment of fluvial deposits associated with the River Trent, Beckingham Marshes, Beckingham, Nottinghamshire. Birmingham Archaeo-Environmental, University of Birmingham.

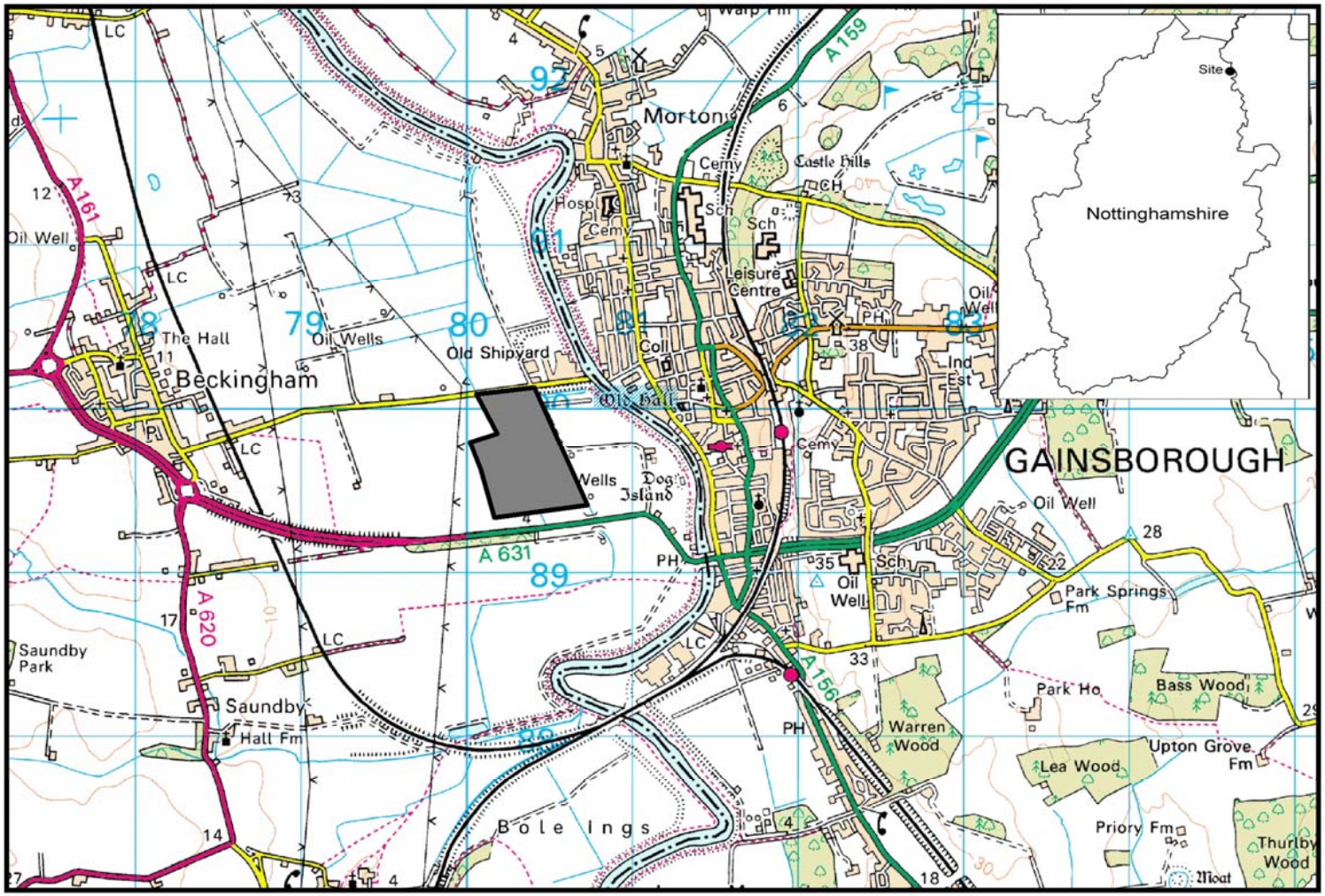

Figure 1 Site Location

