1 Introduction

Introduction

The Nene Valley, from Northampton to Peterborough (Fig 1.1), has been intensively quarried for both terrace and suballuvial gravels from the 1950s onwards due to the demand for aggregate in the construction of the motorways and town developments in the region. The long history of aggregate extraction meant that in the 1980s co-operative approaches between the minerals companies, local authorities and heritage organisations enabled the excavation of several sites such as Stanwick and West Cotton. Since the implementation of PPG 16 this co-operation has been extended and many of the aggregate companies see archaeology not only as part of the process of extraction, but also as a positive side to the quarrying and worth promoting to the community.

Because the size of many of the quarries has increased over the last two decades, the Nene Valley now has huge tracts of ancient landscape that have been recorded by excavation. Unfortunately, each of these individual tracts has seldom been linked to the next to create a picture of the valley as a whole. Much is still to be published and much earlier work has not been synthesised. The quality of scientific techniques used to reconstruct past environments has advanced enormously in the last two decades, enabling the reconstruction of more detailed and accurate landscape pictures of the valley and its immediate vicinity.

Particular features such as former river channels, deep pits or wells, are of use in the reconstruction of such a synthesis as they are normally waterlogged. They are features that are also frequently well dated, either by radiocarbon or by artefactual evidence, so the environmental data can be placed firmly in a well understood time frame. These contexts contain floral and faunal snapshots of the environment, both in their immediate vicinity and in a wider landscape. The preservation and identification of macro-plant, pollen and insect evidence in waterlogged contexts make them time capsules of the landscape.

Over the last ten years pollen analysis has been undertaken on most of the archaeological sites excavated in the Nene Valley. These sites, which range from the Neolithic to the post-medieval periods, have produced unique data for a 'dry' area of Britain notably lacking in archaeobotanical (macrofossils and pollen) and sedimentological information but rich in field archaeology. However, these data has not been integrated due to the constraints of developer funding. Additionally there are gaps in the record which, once identified, could be filled by palaeoenvironmental work with the aim of providing complete valley coverage.

There is also historical and archaeological evidence that the present watertable does not reflect the past watertable, but is the result of post-medieval efforts to make the Nene navigable by the insertion of locks and weirs. It is apparent that watertable variability has been a feature of life in the valley since earliest times, yet the maintenance of the watertable at 'present' levels is sometimes seen in the planning process as the correct approach. The nature of the watertable at any time is such that it could reflect a number of disparate factors including: the level of abstraction, the annual rainfall, the character of landuse and the nature of the river.

As mentioned above, the result of developer-led funded archaeology is an unusually dense pattern of archaeological evaluation and excavation. In addition, during the late 1980s and early 1990s, the Raunds Area Project (RAP) was undertaken which incorporated part of the Nene Valley floodplain in the Raunds-Stanwick area (Fig 1.1). The archaeological work was carried out by a number of organisations: English Heritage, Northamptonshire Archaeology and Oxford Archaeology, and the

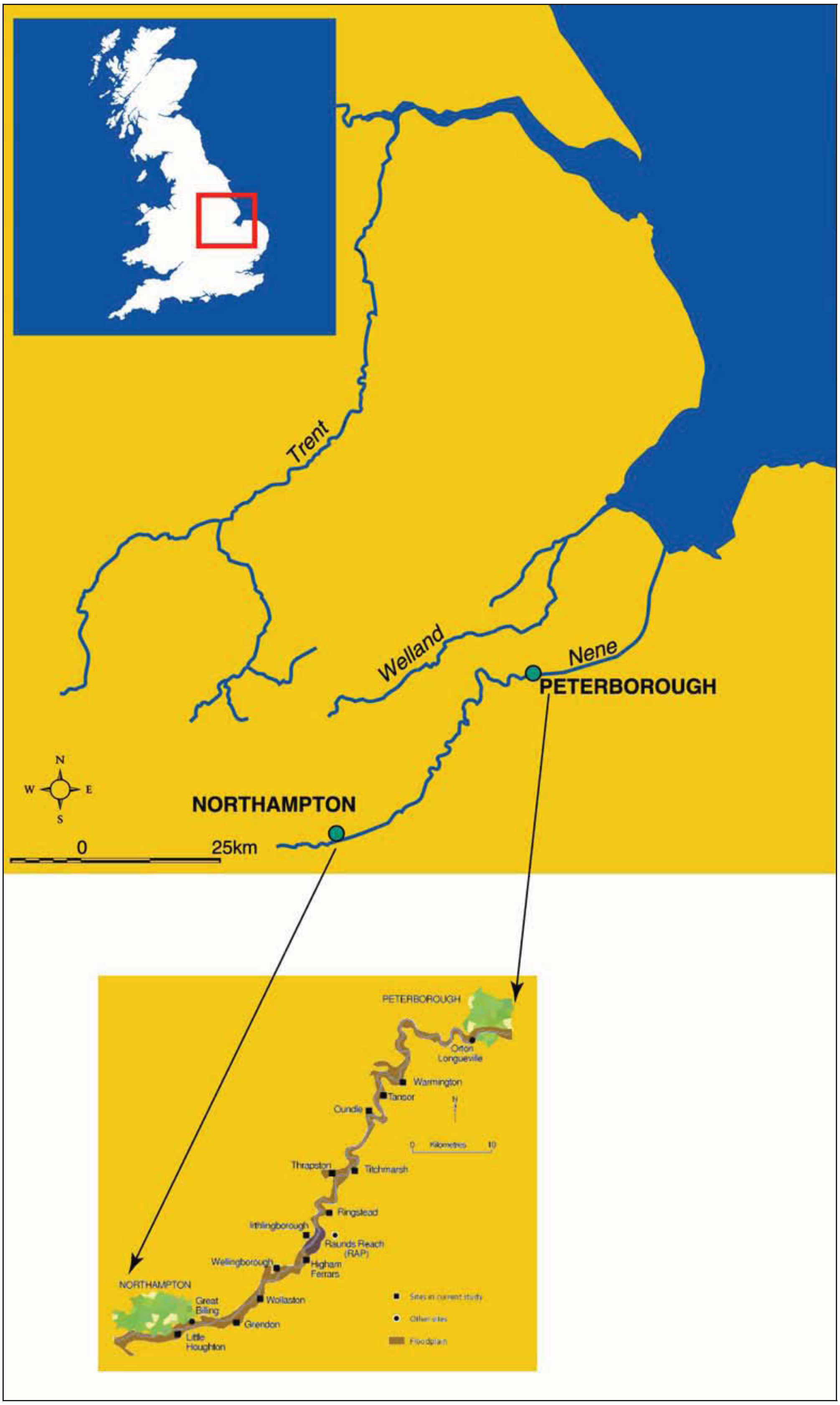

Fig 1.1: Location of the Nene Valley, and major sites mentioned in this report. Minor sites are omitted for clarity

results are still in the process of being made available (Parry 2006, Harding and Healy 2007 and Chapman in press). Despite the amount of archaeological projects undertaken throughout the valley a notable disparity exists between environmental and archaeological studies. Earlier environmental studies were carried out prior to and during PPG16 stimulated archaeological excavations and have been described in Brown *et al* (1994), Brown (2004), Brown and Hatton (2000, 2001), Brown (2006) and Robinson (1992, 2006).

The Northamptonshire Minerals Local Plan (MLP) was last approved in 1996 and is now in the process of review as part producing a new plan covering the period up to 2016. The current draft has designated an expanded area of extraction between Cogenhoe and Wollaston, which is one of the last areas unaffected by aggregate extraction and is known to contain a funerary landscape. There is no doubt that due to the quality of the aggregate and the areas location there will be continued pressure for aggregate production in the Nene Valley and it is with the aim of allowing past environmental analyses to be compared with contemporary and future analyses that this report is in large part concerned.

The Nene Valley project area

The Nene Valley is located in central England with a west-east to north-east orientation, running through Northamptonshire and Cambridgeshire and terminating in the North Sea via the Wash (Fig 1.1). The focus of this project is the *c* 100km stretch between Northampton and Peterborough. The Nene Valley is possibly the most extensively quarried valley in the United Kingdom, with over one third of the floodplain gravels having already been removed (Meadows pers com). The modern floodplain of the River Nene in this reach varies from about 750m to 900m in width (Fig 1.2) and, until removed by quarrying, was relatively flat with only a few low terrace fragments 2m or less above the floodplain. The reach of the Nene Valley is overall of low slope and characterized by one or two sinuous channels, which are today controlled by weirs and sluices. The rainfall of the area is relatively low at around 600mm yr^{-1} and only moderately erosive. Although rainfall has undoubtedly varied during the Holocene, such variation is likely to have been relatively small due partly to the importance of orographic controls on precipitation patterns in the British Isles. However, under intensive arable cultivation even low-slope landscapes can become sensitised to even single rainfall events (cf Bork 1989).