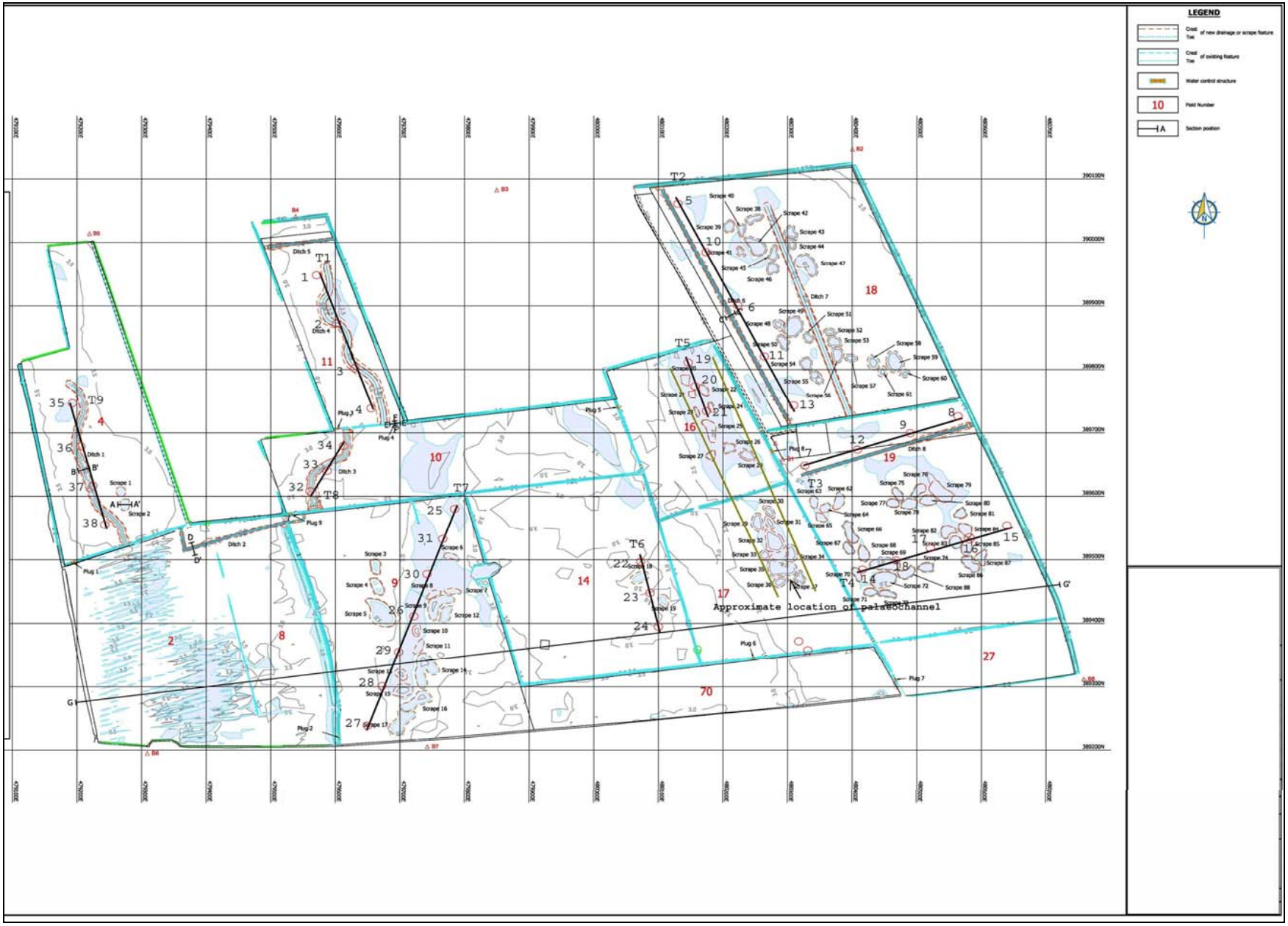

Figure 2: Field and Borehole Locations

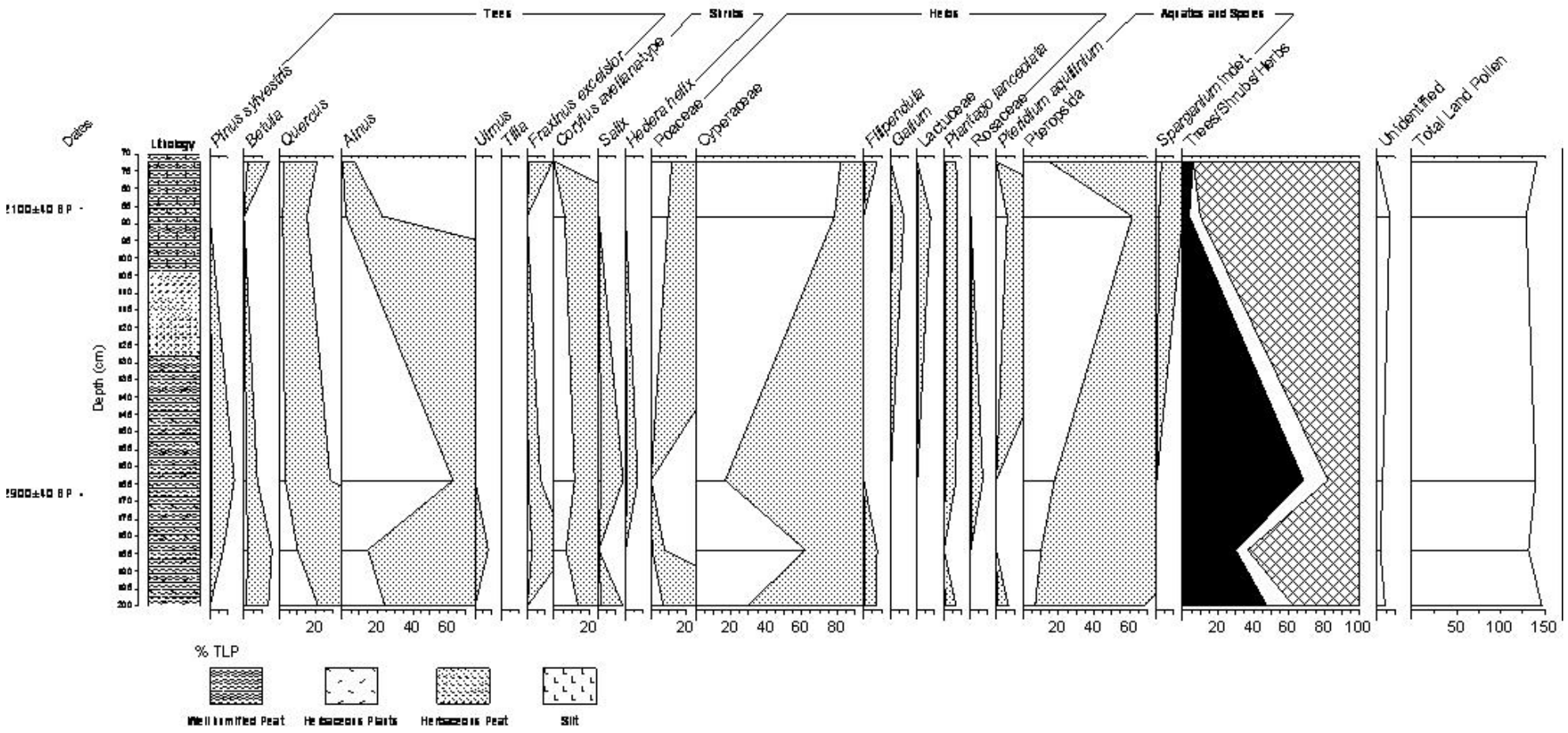

Figure 3: Beckingham Marshes Percentage Pollen Diagram. Shading = exaggeration x 10

Sample	Lab Code	Age BP	δ13C	Calibrated BC/AD
BA1929-0.86m Peat (acid-alkali-acid)	Beta-260810	2100±40 BP	-27.5	340 to 330 Cal BC, 200 to 30 Cal BC
BA1929-1.68m Peat (acid-alkali-acid)	Beta-260811	2900±40 BP	-28.1	1250 to 1240 Cal BC, 1220 to 980 Cal BC

Table 1: Radiocarbon Dates