Aims

The project has a series of interlinked archaeological, hydrological and environmental aims. The principal aim was to complete a survey of the published, partially published (grey literature), and where possible, entirely unpublished environmental data on the Nene Valley in order to identify both common trends and also gaps in the coverage. Additionally this was to be achieved by developing a GIS system for metadata storage and a review of the hydrological environment of the valley (see full report).

A further aim was to place the environmental information in context with the known settlement and artefactual data for the Nene Valley. This will be used to identify environmental trends, if any, within a spatial context throughout the valley and also highlight gaps in the coverage.

Objectives

The objectives were specified in the project design (Brown and Meadows 2004) which are reproduced in Table 1.1. These have been slightly modified here in the environmental section and expanded to four principal objectives.

The first is to conduct a full and thorough audit of published and unpublished reports held both in the Sites and Monuments Record (now Heritage and Environmental Records, HER) for Northamptonshire and by the individual archaeology units. This will identify and catalogue all contexts of environmental value. This will then allow for the identification of common themes and also notable gaps in the record either spatially or chronologically. This data will enable the better targeting of research resources in excavations by identifying gaps in our knowledge.

Table 1.1 The objectives as defined in Meadows and Brown (2004)

Objective 1
To conduct a full and thorough audit of published and unpublished reports held both in the Sites and Monuments Records (SMR) for Northamptonshire and by the individual archaeology units. This will identify and catalogue all contexts of environmental value and also the contexts that might reflect watertable levels. This will then allow for the identification both of common themes and notable gaps in the record either geographically or chronologically. This data will better inform the development control process and any mitigation strategies in place. It will also enable the better targeting of research resources in excavations by identifying gaps in our knowledge.
Objective 2
To map the locations of sites of environmental value (plants, macro-remains, wood, pollen and some mollusca), on a period-by-period basis to the existing Mapinfo database for the entire valley, to identify the quality of coverage and any geographical and chronological gaps that might be present. This will enable not only the visualisation of the environmental sample distribution, but will also provide information to inform the planning process as to the value of environmentally rich contexts for filling gaps in knowledge. It will also identify if the abstraction association with mineral extraction has locally influenced the survival of environmental contexts by indicating differential survival in adjacent quarries separated by time.
Objective 3
The production of a period-by-period series of maps showing the level of waterlain deposits, or waterlogged contexts for the whole valley. This will identify trends, both within individual reaches of the valley and within the valley as a whole, and any gaps and it should be possible to relate this watertable evidence to the settlement and landuse pattern period to period. Watertable is likely to have been one of the biggest constraints to landuse in the flood plain; its migration would both affect the fertility of the area and also how marginal it was in terms of permanent, as opposed to seasonal occupation, or in terms of ceremonial/ritual use rather than agricultural use. This project should identify the link between watertable and landuse, if one exists.

The second objective is to develop and construct two tailored databases, the first as a depository for the catalogued information, which can be easily updated and searched. The second will be a GIS database to display the information in a spatial context.

The third is to map the locations of sites of environmental value (plants, macro-remains, wood, pollen and some mollusca), on a period-by-period basis to the project GIS database for the entire valley, to identify the quality of coverage and any geographical and chronological gaps that might be present. This will enable not only the visualisation of the environmental sample distribution, but will also provide information to inform the planning process as to the value of environmentally rich contexts for filling the present gaps in knowledge.

The fourth and final objective is the production of a period-by-period series of maps showing the level of waterlain deposits, or waterlogged contexts for the whole valley. This may identify trends, both within individual reaches of the valley and within the valley as a whole, along with any gaps. It might then be possible to relate this watertable evidence to the settlement and landuse pattern period to period. Watertable is likely to have been one of the biggest constraints to landuse in the flood plain, its migration would both affect the fertility of the area and also how marginal it was in terms of permanent as opposed to seasonal occupation or in terms of ceremonial/ritual use rather than agricultural use. This project should identify the link between watertable and landuse, if one exists.

Geological setting

The catchment of the River Nene above Peterborough drains approximately 1711 km^2 of the south-east Midlands and has its headwaters on the Midlands Plateau. The river and even the catchment largely follow the edge of the Jurassic escarpment, although it is not a prominent topographic feature in this area. The result is that the catchment is underlain by entirely Mesozoic sedimentary rocks, with a distinct banding from south-east to north-west. The lithologies that crop out are, in stratigraphic order from youngest to oldest, south-east to north-west. The river valley follows the boundary between the Oxford Clay-Cornbrash-Upper Lias and further north-west the sequence continues through Great Oolite, Inferior Oolite, Upper Lias, Middle Lias and finally onto the Upper Lias of the Midland Plain. There are important consequences of these adjacent bedrock types, particularly the juxtaposition of aquifers (eg Oolite and Cornbrash) and aquicludes (Upper Lias and Oxford clay). The most obvious is the existence of a prominent springline along the valley sides (Brown 2006). Another is that the groundwater is an important component of river flow and is alkaline. Indeed the result of the high and alkaline groundwater is the preservation of bones in both soils and in river gravels. The frequency of occurrence of bones in both the alluvial gravels and fine overbank sediments is high and is one of the taphonomic characteristics of the area.

This geological context is important as it affected the landuse history of the area, as the soils are alkaline, but frequently contain significant clay; the result being moderately fertile soils which, under the low rainfall and high sunlight hour and temperatures of the area, provide good conditions for arable agriculture. However, soil quality varies over short distances largely in correspondence with the geology (Brown 2006).

The Pleistocene history of the valley has recently been reviewed in some detail in Langford and Briant (2004a). The valley crosses the drift (Boulder Clay) covered lowlands which lie between the maximum Pleistocene ice limit and the last ice limit, during the Devensian, which is generally believed to have reached about 80km north of Raunds (IGS 1977). The orientation of the Nene Valley across the Boulder Clay plateau from Northampton to Peterborough partly follows a drift-filled buried channel (Horton 1970), which is almost certainly pre-Devensian in age. Traditionally the Boulder Clay is ascribed to the Wolstonian glaciation, but with the present doubts over the status of the Wolstonian in Central England (Rose 1987, Langford and Briant 2004) it is safer to regard it as having been deposited by a post-Hoxnian, but pre-Ipswichian glacial (Jones and Keen 1993). The pattern of Boulder Clay and its occurrence on the plateau suggests significant erosion in the succeeding interglacial, glacial and Holocene.

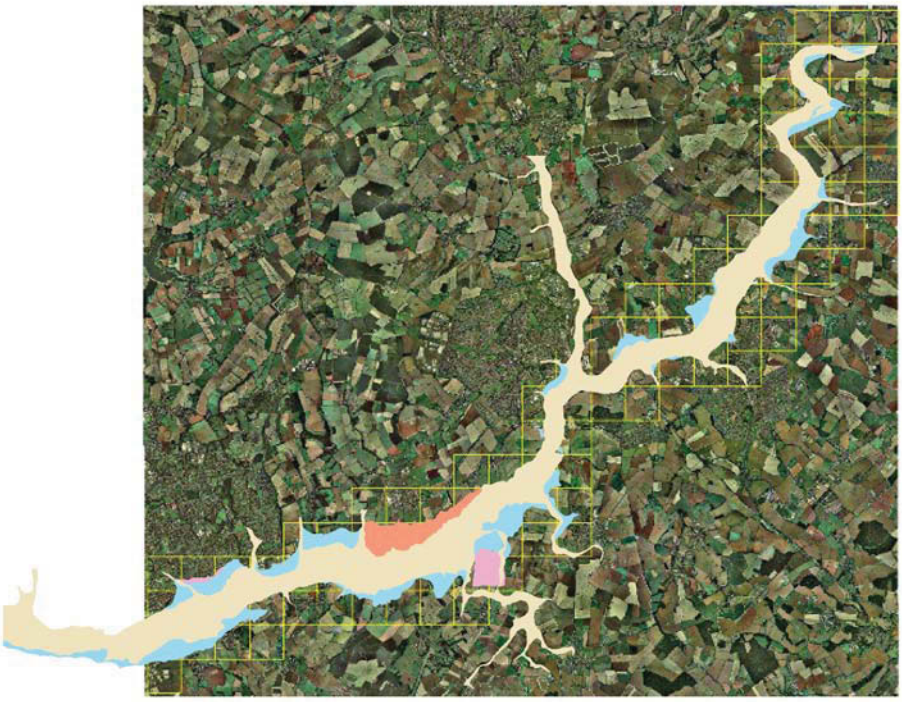

Fig 1.2: The Nene Valley floodplain and terrace complexes

Most of the terrace sand and gravels are sub-alluvial and have been the subject of geomorphological studies over several years (Castleden 1976, 1977, 1980a, 1980b, Morgan 1969, Holyoak and Seddon 1984, Brown and Keough 1992a; Brown *et al* 1994). Morgan (1969) dated fossiliferous organic deposits from the sub-alluvial gravels (terrace 1) at Great Billing upstream from Raunds. The site produced a fossil insect assemblage similar to that prevailing in the arctic tundra of the present day within a lens of peat and organic silt which produced a radiocarbon date of 28,230+330 BP (Birm-75).

Castleden (1976) investigated the sub-gravel valley surface, which he suggested was planar between Northampton and Woodford but with a deep buried trench further downstream. He cited a *Carex* peat erratic within the uppermost layers of the first terrace at Thrapston, which produced a radiocarbon date of 8530-7590 cal BC (8,920±160 BP Birm-87), as evidence of continued deposition or the reworking of the terrace deposits into the early Boreal. However, on the basis of the plant remains which were typical of a Late-glacial environment, there has always been considerable doubt as to the accuracy of this date. A more reliable radiocarbon date for the initiation of fine alluviation at Wansford is 9120-8490 cal BC (9,420±70 BP SRR-283) Harkness and Wilson 1979).

In all, three terraces have been identified on the Nene (Taylor 1963, Castleden 1980a) with the second terrace occurring 5-9m above the floodplain and the third 10-17m above the floodplain. The remnants of these higher terraces are very fragmentary and this has led Langford and Briant (2004) to question whether grouping them as fluvial terraces is really appropriate. Castleden (1977, 1980b) used the evidence from the Nene of a sub-planar valley bottom with gravel suites containing periglacial features, together with studies from elsewhere, to substantiate a general model of fluvioperiglacial pedimentation. Recent work on the terrace sequence has suggested the gravels are likely to date from both prior to the Glacial maximum (OIS3) and the Late-glacial (OIS2) from unpublished work by Brown at Ditchford and work by Briant at Stanwick (Brown *et al* 1994, Brown 1995, Briant 2002, 2003, Langford and Briant 2004).

There is clear but limited evidence of the reworking of gravels and of channel change in the early Holocene and mid-Holocene from several sites including Thrapston, Ecton and Ringstead (Castleden 1976); several of these channels are probably Atlantic to Sub-Boreal in age (Neolithic to Iron Age). Their relatively small size may be explained by lower Atlantic discharges due to forested conditions counteracting slightly higher rainfall, or the existence of a multiple-channel system (Brown 1997b?).

Castleden (1980b) has proposed a chronological model for the Nene Valley from the early Devensian (Longueville Stadial) to the Sub-Atlantic. It includes vertical incision in the Atlantic followed by anthropogenically induced aggradation. Holyoak and Seddon (1984) analysed organic deposits from Little Houghton, Titchmarsh and Orton Longueville. Both Titchmarsh and Orton Longueville provided evidence of the deposition of silts and muds together with gravel deposition in the late Devensian. On the basis of this evidence, the likelihood of the Thrapston date being too young, and a lack of other corroborating evidence, they questioned Castleden's (1980a) proposition that the deposition of the first terrace was followed by vertical incision in the late Devensian. They did, however, identify a major discontinuity between the Devensian gravels and the overlying Holocene channels and fine sediments. The channel fills at Titchmarsh and Orton Longueville were tentatively assigned to the Iron Age on the basis of pollen and pottery and the truncated roots present at the top of the gravels were ascribed to fluvial erosion/planation across the floodplain.

At Raunds comparable features have been identified (Brown and Keough 1992a) where they occurred in a buried palaeosol or palaeosol remnant of mid-Holocene age. It should be remembered that the present maximum depth of fine sediment is only 3.5m (about maximum present channel depth) and generally much less, and low fragments of terrace have little or no fine alluvial cover; therefore the existence of a higher, or substantially lower, channel than the present channel is unlikely.